

**Calming Troubled Waters: Making Interdisciplinarity Work  
(RES-224-25-0110)  
November 2005**

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*“It is often the dialogues between disciplines that leads to the most exciting breakthroughs in science” (Gornitzka, 2003).*

**OVERALL AIM**

The aim of this study (RELU Development Activity RES-224-25-0110) was to investigate several important themes relating to interdisciplinary collaboration, including:

1. The *processes* involved in undertaking interdisciplinary research,
2. An exploration of research outcomes and formats which best address stakeholders’ requirements,
3. Investigating issues surrounding the refereeing and publication of interdisciplinary research findings.

Focussing on these aims we worked towards achieving the following objectives:

- To investigate the management and organisation of projects, the integration of social and natural science datasets and the subsequent dissemination of results.
- To determine whether official project reports are useful to stakeholders.
- To enquire how journal editors and referees dealt with manuscripts arising from interdisciplinary research.

In addition, we synthesised material derived from three workshops on the theme ‘*Exploring Routes to Interdisciplinarity*’ that we ran at the first RELU conference (Rural Economy and Land Use: the challenge for research) held in Birmingham, 19-21 January 2005.<sup>2</sup> These workshops proved particularly useful, as many RELU Award Holders participated, offering us the opportunity to encapsulate their ideas and concerns about the processes and outcomes of interdisciplinarity. It should be noted that this report does not address the history of interdisciplinarity, why it has acquired such importance, or the relationships between disciplinarity, multidisciplinary and interdisciplinarity (for a detailed overview see Klein, 1990). Rather, we have concentrated our efforts on examining how natural and social scientists can, and have, worked together to address natural resource management issues.

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<sup>2</sup> Our original intention had been to interview researchers involved in interdisciplinary projects funded under RELU’s first call. However, many of these projects were in their very early stages during the period of our research. This element of our work was thus replaced by the design and reporting of the ‘interdisciplinary workshops’ for RELU researchers invited to attend the Programme’s first annual conference.

## **BACKGROUND**

### *Learning from experience*

The inspiration for this Development Activity came from our experiences while coordinating two EU Fifth Framework projects: REDCAFE (Reducing the Conflict between Cormorants and Fisheries on a pan-European scale) and IMEW (Integrated Management of European Wetlands). Both REDCAFE and IMEW provided key understandings of human-wildlife conflicts in wetland habitats that support recreational and commercial fisheries and a variety of land uses.

REDCAFE (adopting a predominantly ‘natural science’ perspective) was a response to the increasing conflicts between conservation and fisheries interests as a result of rapidly expanding cormorant populations across Europe. It involved a diversity of stakeholders from 25 countries and reviewed current management strategies and synthesised the concerns of fishermen and conservationists. IMEW (taking a predominantly ‘social science’ perspective) focussed on how local people in 4 countries perceive their wetland environments, particularly in relation to harvesting resources and aquaculture. While both projects focussed on wetlands, our research involved understanding natural resource use and management within the context of sustainable rural livelihoods e.g. hydrology, water regulation, sustainable harvesting, irrigation, agriculture, grazing. These projects also addressed a number of concerns affecting rural communities across Europe, including tourism, commercial and recreational natural resource exploitation and economics, and financial issues such as compensation schemes for both ‘stewardship’ and revenue loss due to the implementation of conservation legislation.

Both REDCAFE and IMEW incorporated the experience and knowledge of natural and social scientists, local experts, policy makers and representatives from many formal and informal institutions. However, our work in both projects showed that while social and natural scientists do co-operate, there were difficulties in fully integrating disciplinary perspectives and different types of data. Dissemination activities from such research projects are clearly an important element in the development of a more collaborative and mutually informed environment. However, our experiences from both projects raised important issues in relation to how to provide useful, accessible information both to the academic community (interdisciplinary research papers) *and* to local stakeholders for whom the standard Final Report formula is often unsuitable.

The key aspect of this Development Activity is thus to learn from the people who participated in REDCAFE and IMEW, as their experiences are directly relevant to the RELU Programme. We aim to explore how a better understanding of the potential for, and problems associated with, interdisciplinary collaboration and stakeholder involvement can be built into project design, implementation and output. These problems range from the most visible finding that people adopt different ‘world views’ that affect how they perceive and value research, to the more nuanced findings that relate to peoples’ backgrounds and previous experiences beyond the research arena.

### ***Methods and approach***

As the present study was an investigation of how *people* understand and undertake interdisciplinary research, it adopted a range of qualitative social science methodologies which “*contribute to a better understanding of social realities and to draw attention to processes, meaning patterns and structural features (and) to describe life-worlds ‘from the inside out’, from the point of view of the people who participate*” (Flick *et al.* 2004: 3). Qualitative interviewing, through face-to face interviews and semi-structured questionnaires sent by email to informants outside the UK, was undertaken with both researchers and end-users of REDCAFE/IMEW.<sup>3</sup> Nine major (1-2 hour) face-to-face interviews (see Holstein and Gubrium, 2003 for synthesis of approaches) were conducted with researchers and four with end-users, and all were transcribed in their entirety. In addition, 21 questionnaires were distributed to respondents outside the UK as email attachments, which was cost-effective and convenient for respondents (Mann and Stewart, 2003: 248-9). In total, 34 researchers<sup>4</sup>, reasonably evenly divided between the natural and the social sciences, provided data. Several Journal Editors were also interviewed (two face-to-face interviews, two phone interviews and two questionnaire returns).

This report is intended to be a reflection of people’s experiences and thoughts about their own discipline and about working with other disciplines. We have therefore adopted a largely descriptive approach in an attempt to do justice to the ‘depth’ of our research. While the report primarily examines the differences between natural and social science, we also highlight that there are complex issues associated with collaboration even within disciplines. We begin with a brief overview of some of the more pertinent issues surrounding interdisciplinary research.

### ***Issues surrounding interdisciplinarity***

Our literature review shows that other projects have faced similar issues to those experienced by REDCAFE and IMEW and the most relevant of these are discussed here. Many articles have highlighted the need for interdisciplinarity. Klein (1990) suggested that people have turned to interdisciplinary collaboration in order to answer complex questions, address broad issues, to explore disciplinary and professional relations, to solve problems beyond the scope of any one disciplines and to achieve unity of knowledge (see also Petrie, 1976; Vedeld, 1994; Qin *et al.*, 1997; Hansson, 1999; Brewer 1999; Schoenberger, 2001; Kinzig 2001; Evans and Macnaughton, 2004; Gornitzka,

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<sup>3</sup> Two interviewees were not part of REDCAFE or IMEW but were keen to be part of this research because of their experiences of interdisciplinary collaboration.

<sup>4</sup> When asked about their discipline/field of research, participants described themselves variously as follows: Natural scientists (20 researchers) - physical geographer, vertebrate ecologist, avian/conservation ecologist, biologist, behavioural/life-history ecologist, marine biologist, ecophysiological, ornithologist, fisheries management ecologist, fisheries biologist, fisheries stock assessment biologist, zoologist, food-web biologist. Social scientists (14 researchers) - medical humanities, education researcher, social economist, social anthropologist, human ecologist, sociologist, human geographer. Although the nationality of participants is not provided here, 12 were from the UK, the remainder from: Austria, Denmark, Estonia, France, Finland, Germany, Greece, Italy, Latvia, Lithuania, Romania and Sweden.

2003; Bruce *et al.* 2004 etc.). Interdisciplinary research can merge practitioners and ideas from any number of fields. For example, collaboration between natural and social scientists is increasingly seen as vital for addressing ecosystem and land use issues (Daily and Ehrlich 1999) because effective management requires practitioners to understand and mediate the biological and human factors driving environmental change as well as the interactions between them (Bradshaw and Bekoff 2001)<sup>5</sup>. Furthermore, Karlqvist, (1999:379) adds that interdisciplinary research is necessary if science is to work in the arena of “*applications, decision-and policymaking*”. However, many (cf. Nowotny *et al.*, 2001; Evans and Macnaughton, 2004; Bruce *et al.*, 2004) have warned that claiming to be ‘interdisciplinary’ is easier than demonstrating that you are being so. Understandings of what this term means can differ (cf Klein, 1990).<sup>6</sup> Tait *et al.* (*undated*: 11) stated that the term ‘interdisciplinary’ is **interpreted** and **understood** differently depending on whether it refers to research that crosses the boundaries between social sciences, or those between the social and natural sciences, or whether it bridges both academic or non-academic sectors.

Several other important issues are raised in the literature (which both informed our research agenda and were supported by our findings), particularly those related to problems with **communication** (between disciplines), **understanding methodological approaches** and **methods**, and **motivations** to collaborate.

Vedeld (1994) asserts that people from different disciplines **think, understand** and **approach** the same problem in different ways and that this can cause difficulties in terms of **communication** and **collaboration** (cf Schoenberger, 2001). **Language** is an important issue to address, both cross-culturally (Tait and Lyall, 2001) and in relation to disciplinary language. As Wear (1999:299) points out: “*Language is important because scientists speak in dialects that are specialised to their discipline. Unfortunately, these dialects can at times sound very much like common language, leading the uninitiated reader to the mistaken conclusion that she understands what is being said.*”

**Trust** is also an important element of the collaborative process. Ascher (1999) proposes that one crucial reason for distrust is that social and natural scientists worry about how their data will be used. Thus, there is a need for greater understanding of different methodological approaches and methods. Bruce *et al.* (2004) also believes that participants from different disciplines need to feel that their contributions have a **value**. Indeed, Bracken and Oughton (*in press*) emphasise that in recent years there has been greater recognition and appreciation of the barriers to interdisciplinary research and this has led to key proposals which include the need for a longer **start-up phase** to promote **group cohesion** and encourage members to value contributions from other disciplines.

Furthermore, Kwa (2005) suggests that **expectations** of what can be achieved through interdisciplinary collaboration differ between and within disciplines. Bruce *et al.* (2004)

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<sup>5</sup> In technical terms, such research is termed Mode 2 interdisciplinary research, that is research which addresses issues of social, technical and/or policy relevance where the primary aim is problem oriented and discipline-related output are less central to the project design (Bruce *et al.* 2004: 460).

<sup>6</sup> During the research interviewees were asked to define interdisciplinarity. The answers were wide-ranging but generally referred to some level of cooperation between people with different backgrounds.

makes it clear that an interdisciplinary approach is not always necessary or important for the outcome in some research areas and also that working in an interdisciplinary arena can even be **disadvantageous** in terms of **career prospects**. Tait and Lyall (2001) emphasises that too much focus on integration may lead to rigid project management, thus enforcing a ‘common platform’, which can damage both flexibility and ‘helpful differences’.

The **writing** and **evaluation** of proposals and the **publication** of research findings have also been outlined as important issues requiring consideration. This appears particularly relevant in relation to whether evaluators and/or referees have the necessary experience to adequately assess interdisciplinary research (Turner and Carpenter, 1999; Tait and Lyall, 2001). Whether or not there are enough interdisciplinary journals is open to debate (e.g. see Naiman, 1999) but Bracken and Oughton (*in press*) believe that the problem of **where to publish** interdisciplinary research is a real one (in the UK at least), and is exacerbated by discipline-specific journals and the Research Assessment Exercise in many British universities.

Tait *et al.* (*undated*: 24, 30) consider ‘what makes a good interdisciplinary researcher’ highlighting that good interpersonal skills, flexibility, creativity and a willingness to learn are key qualities needed. Gornitzka (2003) suggests that there is still some **antagonism** within the research community between monodisciplinary and interdisciplinary approaches. However, Sillitoe (2004) points out that we are not dealing with the case of two opposed poles (mono-disciplinary versus interdisciplinary) where one is the correct approach, but one where researchers are striving to find a **workable consensus** between the two. We now explore REDCAFE, IMEW and RELU researchers’ thoughts and experiences of attempting such a workable consensus.

## **FINDINGS**

Our findings set out to provide a greater understanding of the processes, potential and problems facing research projects that involve more than one discipline. This section is thus divided into four parts, covering the main aspects of our study:

- (1) Interdisciplinarity within the REDCAFE and IMEW research projects,
- (2) Discussion of dissemination of this research with some end-users,
- (3) A wider discussion with researchers and Journal Editors on their experiences of publishing interdisciplinary papers,
- (4) Exploration of routes to interdisciplinarity, based on workshops held at the RELU conference (January 2005).

### **(1) Interdisciplinarity within REDCAFE and IMEW**

Researchers who participated in REDCAFE and IMEW, including both natural and social scientists, were asked a number of questions (see Appendix 1) in relation to the management of these projects and the integration of natural and social science datasets. The questions were geared towards developing an understanding of the processes involved in collaboration with the aim of highlighting potential strategies for creating

effective interdisciplinary research. Some of the key issues that these researchers were asked to consider included:

- What helps to create interdisciplinarity?
- What are the major obstacles to interdisciplinarity?
- How far do natural and social scientists understand different methods of data collection, interpretation and presentation?
- What are the levels of respect/suspicion accorded to differing methods? What is considered good and rigorous practice?

Individuals clearly reflected widely on these issues and also drew on their research experiences outside REDCAFE and IMEW. We identified four recurring themes from our interviews and questionnaire returns: (1) Management and communication; (2) Understanding other disciplines; (3) acceptable standards/quality of work; (4) Achievements and obstacles. After discussing these themes in some detail, we consider suggestions for improving the processes involved in undertaking interdisciplinary research.

### **Theme 1. Management and communication**

The practicalities of, and time needed for, managing large projects (even ‘work packages’ or ‘modules’ within them), was a recurring theme and much has been written about management issues. For example, Bruce *et al.* (2004) stress that many factors (such as methodological, epistemological and linguistic differences) act as obstacles to interdisciplinary research and thus, more time is needed to address these factors during the start-up phase of a project and throughout the research process.

Our findings reveal that projects involving a range of disciplines will not necessarily produce interdisciplinary research unless specific steps are taken to ensure the communication and integration of disciplinary perspectives. However, the practicalities of the research process may work against interdisciplinary integration, as expressed in one interview:

I04 *“I think the goals and aims were [interdisciplinary]...the multidisciplinary aspect was the way we actually worked on it practically. I think it was difficult to mix up the disciplines once you actually decided how you were going to do it - in that people from different disciplinary backgrounds and training actually ended up working on their little area, separately in some cases, and that there couldn’t be the cross-over until some way on...it’s a fine line between what is actually practical and what would make a more interdisciplinary project.”*

Many respondents believed that effective communication required good leadership, trust, receptiveness and a willingness to learn and that these issues were key to promoting collaboration within a project (cf Ascher, 1999; Tait and Lyall, 2001; Bruce *et al.*, 2004). Respondents also suggested that communication should be developed, at least initially, through face-to-face contact (email contact being more useful once good relations have

been established - otherwise people may ignore messages or feel that responding is a chore). As one respondent put it:

I12 *“The best interdisciplinary collaborations I ever had were with an office mate and a flat mate. Time together is far better than any other means.”*

Meetings or workshops were the main opportunity most researchers had to get together to discuss their research. These opportunities were cited as important for establishing a ‘group identity’, and also for promoting a sense of ownership and responsibility towards the project. Nevertheless it is essential to consider the balance between disciplines in order to allow multiple perspectives and to prevent one discipline becoming dominant:

I03 *“You’ve got to have quite good balance as well between different disciplines... so you can explain things in a number of ways as well and you’ve... got support.”*

A related concern was that there should also be a suitable balance in the power relations between members of a project. All members should feel able to become fully involved in discussions and research efforts. In large projects, effective dialogue between all participants will take time but it is clear that every effort should be made to actively encourage ‘inclusion’, rather than expecting that it will ‘just happen’. Social occasions and field-trips within meetings were highlighted as important opportunities for people to build stronger relationships in a more relaxed setting. Researchers considered that support from funding bodies was necessary for this and that such activities should not be seen as a luxury but as a necessity if interdisciplinarity is to be encouraged and sustained.

Other important issues were raised of direct concern to project management. In particular: how to get beyond a *‘superficial knitting together of things’* and how to ensure that communication continues in between organised meetings when other work commitments often take priority. Several respondents indicated that they needed to be convinced that interdisciplinarity had *‘added value’* (and was worth the effort involved), before they would commit themselves to the process. The commitment required was certainly an issue that researchers felt had to be discussed at the very beginning of any project and people also felt that the responsibilities of each participant should be clearly stated. In this context the conceptual framework of the project was also emphasised, chiefly in relation to deciding whether the research process would be flexible or more rigid. As Bruce *et al.*, (2004:465) highlights:

*“A good interdisciplinary researcher will also have a high tolerance for ambiguity. This means not prematurely reducing a problem to a limited set of dimensions, but taking time to explore a range of dimensions, to test several potential boundaries to a problem (each of which may imply the involvement of different sets of relevant disciplines) until the apparently optimum boundary and set of dimensions has been identified.”*

Our findings suggest that for interdisciplinarity to be achieved within a project, where it is most likely that the group is made up specifically of qualitative and quantitative researchers (rather than interdisciplinary ones), we must acknowledge the ‘different worlds’ within which qualitative and quantitative researchers work. This may often require researchers to invest considerable time and effort in building effective channels of

communication (cf Bracken and Oughton, *in press*) in addition to specific management skills and efforts from project leaders. Moreover, it is the responsibility of project leaders to ensure enough space for communication and learning when designing the project. However, it is also the responsibility of funding bodies to allow for the additional time needed for interdisciplinarity to be included within the project design and, importantly, to be budgeted for.

## **Theme 2. Understanding what other disciplines do**

Most of our respondents felt that in order to collaborate effectively, they needed to know and understand some of the underlying principles of other disciplines. However, one of the most interesting findings here was the extent to which people faced difficulties, both perceived and real, in understanding what other disciplines do and *vice versa* and the subsequent impact this had on the quality of their interactions. Difficulties in understandings included issues surrounding language, appreciation of what other disciplines actually do, feeling confident to ask questions, and having a real sense that one's own skills and perspectives are valued.

The issue of language was raised in two contexts: the linguistic problems of communicating in English, and the discipline-specific problems of terminology and jargon (See also Tait and Lyall, 2001, Bruce *et al.*, 2004, Bracken and Oughton, *in press*). One respondent highlighted the difficulties of multi-lingual communication:

*I04 "...Language did make it more difficult to add an extra complication...because of differences in our terminology. It takes long enough to even work out the terminology in our own languages and get that clear amongst partners. But to actually share that terminology across languages...it's extremely difficult and you can lose a great deal."*

However, another important language barrier evidently exists between disciplines. The following exchange between a natural and qualitative social scientist reveals the gulf that can sometimes occur in understanding differing disciplinary methodological approaches and methods:

*I34 "I felt that actually the [natural] scientists probably got more out of...their contact with the social scientists than vice versa... I think that the way the scientists presented their work to us social scientists was over our heads, whereas I think the scientists found it easier to sit and listen to a social scientist and follow it and understand what they were saying...Maybe those scientists felt they were actually presenting to the other scientists in the room...they didn't want to make it 'Mickey Mouse' [easy to understand] because then they'd be judged...so they wanted all the flashy graphs [to impress their peers]..."*

*I05 "They're not doing that to be flashy, they're doing that because that's the simplest way of distilling their message. It's not trying to over elaborate, it's trying to simplify."*

*I34 "But if you can't speak the language in the first place."*



I05 *“Exactly...I think one of the problems with natural scientists, I guess it’s probably the same with all disciplines, is 99% of the people they speak to are in that discipline and they very rarely have to talk outside that discipline so everybody uses the same conventions, the same codes.”*

To what extent, then, does successful collaboration necessitate time set aside for learning disciplinary languages, the ways of doing research and analysis and writing/presenting styles? Certainly, from our interviews it was clear that even after working together for three years, many natural and social scientists felt that they did not fully understand the complexities of their counterparts.

I11 *“It can be hard for a biologist to understand why a certain method in social science is preferred instead of another...”*

I34 *“One feels there is a kind of monolithic cannon of what you’ve got to learn to be a biologist... long-lasting names and taxonomies and things like that. That takes years and years and years to be at home with - so I feel that maybe what they do is more impenetrable to me than what I do is to them.”*

The lengthy apprenticeship that researchers undergo before becoming fully accepted as competent actors can also breed a form of protectionism. Several respondents believed that researchers were often defensive about their own disciplines and that this could inhibit their ability to interact and collaborate in an interdisciplinary way. However we should appreciate that their uncertainty around other disciplines can also hinder effective communication, as one social scientist outlined below:

I34 *“...I think if you haven’t got a hard science background that you do feel quite illiterate, and that you’re missing out on so many basic things that scientists are going to assume that you do understand, and in a way you are almost reluctant to admit that you don’t understand it...So I think there’s a lot of...self protection that goes on.”*

Learning about different methodological approaches thus seems essential for interdisciplinarity, not only to enable researchers to identify ways of working together but also to allow them to feel colleagues respect their particular skills and knowledge and potential contribution to a project. One respondent recounted her feelings of having been ‘devalued’ by the natural scientists in a previous project because she felt they did not understand how qualitative social scientists worked. Thus they inferred that she *“just pottered around...arranging to have coffee with people”* (see also Bruce *et al*, 2004).

However, a specific project meeting was mentioned by several social science respondents from IMEW, which highlighted the inroads to better understanding that can be achieved when attempts are made to ‘teach’ (rather than just ‘present’) a specific disciplinary perspective to others. The session involved a natural scientist who took the time to explain the approach and philosophy of ecology in order to frame the data being presented. As one social scientist explained:

I04 “... I think I did learn that there was more of an attitude of ‘this is not the hard and fast truth and our methods do have holes in them’. I think I saw more honesty in the scientific approach than I’ve seen in the past...saying ‘we can’t find it all right now, this is only a window’ and I thought ‘hey, we do that too’ and I really appreciated that and so I thought, actually there’s more similarities.”

In order to address the issues mentioned above, interdisciplinarity requires researchers (and project managers) to learn some of the basic principles of other disciplines within the project. Taking the time to understand how different disciplines (and individuals within those disciplines) approach a problem and presenting your own perspective in an environment (meeting/workshop) that has been specifically set up for *learning* may go some way towards breaking down disciplinary and/or individual barriers. Such an undertaking, however, requires effort and in many cases needs to be ‘taught’ but although greater understanding won’t happen instantaneously, it is possible over time. Nevertheless, it is also necessary to address the ways in which your own discipline influences how you interpret the methods and results of another discipline.

### **Theme 3. Assessing quality**

As well as gauging the extent to which social and natural scientists understand different methods of data collection, interpretation and presentation, we also examined what researchers deemed to be methodologically sound and rigorous practice within their own discipline. Our aim, in examining respondent’s detailed explanations of ‘what they do’, was to understand more fully their disciplinary perspectives and how these may impact on the way that they view other disciplines. For example, when asked what was rigorous and acceptable in social anthropology, one respondent cited fieldwork as a good indicator, stating:

I34 “*Methodologically there’s this whole idea of triangulation...that you’ve got what your informants are telling you in an interview, you’ve got what you are seeing going on around you through participant observation, you might add to the interviews [with] focus groups then you’ve got other things like printed texts, cultural representations other than texts, all kinds of artefacts and so on that you can then bring in, and if what you are trying to assert kind of adds up across all those things then you’re at least in a position where you feel you’ve got a strong interpretation.*”

However, the respondent also believed that such qualitative methodologies were not considered rigorous enough by natural scientists. All of the natural science (and, some cases, quantitative social science) respondents referred to sample size, repeatability and statistical evidence as validating their research:

I15 “*Research is rigorous if (1) the amount of data are large and if the quality of data is high (precise and representative), (2) if the data have been properly analysed statistically, (3) if the interpretation is sound and takes into account findings made by others...It is hard to be convinced simply by qualitative information that is not connected to some quantitative information.*

I29 *“Sometimes reading a social science book or paper is like reading a newspaper where nothing is stated clearly but discussed endlessly.”*

One respondent believed that research was considered rigorous if stakeholders adopted management suggestions resulting from the research. However, high impact journals were often cited by researchers as a measure of quality (see also Parts 3 and 4). Several natural scientists described the process of reading an academic paper in order to explain how they judged a piece of research to be rigorous. It is worth including one of the responses in full, as it clearly sets out how this respondent assesses such work and echoes what others have also said:

I05 *“What makes a piece of ecological research rigorous and acceptable is the right methods and the right interpretation. So I’d read a paper, read the title and because of the way things go, the title is always sexed up and it’s always...there to draw your attention but you have to get beyond that and read the abstract and in some cases the abstract’s a bit sexed up as well so I’d always read the results first...and a bit of the discussion and then as soon as the author starts making some points, you’re default position is: ‘well, that’s all well and good but how do you know that, what methods did you use?’ So, most of the perusal of the paper is on the methods, to see what methods they used, what biases were involved, whether they took biases into account, whether they changed the methodology because they understood the biases or discovered them later...And then the interpretation - and there’s lots of interpretations but I don’t honestly think for most aspects of ecology, you can come up with the answer. You can come up with the most likely explanation given the study circumstances and the current methodology but I’m always suspect of a paper that sort of finishes off without alternative explanations because there’s always an alternative explanation.”*

As was highlighted in Theme 1 and 2, a clearer understanding of fundamental disciplinary frameworks is important if researchers are to find effective ways of integrating data collection, analyses and interpretations. This was particularly emphasised when respondents started to discuss how to bridge the ‘biological/social’ divide. Interestingly this divide was described by some not in terms of the *methods* that disciplines use but in terms of completely different paradigms (see also Vedeld, 1994):

I08 *“...the difference in disciplines means that they’re from completely different paradigms and that people don’t necessarily know that because they’re operating within their own one...they think it’s just maybe a different set of methods or something. But it’s not. It’s thinking about the work in very different kinds of ways - which is then quite hard to match up.”*

Different ways of ‘thinking about work’ can also create practical problems in relation to presenting data and writing-up. For example, one respondent (a social scientist) outlined her experiences of managing a project, which involved anthropologists and architects:

I02 *“...in terms of the ways that the anthropologists use their ethnographic material – they will use very large quotes with lots of ‘erms’ and ‘ahs’ and sneezes and sorts of*

*things that don't make sense, because that's their training to make use of that. Whereas I think the architects who've had less of that sort of training will just use a specific bit of quotation that illustrates a particular point rather than putting it in context...  
...With myself and the architects working on the project, we found it easier to draw our conclusions...But the anthropologists are taking a long time to get towards their conclusions, because they're much more careful about drawing conclusions from the work."*

The key to a more holistic approach, perhaps, is for the project team to collectively develop an appreciation of the methodological rigour that exists at the heart of the research itself, regardless of discipline. One method could be for researchers to make a conscious effort- and to take the time- to describe to others both the methodological and epistemological foundations of their research and how these are used to interpret their findings. Thus, researchers should strive to make their disciplinary contribution mutually intelligible so that common understandings can be achieved, offering an opportunity for disciplinary research strands to be integrated.

#### **Theme 4. Achievements and obstacles**

All our respondents felt that they had benefited as researchers from participating in REDCAFE or IMEW, particularly meeting other researchers with different skills and interests. Indeed, having the opportunity to develop a working relationship with other researchers was seen as crucial for a project's success. Moreover, *personal* as well as *professional* satisfaction also plays a part in this process. When asked what he found most rewarding about being part of an interdisciplinary team, one respondent replied:

I19 *"Being in contact with people who are not only experts in their field but willing to share information and friendships. Working on a common shared problem. Having the opportunity to confront/learn from different experiences and communicate my own opinion/experience. Having the opportunity to spend some time in an international atmosphere, sharing thoughts on everyday life..."*

Even when attempts to work together are proving difficult, respondents underlined the benefits that could be derived from interdisciplinary collaboration. Everyone acknowledges the need to build in project time for training and dialogue (Bell *et al.*, 2005), but some believe radical measures are required, for example enabling joint fieldwork. As one biologist explains:

I19 *"I think some degree of 'field contamination' is very useful to improve the [interdisciplinary] participation and progress of a project. During [our] meeting and especially during the field visit...I was a little bit surprised that some experienced and very smart [ornithologists] knew so little about fish or fisheries ..."*

Several respondents recognise that such *"field contamination"* leads to an integration of perspectives. As one natural scientist points out:

I03 *“You get questioned so much more than you do working with the kind of people who are in your own discipline. So they would say ‘but why do you do it like this?’ or ‘but what about this, what about that?’ Even with common assumptions, people just don’t know till they are questioned and then you have to think ‘but that is something I have assumed since I was 19’...So you have to explain them. You have to be able to do that and not take it too personally but that’s where the real insightfulness of a joint project comes from because you recognise the strengths of your disciplines but you recognise the weaknesses and that’s...where you can link the two together much more easily to then come up with a stronger perspective for a project and stronger aims and objectives for the research.”*

During our interviews, researchers also raised a number of more general concerns that they felt were potential obstacles to interdisciplinarity. Many of these concerns are also pertinent to each of the other three themes that emerged from our interviews.

**(a) *Claims of interdisciplinarity in research proposals do not translate into reality***

Some believed that interdisciplinarity was not always necessary but, overall, there was a general agreement that an interdisciplinary approach was useful in the context of human:wildlife conflicts. However, very few researchers had real experience of working in this way. As one respondent pointed out:

I02 *“...But, after all the talk and what was written on the research proposal, I don’t think that I’ve ever actually done a project where that’s happened.”*

There was also a concern that researchers were more interested in getting funding than really wanting to work towards an interdisciplinary approach (see also Tait and Lyall, 2001). This raises a recurring issue of the term ‘interdisciplinarity’ being used merely as a buzzword in order to obtain funding.

**(b) *Interdisciplinary projects may not be funded***

Conversely, several respondents questioned the evaluation process and whether interdisciplinary project proposals may be disadvantaged. They felt that evaluators often judged the project proposals from a disciplinary perspective, as one respondent explained:

I07 *“There’s a problem I think at the funding level that [they’re] always paying lip service to interdisciplinarity, but when it comes to actually selecting a feasible project, people...selecting proposals to support and fund [are] all coming from their own disciplinary bases. And very often I think interdisciplinary projects can sound a lot woollier and less defined partly because people don’t always know the outcomes when they start off. You can’t sort of package them in a nice neat sort of single disciplinary way that somebody from that disciplinary background can just put their hand on their heart and say “yes, I know this is going to be successful as a research project.”*

**(c) Interdisciplinarity affecting your career/publication prospects**

While interdisciplinarity is favoured in theory, particularly in addressing complex, applied problems, it can, in reality be difficult to achieve recognition for this kind of work. There was a general assumption amongst respondents that researchers need to build up a personal reputation in their 'own' discipline before branching out into interdisciplinary collaborations. This was linked both to an individual's career prospects and to pressures from the Research Assessment Exercise (see also Parts 3 and 4). Two respondents highlighted the 'institutional barriers' they felt existed:

I05 *"When I gave this...forging real links between natural and social science talk, one of the senior scientists there said 'this is fine for you because you've got a name for yourself in your chosen discipline and you can afford to move into this soft stuff', meaning social science, 'but how can anyone starting their career comprehend the notion of going into soft stuff when they need to forge their career in the hard stuff'. So there's very much a barrier to go through before people would accept that you can move between the two..."*

I35 *"Who is promoting interdisciplinarity? It's the people at the top...that see the value of interdisciplinary science. They're not the people refereeing your journals and manuscripts are they? ...It's the individual scientists and social scientists from different institutions that are doing that, so that's where it all begins to break down. You might have a party line that stresses the importance of interdisciplinarity but unless that filters right down through the organisation, right through to the very bottom, to the practitioners then...there's going to be a problem because those practitioners won't recognise the importance of interdisciplinarity in your research applications or in the publications that you write because they're monodisciplinary."*

These extracts support the contention by Bruce *et al.* that *"the peer review of proposals and publications is one of the most contentious areas in interdisciplinary research"* because of the wide ranging expertise needed to assess interdisciplinary contributions. (2004:469).

**(d) Interdisciplinary research meetings turning into 'conference-style' programmes**

Some respondents felt that supposedly interdisciplinary meetings/workshops were often dominated by researchers promoting what they were going to do rather than spending time more usefully discussing how to interweave perspectives.

I11 *"There are many obstacles, one very important one is that members in a interdisciplinary team start the work with the attitude, " now I will show that my subject is relevant and important, and we have got so little money the last 15 years and ..."*

This suggests that more innovative ways of organising some interdisciplinary research meetings could be designed so that time for teaching, learning and 'interdisciplinary discussions' are included.

Involving an independent facilitator at such workshops may also be a useful strategy to ensure that participants are supported and encouraged towards interdisciplinary-focussed endeavour, particularly as it was noted that:

I11 *“Another obstacles is that it takes time. People interpret words in slightly different ways and this can cause irritation.”*

**(e) Keeping the momentum going**

During our interviews, researchers raised several concerns relating to maintaining communication within a research project, particularly if researchers were based in different institutes/locations. While it is important that interaction occurs throughout the research process and not just at specific meetings, it was highlighted that sending a constant stream of documents by email (the most commonly used means of ‘remote’ communication) was not often the most effective way to keep collaborators engaged (see also Theme 1). It would thus be useful to devise new ways to encourage communication and interaction that did not involve ‘information overload’ (see also Tait and Lyall., 2001). It is clear that a balance needs to be found between managing an interdisciplinary project effectively, maintaining strong and clear lines of (at least two-way) communication between researchers, and ‘just sending everything out to everyone’. An important issue raised during interviews was how to maintain research connections that had been made during the life of a project. As one respondent pointed out:

I02 *“One of my worries is that having finished this project...things come to an end...that everyone goes off and we don’t make a virtue of those links that we’ve built up and that working relationship that has developed.”*

**(f) Is interdisciplinarity worth it?**

Some researchers we talked with felt that the increased effort needed for interdisciplinary collaboration did not necessarily always yield extra benefits.

I20 *“I have been working in a research department for 5 years, which has been focused on interdisciplinary research (including architects, sociologists, landscape ecologists, biologist, geographers and physiologists). As a biologist I felt professional unchallenged...the [efforts required for] communication [was too] costly compared to the results of the project”.*

Another respondent believed that in order to encourage interdisciplinarity, the richness and subtlety of individual disciplines may be lost:

I07 *“...the problem I suppose with an interdisciplinary approach is that maybe you could end up losing the richness of each individual discipline [e.g.] if everyone’s got to communicate with one another using common language...in a way, maybe they might all think of the lowest common denominator in terms of what they do, what they’re able to achieve...So there’s a certain risk to it.”*

### **Suggestions for the way forward**

Many suggestions were offered during interviews for improving interdisciplinary integration in projects, based on the experiences of those involved in the REDCAFE and IMEW projects as well as other research. Several suggestions were of a practical nature whilst others were placed on a 'wish list'. For example, some respondents felt that interdisciplinarity should be encouraged through education at the undergraduate level or even at secondary school (see also Tait and Lyall, *undated*:10). Most importantly, an overarching theme was that interdisciplinarity required members of the different disciplines to inform each other throughout the research process. Thus there is a need for flexibility within projects so that participants can react adequately to the changing research environment. Interdisciplinary research can thus involve an element of risk-taking. It is also important for researchers to make a substantial investment in time, as well as intellectual and practical energies, to maintain both an interdisciplinary perspective as well as the strengths of the component disciplines. One respondent pointed out that an interdisciplinary approach is often transferable to other aspects of an individual's work and this should be promoted.

As interdisciplinarity is dynamic, being the integration of 'ways of thinking' as part of the development of a 'way of working', it clearly cannot be produced by following a predetermined recipe. We therefore feel that providing 'recommendations' for interdisciplinarity would be inappropriate and too prescriptive. Instead we list some practical suggestions gleaned from our interviews:

- Plan a focussed and practically based period of training at the beginning of the project, placing emphasis on the distinct processes inherent in interdisciplinary work. This could include teaching and learning through fieldwork.
- During a research project, a month of each year should be dedicated to interdisciplinary training and greater dialogue.
- Organise workshops through the project life cycle that focus on learning about different methodologies.
- Ensure that research progress is dependent on contributions from all researchers.
- Provide quality time to meet, discuss, reflect, evaluate, re-plan.
- Each 'work package' within a large project should have an interdisciplinary coordinator whose task it is to keep the research comparative and to encourage greater dialogue within and between teams.
- Leaders of interdisciplinary projects should be able to manage (resources, logistics etc.) whilst also meeting the needs of different approaches and be able to combine them while making clear to all participants what the goals are.
- A professional facilitator could be employed to run workshops to explore the processes and problems of interdisciplinary collaboration in order to develop successful strategies for the research team(s).
- Funding agencies must be prepared to resource the additional requirements of an interdisciplinary project.



## **(2) Discussion with end-users on dissemination: revisiting stakeholders in the Lea Valley**

Dissemination activities are important for ensuring a more collaborative and mutually informed research environment (cf Ewel, 2001; OED, 2002). However, taking our previous experiences as a case in point, a common source of antagonism between the researchers and other groups stems from feelings of exclusion among local stakeholders, to which poor communications and simplistic understandings of information transfer needs have contributed (Carss, 2003). Data from REDCAFE highlighted that stakeholders (commercial and recreational fishermen) were most frequently informed through popular and grey literature whereas natural and social scientists publish primarily in refereed journals. There is clearly a requirement here for researchers to bridge the 'communication gap' through better dissemination of scientific information, greater consideration of the limitations and implications of scientific research, and better appreciation of the needs of the end-users of this research.

Several REDCAFE participants commented on issues surrounding communication with stakeholders but we were also interested in discovering the extent to which the final project report was able to both inform policy makers and provide useful, accessible information to local people. Thus a number of stakeholders who took part in a conflict-resolution workshop (as part of the REDCAFE project) were interviewed in relation to the usefulness of the project's final report (see Carss, 2003). The conflict-resolution workshop focused on cormorant-fishery conflicts in the Lea Valley, Hertfordshire, Southeast England and involved REDCAFE participants as well as Lea Valley angling representatives, Environment Agency, Thames Water, British Waterways and English Nature. The workshop itself was able to feed into the first stages of a Fisheries Action Plan which was being developed for the catchment. It also presented an opportunity for all the key stakeholders in the catchment to get together for the first time discuss specific issues and was a major 'public event' as the culmination of the REDCAFE project when scientists and local experts came together to exchange views, opinions and perspectives.

### **2.1 What the researchers think**

Several respondents from REDCAFE and IMEW emphasized that there was a pressing need to reach stakeholders in a format other than the official report and papers published in refereed journals (even though these publications would not 'count' in terms of research outputs- see also Part 3).

I10 *"The question is how to formulate [and] express your research...if you take [dissemination] seriously, there is always a need to write more versions. You have to translate results...to suit the needs of the relevant audience you want to inform and reach."*

The Lea Valley workshop was particularly useful in that local stakeholders and scientists were brought face-to-face to discuss issues surrounding cormorant-fisheries conflicts. Local stakeholders were not simply asked to read a scientific report. Scientists were not asked to 'imagine' the local context (Carss, 2003). It was possible to provide different perspectives and improve understanding through establishing good rapport. Nevertheless,

in terms of providing more widespread and relevant dissemination, one respondent made the following statement:

I18 *“The conflict resolution case study in [Lea Valley] achieved more than I thought it would – and the effect seems to have been maintained – as I discovered recently following discussions with the Environment Agency...However, while... the ‘group dynamic’ worked well I don’t think REDCAFE was particularly successful in getting the message out to a wider audience and to stakeholders...”*

However, the difficulties of ‘getting the message out’ to wider audiences were also highlighted, not least of which was the time involved. Some researchers felt that institutional and financial pressures meant that time was only allocated within grants for the production of a final report and the subsequent publication of papers in peer reviewed journals (to some, the ultimate goal of the research). Others felt that as well as not reaching local stakeholders, this process reflected badly on the research community:

I34 *“Because they’re the people who need to hear what you’ve got to say but you’re not allowed to spend time doing that and then that, of course, goes back to the way that people who aren’t academics or researchers feel about researchers because you know, a lot of people would just say ‘oh well they just end up talking to one another’. And there actually is some truth in that populist criticism...”*

## **2.2. What the stakeholders think**

One of the most important aspects of this part of our research was to meet up with some of the stakeholders who had attended the original REDCAFE workshop to discuss the project’s final report and related cormorant-fishery issues. Two main themes emerged: (1) the needs of fishery/natural resource managers, (2) how to target information to anglers and other recreational users

All of our interviewees felt that the REDCAFE final report was useful in that it provided comprehensive, detailed information on cormorant conflicts across Europe. It was clear however, that the size of the report (169 pages) was a hindrance to it being read. For example, two respondents stated:

I33 *“...the actual report itself, I personally thought it was excellent, but it’s heavy-duty. It’s a doorstep...and it puts most people off reading it... I circulated it to my team members and I know for a fact that they’ve given it a glance, but they haven’t read it...they might have glanced at the odd page here and there, that kind of thing.”*

I32 *“...we haven’t got time to read through wedges of information so you want the basics to be able to respond to people.”*

There were proposals that a more user-friendly document, in this case a ‘handbook’ outlining management tools, would be a useful output from the project. As one respondent commented:

I32 *“It just gives you ideas, you know, for what you can do and what you can’t do. So, for example, if it was cormorants-we’ve just been talking about their ecology, and how they feed and how much they need to feed everyday and the competition-that would be a really good thing. And if you could get it sponsored, you know the final handbook such that...water managers could get it freely and it wasn’t too expensive...”*

It was also clear that the managers and angling representatives we interviewed felt it was primarily their responsibility (as opposed to the researchers themselves) to translate the key messages from the final report into clear, jargon-free language for a wider audience:

I32 *“You’ve obviously got to get it into a language that people will even consider reading. So, it’s got to be really short, sharp information. So, you’ve got to have the fewest words possible in order to get the message across and, it’s a case of hitting the populist information slants.”*

Much thought has clearly been given to reaching the target ‘audience’ and our interviews revealed significant insight into how organisations/groups try to reach the public. For example, one major national stakeholder uses a variety of avenues for reaching the ‘customer’ both at a national and local level: website, magazine (sent out to subscribers across the country), local newsletters distributed through angling clubs and tackle shops and (a new development in 2005) a road show. Newsletters and websites are a popular format for distributing information. However, several respondents highlighted the difficulties in countering ‘Chinese whispers’ [misinformation passed through word of mouth] and dealing with the problems of limited time and communication resources:

I33 *“...communicating with our customers has been reasonably effective. I would say that we’ve still got a way to go, because I actually believe... we’re [not] hitting more than 50% of all our customer base effectively. It’s difficult...going through the tackle shops is a good way, because a lot of these characters are not members of clubs and are not members of the [angling] consultatives, and they don’t go to meetings and they throw away newsletters and things like that, and they don’t read stuff...unless it’s on TV or in front of them somewhere where it’s a friendly environment...”*

The clear need to engage with stakeholders was an important issue raised by many. In order to disseminate information resulting from research, people have to have confidence in the research results and the interpretation of them. One respondent emphasized that disseminating information through National Angling bodies would be an effective measure for widespread distribution but only if those organisations ‘bought into it’. Another highlighted the difficulties in dealing with recreational resource users (in this case, anglers) in terms of understanding their motivations and devising appropriate management responses:

I30 *“I can tell them or try and interpret the scientific messages in the report and workshops ([those] that are brought to my attention) into a form that they understand and*

*can make use of but I can't force them to actually act on that information and that's the problem."*

Although not necessarily the job of the researcher (see above), our interviewees thought the researchers could contribute to the dissemination process through various means. Several of the comments below offer suggestions on how research findings and interpretations could be translated into different formats and disseminated through various channels (e.g. angling clubs, local Environment Agency officers, official websites):

I33 *"Could you use an interactive CD? Something like that?... And what I would suggest is, taking a couple of case studies, maybe one or two different case studies, which really encapsulates much of the issues and just run through those. Visual aids are very, very useful."*

I32 *"From my perspective...if I wanted to get information about cormorants and their impacts, I would go immediately to the executive summary...you'd pick out just five main things from it, for example, and you'd probably want a sentence on each and it would just go into a very short website articles that people would, you know, dip in and if you see...much more than that, you just switch off."*

I31 *"I certainly think from an angling/fisheries point of view...if you could get something [pamphlet] that's eye-catching. If [they] want to know more, then give them a contact where they can get copies [of the full report] from."*

I30 *"In terms of spreading out information, probably producing a summary document as well as a main report would have been quite useful...if you give them [anglers]...an 8 page pamphlet, they're more likely to thumb through and take home a few key messages."*

The key message to come out of the interviews is that the ways in which REDCAFE and IMEW researchers have primarily disseminated information (through final reports and refereed journals), may not necessarily be in the right format to reach stakeholders. As Tait *et al.* (undated b: 144) point out "dissemination and exploitation should not be left for the end of the project but be prepared from the beginning". Any dissemination strategy needs to include consideration of who the stakeholders are, the sort of outputs they will be looking for and the different formats in which to present these outputs (on paper, not just at workshops).

### **(3) The process of evaluation: publishing and refereeing**

From the discussions that have emerged in Parts (1) and (2), it is clear that there are some concerns with outputs, both in terms of how to effectively reach the stakeholders but also how interdisciplinary publications are evaluated by the scientific community. Indeed the evaluation and presentation of interdisciplinarity studies may be difficult under current circumstances where 'traditional' academic funding bodies and journals tend to cater for specific specialist groups. With this in mind, we asked IMEW and REDCAFE

researchers if they had published an interdisciplinary paper, what they had thought of the *process* (e.g. finding the right journal). As the outputs a researcher produces are closely connected to career progression we also asked researchers if they had faced any problems as a result of working in an interdisciplinary project. In addition, we interviewed several journal editors in order to find out how they, and the referees they send papers to, deal with/evaluate interdisciplinary papers.

### **3.1. What the researchers think**

Tait *et al.* (undated: 10) highlight how, “education and training is still very disciplines-focussed, and career development in universities still depends on publishing in single discipline journals”. Two main issues were raised by researchers: firstly, how you are evaluated by the scientific community and secondly, where to publish the results of interdisciplinary research.

Several respondents focussed their attention on the Research Assessment Exercise (RAE) and the pressures this places on evaluation of your work and future career prospects:

I03 *“I think traditionally because of, say, RAEs you’re supposed to [be]...world leading, agenda setting, focussed...and even for promotion in the University, you’re supposed to have your focus and what you do and all that – and people see interdisciplinarity as...losing focus. And then also there’s this other attitude that people don’t rate it because they think it is easy or soft!”*

I02 *“I think the other thing...that is...challenging us is...the measures that are important for academics, like the RAE...how that impacts upon something like interdisciplinary work. There is no opportunity to submit your work to a panel that recognises that approach. You have to submit your work to a panel that is single disciplinary.”*

These pressures tend to spill over into other areas which are important for career progression, especially the publication of academic papers. While some researchers stated that it was difficult to find interdisciplinary journals, others felt that there might be journals that could accommodate interdisciplinary papers but *where* you publish and *what* you publish were important factors if you wanted to progress in your career.

I02 *“There are quite a few journals out there – the more I look, the more I find – who recognise and see this whole area of interdisciplinarity as actually important”*

I34 *“But I think the next problem on...having completed a project like that is the issue of dissemination and then you’ve started to hit new barriers with what journals do you publish in? We want to publish in journals that deal with biodiversity management...because we feel that it’s people on the ground doing those things that need to know what we’ve found out but in terms of our careers, we should be publishing in a high prestige journals.”*

Moreover, researchers felt that there were further constraints to being able to publish interdisciplinary papers (as opposed to mono-disciplinary ones). For example, one respondent claims:

I03 *“I know there’s lots of arguments...about where you publish the work...It’s more than that, it’s not just where you publish, it’s are you using a social science framework or a science or a combination. And at the moment there’s no room for a combination. You’re still in one style or the other, let alone where you publish it.”*

Another respondent pointed out that it would very difficult to get a ‘descriptive’ paper published in a quantitative journal. Nevertheless, a common suggestion made by researchers, on how interdisciplinary contributions could be more effectively evaluated, is represented by the following quote:

I03 *“If you could get a chunk of interdisciplinary experts, from a range of perspectives, that had practice of doing things in more than one discipline and had experienced these difficulties and have a appreciation then they’re the people. There should be that body that gets to be the reviewers of papers or grant applications because...we know they have that appreciation and we would know that they would rate time being in a proposal for people to work together and develop common understandings and not somebody who is going to rubbish it because they think that kind of whole avenue of research is a waste of time.”*

### **3.2. What the publishers think**

During this research, we wanted to uncover Journal Editors’ ideas, thoughts and direct experiences of publishing interdisciplinary papers, particularly in relation to integrating natural and social science research. Although we considered that such a straightforward dichotomy might be valid for some Journals, we made it clear that we were also interested in interdisciplinarity within subjects such as ecology, geography and anthropology where such straightforward divisions (i.e. ‘natural’ versus ‘social’) may well be non-existent. Nevertheless, we were still keen to explore how Editors dealt with papers involving integrated research strands (e.g. genetics/population ecology or social/biological anthropology) within different philosophies of natural and social science, respectively. Interdisciplinarity is often described as a buzzword and we wanted to understand what, if anything, it meant to Journal Editors and, if it did mean something, how they ‘dealt with it’.

Unfortunately few Journal Editors responded to our questionnaire and time limitations meant that we were unable to make many follow-up requests. However, we did interview some Journal Editors but, while their views were interesting, they were often widely disparate: in deciding what interdisciplinarity meant, if it was a useful term, and whether it could be applied to their subject matter. It thus became clear that further research is necessary if we are to understand, as one Journal Editor described it, the “sociology of Journals”.

Nevertheless, what we can present briefly here is an insight into some of the processes involved in publishing papers and the difficulties that Editors might face. We focus specifically on publishing interdisciplinary papers and the refereeing process.

When asked how he dealt with interdisciplinary papers, one Editor from an interdisciplinary journal explains:

I36 *“Every article has to be interdisciplinary in the sense of being of potential interest (or at least accessible to) a range of specialists in different fields... [for the refereeing process] We stress clarity of language...that technical terms and procedures are spelled out where not absolutely common knowledge. More articles are sent back for methodological clarification than any other single reason.”*

Another Editor from a natural science journal commented:

I37 *“We don’t have a hell of a lot of problems dealing with interdisciplinary papers, with one or two exceptions. Finding reviewers who know the fields...because all the Editors of the journal are biologists. So we need guest editors and they handle the reviewing...the journal is a bit hands off.”*

Editors were asked about the refereeing process and whether they faced any problems in finding suitable people to evaluate interdisciplinary papers. These questions elicited a range of diverse and interesting responses which suggested how some Journals evaluate contributions. For example, several Journal Editors comment on where they find referees:

I36 *“Our reviewer data base contains more than 300 active reviewers and is continually updated.”*

I37 *“[We have an] Editorial board of about 30, most go to one of them plus another person... We’ve got a database of referees [or we] call up people, search key references, search databases, authors recommend them, or we may ask the editorial board, web of science etc.”*

I35 *“Over a number of years you build up a group of referees-there are about 80 for the Journal-whose judgement you can rely on (and that’s from past experience, there’s a learning curve there). You know who are going to be reliable enough to look at that paper and make a very fast... recommendation.”*

I37 *“It’s a pain in the butt. Know someone off the top of my head on experience or do an internet search and get names....its not easy”*

Editors also described the process of choosing which referees to send a paper to.

I35 *“Different journals will have different policies. It’s unlikely that you would send it to, in the example we have just chosen [genetics, population dynamics and Geographical Information System], to a top person in population genetics, a top person in population*

*dynamics and a top person in GIS because usually one of those three will dominate a paper. It is quite clear what the flavour of the paper is about and the genetics might just be there as a tool, for instance, to tell you something about the way the population has adapted or where it comes from or something like that and the GIS might just be there as a tool so you can explore the way the animals use the landscape...in this particular instance it could be the population biology that's the most important element so you would actually send it to THE population biologist and we send it to two referees."*

I36 *"Most articles of any variety involve distinct data sets, most commonly a region or country. Whatever the discipline someone familiar with the data base (or something like it) will be tapped as reviewer. So a paper on East African pastoralism would go to an East Africanist specialized in animal husbandry as well as to a Middle Eastern expert who has modelled similar herd dynamics. In publishing in our area, the importance of local, population-specific knowledge cannot be over-estimated. Almost every [journal name] article refers to particular people and localities."*

I02 *"I do tend to choose referees, one of whom might read it like a general interested reader and I try to choose my second referee as somebody who might actually have...a knowledge of the kind of major disciplinary backgrounded paper...It's surprising how often they agree...if we get disagreements, we often send it to a further person who we feel knows the journal best."*

In finding out more about the refereeing process, we were also interested in whether the Editors felt that the referees' decision might be influenced by their disciplinary perspectives and also, in some cases, their personal interests. Varying answers were given by different Editors:

I38 *"That's completely naïve and simply doesn't happen with this journal. We just don't do it. I have had screaming emails from senior staff when we've rejected their papers, had my own papers rejected from the journal. It's all done in a totally above-board manner. Most good people produce good papers. So [personal interests] should not influence it at all."*

I02 *"One of the challenges I think for an area like ours is that there are very subject-specific people in [journal name]. Very often, if you're sending off a paper to somebody, in a sense you know what so-and-so's going to think. And this is not the kind of paper that they take to. So you don't want to send it to them because you know the responses you're going to get. You need to know your referees personally to be able to make use of them."*

The Research Assessment Exercise was also a topic raised by Editors. When asked whether there were an adequate number of interdisciplinary journals, one Editor from a natural science journal said:

I38 *"Yeah, I think there probably are. I think there are far too many journals – you could cut a lot of them out actually. Concentrate on just publishing good quality stuff – and less of it."*



The Editor also highlighted his own frustrations with the RAE:

I38 *“The reason we’ve got 1,000 papers per year is because everybody is sort of hung up on the Research Assessment...we’ll probably get another 200 next time on top of the usual number – from the British research establishment because the RAE’s coming up. That’s not because its good science and they want to publish it, it’s because the RAE’s coming up – it’s driven by that, nothing else.”*

Nevertheless, the ‘quality’ of a journal that a research publishes in is still considered an important factor in their career. When asked whether he thought it was difficult for researchers to publish interdisciplinary papers, one Editor emphasised:

I35 *“It’s very, very difficult ... It’s a barrier to younger people... [established researchers] have other irons on the fire, in a particular discipline, so they know they’ve got lots of papers coming out in that anyway so they can afford to drop a few points by being interdisciplinary...Those [interdisciplinary] journals usually have a low impact factor....[others] are actually becoming progressively more interdisciplinary but don’t know what that’s going to do to their impact factor.”*

Although, given the limitations of the present study, we could only scratch the surface of “the sociology of journals” the scientific community is clearly concerned with issues of publishing truly interdisciplinary research, as two Editors concluded:

I35 *“If you wanted to communicate the value of an interdisciplinary approach to the wider community because you felt very strongly about it...then you probably wouldn’t find anybody reading your material because the people in monodisciplinary fields never look at interdisciplinary journals ... it’s hard work.”*

I39 *“I guess the spectrum [of journals] isn’t adequate. Or rather, there need to be better ways of informing different parts of a research community of what’s going on ... where things may be happening that could have a major impact on their worldview if they did but know it. I don’t think it’s so much a new publishing strategy that’s required, as better ways of alerting people to what is happening on the fringes.”*

#### **(4) Exploring routes to interdisciplinary: the RELU workshops**

Three workshops under the title “Exploring Routes to Interdisciplinarity” were held at the RELU conference in January 2005. Each workshop, attended predominantly by RELU first call Award Holders, was divided into two sessions: (1) Working Definitions of interdisciplinarity, where each participant was asked to share their understanding(s) of interdisciplinarity, (2) Mapping exercise: ‘Bridge building’, where small groups of participants mapped the ‘architecture’ of interdisciplinarity. The starting point for this exercise was to use the bridge as a metaphor for describing how disciplines could work together and what obstacles researchers might face.

## **Session 1: Working Definitions of interdisciplinarity**

### **What is interdisciplinarity?**

This session revealed what the participating RELU researchers understood by the term ‘interdisciplinarity’. The general consensus from workshop participants was that interdisciplinarity draws on the methods and theories of different disciplines to address complex problems holistically. As one workshop participant pointed out: “*How can we solve real world problems in any other way?*” Some felt that interdisciplinarity was hard to define (see below) but that it did involve learning other researchers’ ways of ‘doing science’ and adapting practices in the light of this. One participant referred to this process as a ‘fusion of methodologies’. Workshop participants considered that an interdisciplinary way of thinking/working could be held within an individual researcher as well as within a research team. Furthermore, interdisciplinarity refers not only to links between natural and social science but to links between disciplines within the same research paradigms. Participants also referred to the fluid and flexible nature of interdisciplinarity, highlighting that effective collaboration requires an integration of approaches, and that this differs both from project to project and on the issue being addressed by the research. The clear advantage of interdisciplinarity is that its innovative quality allows for new cross-cutting research questions to be developed. Interestingly, several participants felt that transdisciplinarity would better reflect RELU’s aims. Gibbon *et al.* (1994) define transdisciplinarity as “knowledge which emerges from a particular *context of application* with its own distinct theoretical structures, research methods and modes of practice but which may not be locatable on the prevailing disciplinary map”. (see also Gornitzka, 2003; Bruce *et al.*, 2004).

## **Session 2: The architecture of interdisciplinarity**

In this session, groups were asked to draw their perceptions and personal experiences of interdisciplinarity using, as a starting point, the metaphor of a bridge. However they were not constrained to this metaphor as the main aim was to encourage group discussion and illustration of the multifaceted nature of interdisciplinary collaboration. Here we have represented the discussions from several groups:

### **Group 1: The Rope Bridge**

This group chose the concept of a rope bridge because they felt there were many dangers involved in interdisciplinary collaboration. For example, like many others, they felt that there were not enough sufficiently qualified referees to judge the quality of an interdisciplinary proposal, and this obviously affected their chances of funding. Moreover, this group felt that interdisciplinary papers aren’t given the same prestige as are single-discipline one and that this reduced their value in the RAE process (see Part 3).

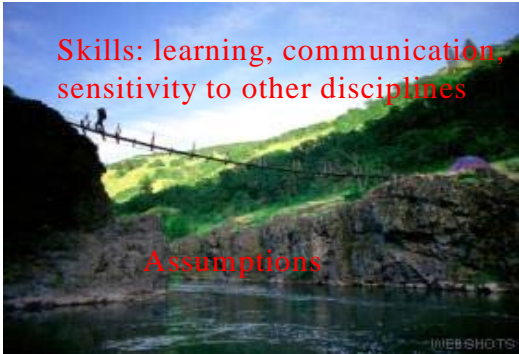
The skills needed for ‘bridge building’ included: willingness to learn, communication and sensitivity towards the perspectives and needs of other disciplines. A major challenge is to address disciplinary assumptions. Assumptions characterise what is taken for granted within a specific discipline – the bridge being across this gulf. These assumptions represent the ‘divide’ that has to be crossed by one discipline to understand another. Thus, there is a need for a flexible set of bridge-building skills/tools to tackle these

challenges. It is also important to consider whom you are going to build the bridge with. Interdisciplinarity was clearly a dynamic process, requiring choreography.

**Interdisciplinary Bridge – a rope bridge**

Because it's dangerous ...

- Referees
- Funding
- RAE



Skills: learning, communication,  
sensitivity to other disciplines

Assumptions

WEB SHOTS

Need a flexible set of bridge building tools

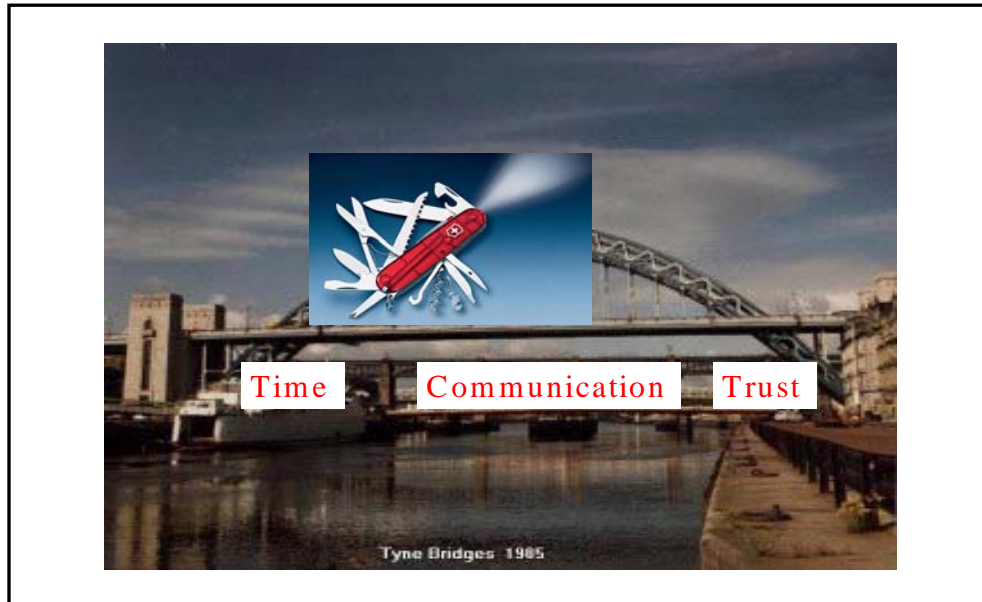
Need to know who to build your bridge with

“The choreography of interdisciplinary bridge building”

### **Group 2: The Suspension Bridge**

This group pictured interdisciplinarity as a ‘multifunctional tool box’ (represented by a Swiss Army knife). In order for this tool box to move around, the group envisioned a suspension bridge with the pillars at either end representing the research questions and the research outcomes. The group positioned a tollbooth at the start of the bridge which confronts the research team with the question “*are the research ideas suitable for interdisciplinary research?*”

The cables for the suspension bridge represent the interweaving of different disciplines which requires formal and informal communication. Informal communication helps build up relationships but trust and understanding is also necessary. An interdisciplinary bridge is stronger and more beneficial than a single-disciplinary one but there are challenges. Interdisciplinarity is more costly in terms of time and money. Research questions get redefined through the life of the project, which is a time-consuming process. The disciplinary differences within the team also need to be considered. Should there be equal weighting of disciplinary inputs? Is it possible to have interdisciplinarity at the beginning and end and allow single disciplines to work by themselves in between? This group felt that external facilitation would be needed to help with the learning process and for resolving any conflicts that arise within a research team.

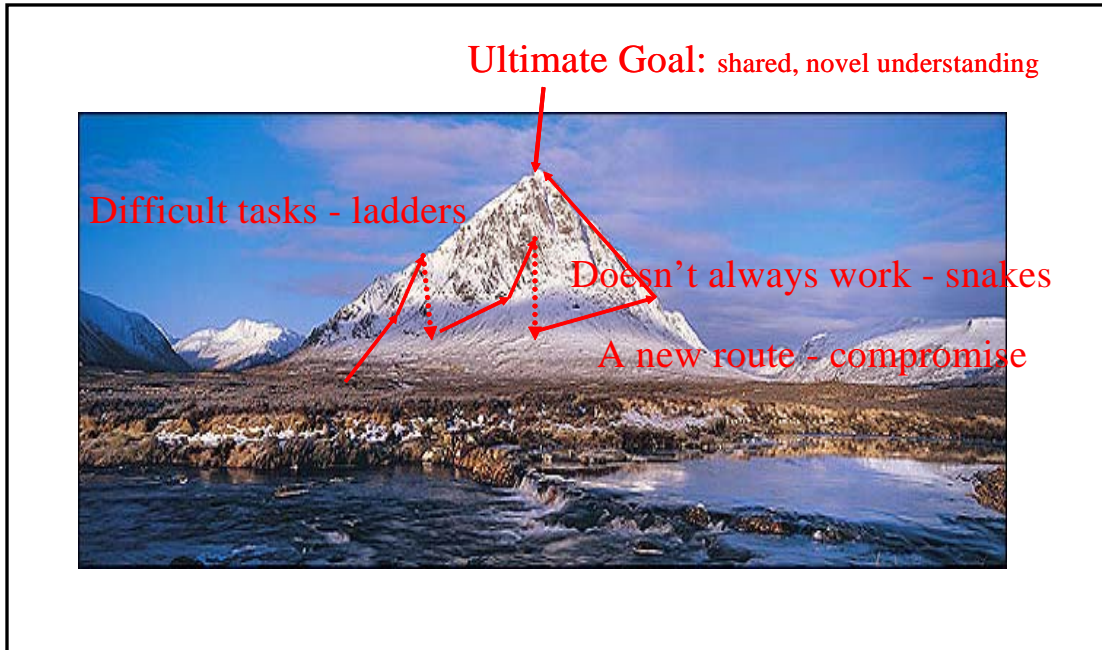


### Group 3: The mountain to climb

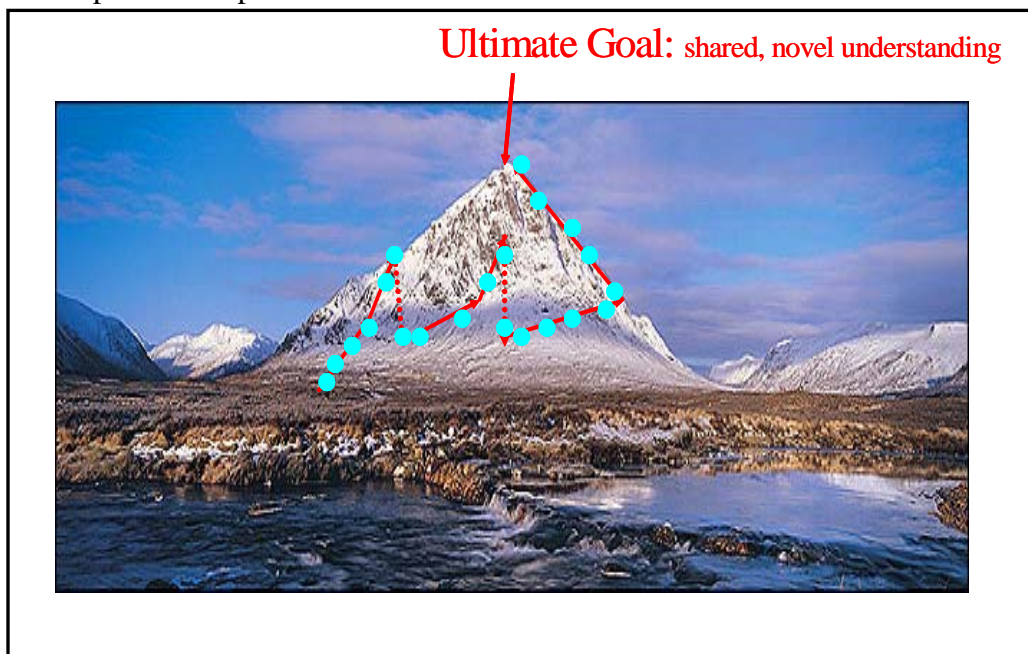
This group felt that bridge analogy was too constraining so they encapsulated interdisciplinarity as a journey. It was not an easy journey: there is a mountain to climb to the ultimate goal of shared, novel understanding.



Researchers assemble in the foothills but can start from many places (with different people and different expertise). The climb is easy at the start with provisions and no challenges but as the team progresses, the journey becomes more demanding.



Researchers must begin to work together to address specific challenges, different people will bring a variety of skills. The group visualised this as using a ladder to cross a difficult section of the route. The result was mutual learning and a shared/novel understanding of an issue or problem. An interdisciplinary journey will also involve mistakes (by an individual or group); the group likened this to a fall, so the journey is like 'snakes and ladders'. Researchers often have to regroup (at 'tea stops') to decide whether to go back up the same path or take another route.

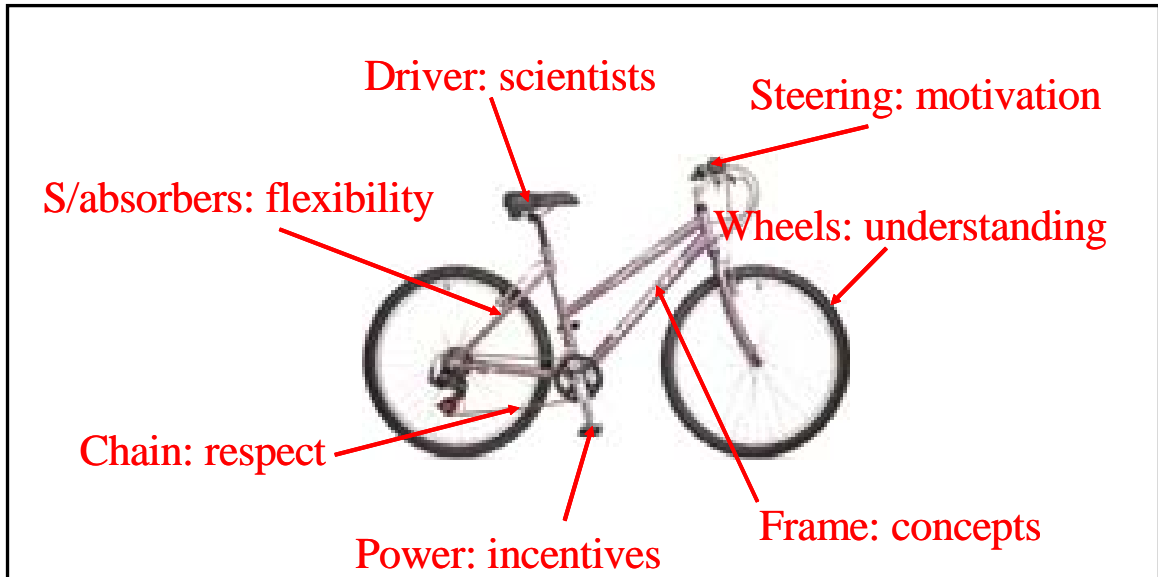


The ultimate goal of interdisciplinarity had to be an important one to act as an incentive for researchers. They considered that interdisciplinarity should lead to something like a

highly regarded publication, which would be impossible to write from a single disciplinary- perspective.

#### **Group 4: Riding a bike**

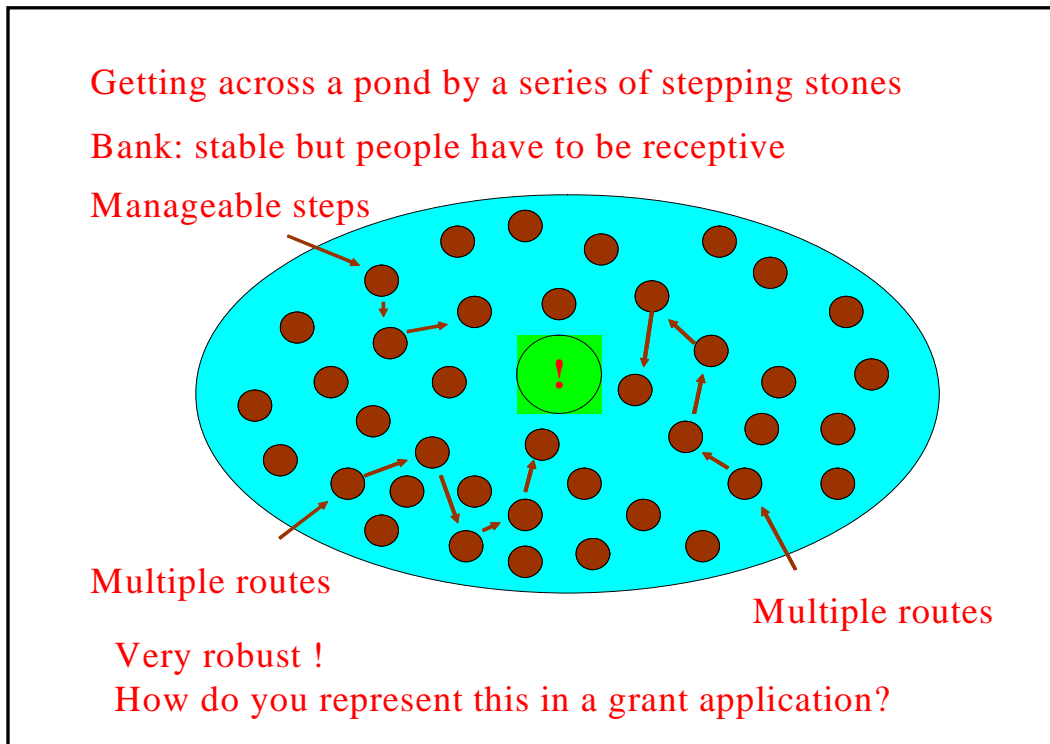
Group 4 focussed on the notion that interdisciplinarity was not fixed but a working, functioning unit requiring many integrated components to function properly: incentives, motivation, flexibility, understanding and respect. In this exercise, they likened interdisciplinarity to a bicycle.



#### **Group 5: Stepping stone**

Group 5 also considered that the concept of a bridge was too restrictive, as interdisciplinarity was not a straight-line journey between two fixed points. The group thought that interdisciplinarity was better represented as a pond with stepping stones, the goal being to reach an island in the centre.

Multiple routes can be taken across the pond via stepping-stones but each individual step is manageable so the route is always robust. Researchers must be receptive to inputs and outputs (as these come along) but remain flexible enough to change direction (or stepping stones) if necessary. Some of the stakeholders will provide input and this may require a change of course, although the ultimate direction will always be towards the research goal. One challenge voiced by this group was how to represent this dynamic process (with some elements of uncertainty) in a grant application.



Thus, by identifying what they believed to represent interdisciplinary practice and how interdisciplinarity should work in practice, workshop participants were able to highlight both what they felt was needed for successful interdisciplinary collaboration and also their concerns about such research. These needs and concerns are drawn up in Table 1:

**Table 1.** Issues (as highlighted by RELU workshop participants) that are needed for interdisciplinary research and that concern them about this approach.

<b>Interdisciplinarity NEEDS ...</b>	<b>CONCERNS that interdisciplinarity ...</b>
<ul style="list-style-type: none"> <li>• Trust</li> <li>• Dialogue</li> <li>• Courage</li> <li>• Preservation of subject expertise but the ability to think laterally</li> <li>• Being open to new ideas</li> <li>• Respect for other perspectives</li> <li>• Incentives for people to work together</li> <li>• The identification of limitations in progress</li> <li>• The development of tools to maintain interdisciplinarity throughout the research process and beyond</li> <li>• Learning by doing</li> <li>• Facilitation to help the process of working together, understanding different methods and framing/reframing research questions</li> <li>• Reflection on your own discipline</li> <li>• A recognition that it will inform policy and be used</li> </ul>	<ul style="list-style-type: none"> <li>• Takes time</li> <li>• Is a process fraught with difficulties</li> <li>• Is hampered by language/jargon being a barrier to communication</li> <li>• Collaboration is difficult to manage and coordinate</li> <li>• Involves knowing how to manage conflicting viewpoints</li> <li>• May involve ‘dumbing down’ disciplinary expertise in order to collaborate with other researchers</li> <li>• Is a buzzword</li> <li>• Is an assumption that it is made up of coherent disciplines</li> <li>• Is institutionally driven and forced on the scientific community</li> <li>• Is lost when publication pressures may split disciplines up</li> <li>• Is affected by the RAE, which influences how/whether people collaborate</li> <li>• Might be impeded by the standard model of provide funding/producing academic papers?</li> <li>• Is hard to maintain after a specific project ends because momentum fades</li> <li>• Is bad for your career</li> </ul>

Note: the lists given in each column are in no particular order, nor is there any implied linkage between specific issues and those in the adjacent column.

## CONCLUSIONS

To summarise, this Development Activity was based on lessons learned from two EU funded projects, REDCAFE and IMEW, where it was found that while natural and social scientists did co-operate to a certain extent, there were difficulties in fully integrating different disciplinary perspectives and different types of data. Yet, both projects dealt with natural resources conflicts where a more integrated approach is considered essential to properly address such complex problems incorporating both natural and social



elements. So, we wanted explore how a better understanding of the potential for, and problems associated with, interdisciplinary collaboration and stakeholder involvement could be built into project design, implementation and output. In this way, the experiences recorded here are directly relevant to RELU's advocacy of innovative interdisciplinary approaches, maximising added value and exploiting opportunities for greater synergy between stakeholders. The outcomes of the workshop (Part 4) should also be taken on board by RELU and potentially (and reflexively) explored further in future workshops as RELU projects progress.

The primary focus of the research, outlined in Part 1, was based around REDCAFE and IMEW participants. We asked what they felt helped to create interdisciplinarity and whether there were any major obstacles. We also examined the extent to which social and natural scientists understood (and respected) different methods of data collection, interpretation and presentations. Our findings suggest that people do face difficulties in understanding what others do and that involving a range of disciplines in a project does not necessarily produce interdisciplinary research. That is, successful communication is not ensured. It has already been pointed out that, in some cases, interdisciplinarity is not needed. However, where interdisciplinarity is deemed important, it is essential that efforts are made to build and develop effective communication channels.

One building block towards better communication is to ensure that project participants have a clearer understanding of disciplinary frameworks and that disciplinary contributions are mutually intelligible. Several suggestions were put forward including meetings and/or workshops where researchers spend time learning about, and teaching, different methodological approaches in order to enhance understanding and engender trust and respect. Moreover, projects will need to reflect on the processes involved in building and maintaining interdisciplinary integration throughout the lifetime of the project and, potentially, beyond. Nevertheless, it was noted throughout the report that working towards interdisciplinarity will take time and require resources. Moreover, discussions with RELU researchers (Part 4) highlighted the need for an open dialogue on needs (e.g. trust, respect, incentives) and concerns (e.g. bad for your career) surrounding such collaboration.

Publication and dissemination of outputs was an issue consistently raised during this project and we were concerned with two aspects of the dissemination process. Firstly how to meet the needs of stakeholders with different information requirements and, secondly, how researchers and Journal Editors deal with the challenges of publishing interdisciplinary academic papers. In Part 2, it was clear from the REDCAFE case presented, that the standard format for reporting results (through a Final report) was not the most effective means for targeting and reaching stakeholders (such as wildlife managers). We asked several REDCAFE stakeholders, representing small and large organisations, to advise us on the best methods of disseminating research findings. Their suggestions ranged from an interactive CD to short pamphlets and web pages, all of which are far from the 169 page report that was originally presented to them. At the opposite end of the dissemination spectrum (e.g. scientific publications), our all too brief exploration suggests numerous issues for both scientists wishing to publish

interdisciplinary work and Journal Editors trying to referee it. Some key issues appeared to be the influence of the RAE, the availability of appropriate (top-ranking) journals, and difficulties in evaluating and refereeing interdisciplinary research.

As we highlighted earlier on in this report, we believe that interdisciplinarity is dynamic, being the integration of 'ways of thinking' as part of the development of a 'way of working' and thus it cannot be produced by following a predetermined recipe. We have therefore concentrated on presenting people's experiences, thoughts, perceptions, ideas and concerns rather than providing 'recommendations' for interdisciplinarity. By doing this, it has become clear that there is a level of agreement between the people we interviewed and with the literature we have read. There is an equally clear level of agreement on many of the issues raised. We believe that taking a route to interdisciplinarity will not be easy but with the right incentives (e.g. greater understanding of the research problem), it is ultimately more rewarding. Nevertheless, the direct responsibility for ensuring successful collaboration (however that is defined) must lie collectively with the researchers, project manager and the funding agencies. Indirectly, the institutions that reproduce the current 'mono-disciplinary' environment in which many interdisciplinary researcher are trying to work, must also move towards breaking the weight of old disciplinary conventions which conspire to inhibit the growth and success of interdisciplinarity and interdisciplinary researchers.

However, to conclude on a note of optimism, our research indicates a keen willingness amongst researchers to undertake more interdisciplinary work despite their broader concerns over currently weak institutional support. Future research could thus focus, for example, on a more longitudinal (qualitative) study of interdisciplinary projects in action, a greater in-depth exploration of the influences of institutional structures such as the RAE and further investigation into the 'sociology of journals'.

## **BIBLIOGRAPHY**

- Ascher, W. (1999). Resolving the hidden differences among perspectives on sustainable development. *Policy Sciences* 32: 351-377.
- Bracken and Oughton (*in press*). 'What do you mean?' the importance of language in developing interdisciplinary research. *Transactions of the Institute of British Geographers*.
- Bradshaw, G.A. and Bekoff, M. (2001). Ecology and social responsibility: the re-embodiment of science. *Trends in Ecology and Evolution* 16: 460-465.
- Brewer, G. D. (1999). The challenges of interdisciplinarity. *Policy Sciences* 32: 327-337.
- Bruce, A., Lyall, C., Tait, J. and R. Williams (2004). Interdisciplinary integration in Europe: the case of the Fifth Framework Programme. *Futures* 36: 457-470.
- Carss, D. N. (ed) (2003) reducing the conflict between cormorants and fisheries on a pan-European scale: REDCAFE. *Final Report to European Commission*, pp169.
- Daily, G.C. and Ehrlich, P.R. (1999). Managing earth's ecosystems: an interdisciplinary challenge. *Ecosystems* 2: 277-280.
- Evans, M and Macnaughton, J. (2004) "Should medical humanities be a multidisciplinary or an interdisciplinary study"? *Journal of Medical Ethics, Medical Humanities*, 1-4.
- Ewel, K. C. (2001) Natural resource management: the need for interdisciplinary collaboration. *Ecosystems* 4: 716-722.
- Flick, U., von Kardoff, E. and I. Steinke (2004). *A Companion to Qualitative Research*. Sage, London.
- Gibbon, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., and M. Trow (1994). *The New Production of Knowledge: the Dynamic of Science and Research in Contemporary Societies* London: Sage.
- Gornitzka, N. (2003). Interdisciplinarity: still a challenge in development research. *NUPI* 30(2): 290-301.
- Hansson, B. (1999). Interdisciplinarity: For what purpose? *Policy Sciences* 23: 339-343.
- Holstein, J.A. and Gubrium, J.F. (eds) (2003). *Inside Interviewing: New Lenses, New Concerns*. Sage Publications.

- Karlqvist, A. (1999). Going beyond disciplines: The meanings of interdisciplinarity. *Policy Sciences* 32: 379-383.
- Kinzig, A. P. (2001). Bridging disciplinary divides to address environmental and intellectual challenges. *Ecosystems* 4: 709-715.
- Klein, J. T. (1990). *Interdisciplinarity: History, Theory and Practice*. Wayne State University Press: Detroit.
- Kwa, C. (in press). "Local ecologies and global science: Discourses and strategies of the International Geosphere-Biosphere Programme", *Social Studies of Science* (35).
- Mann, C. and Stewart, F. (2003). Internet interviewing. In: Holstein, J.A. & Gubrium, J.F. (eds) *Inside Interviewing: New Lenses, New Concerns*, pp241-265, Sage Publications.
- Naiman, R.J. (1999). A Perspective on Interdisciplinary Science. *Ecosystems* 2: 292-295.
- Nowotny, H., Scott, P. and M. Gibbons (2001) *Rethinking science: knowledge and the public in an age of uncertainty*. Cambridge, Polity Press.
- OED (2002) Building biodiversity governance through stakeholder participation. World Bank Operations Evaluation Department, *Précis* (228), Fall 2000.
- Petrie, H.G. 1976. "Do You See What I See? The Epistemology of Interdisciplinary Inquiry", *Journal of Aesthetic Etic* (10): 29-43.
- Qin, J., Lancaster, F.W. and B. Allen (1997). Types and Levels of Collaboration in Interdisciplinary Research in the Sciences. *Journal of the American Society for Information Science* 24 (10): 893-916.
- Schoenberger, E. (2001). Interdisciplinarity and social power. *Progress in Human Geography* 25(3): 365-382.
- Sillitoe, P. (2004) Interdisciplinary experiences: working with indigenous knowledge in development. *Interdisciplinary Science Reviews* 29 (1): 6-23.
- Tait, J. and Lyall, C. (2001). Investigation into ESRC Funded Interdisciplinary Research. *SUPRA Report to ESRC*, May 2001.
- Tait, J., Williams, R., Bruce, A., Lyall, C., Gravalos, E., Rodriguez, P., Jolivet, E., Jorgensen, U. and J. Laessoe (undated). Interdisciplinary Integration in the Fifth Framework Programme (II-FP5) *Final Report to European Commission, Contract No. SEAC-1999-00034*.

Tait, J., Williams, R., Bruce, A., Lyall, C., Gravalos, E., Rodriguez, P., Jolivet, E., Jorgensen, U. and J. Laessoe (undated b). Interdisciplinary Integration in the Fifth Framework Programme (II-FP5) *Annexes to Final Report to European Commission, Contract No. SEAC-1999-00034*.

Turner, M.G. and Carpenter, S.R. (1999) "Tips and traps in interdisciplinary research", *Ecosystems* (2):275-276.

Vedeld, P.O. (1994) The environment and interdisciplinarity: ecological and neoclassical economical approaches to the use of natural resources. *Ecological Economics* 10: 1-13.

Wear, D.N. (1999). Challenges to interdisciplinary discourse. *Ecosystems* 2: 299-301.

## Appendix 1

Example of Questionnaire distributed to REDCAFE and IMEW participants:

### **Calming Troubled Waters: Making Interdisciplinarity Work**

Thank you for agreeing to take part in this study. The questions in this document aim to uncover as much as possible your own ideas, thoughts and direct experiences of interdisciplinary collaboration. Please answer the questions as fully as possible but do not hesitate to telephone or email if you have any questions yourself. I would like to keep the discussion going so I would like to follow up your answers, where appropriate, either with a short telephone call or email. Where possible, please make your responses relevant to REDCAFE/IMEW but also include your wider experiences outside of the project.

Hope to hear from you in the next few weeks!

Name:.....

Job description.....

Institution/Organisation:.....

Role in REDCAFE/IMEW:.....

#### **SECTION I: *Managing Projects***

1. What discipline(s)/fields are you primarily trained in? What other disciplines do you have working experience of?
  
2. Can you provide brief definitions for the following two terms:
  - a) Multidisciplinarity
  
  - b) Interdisciplinarity

Do you use any other terms in your work to describe the collaboration of a group of people from different disciplines?
  
3. Do you have any experience of a) multidisciplinarity b) interdisciplinarity?  
Please give brief examples.
  
4. In your everyday work do you think an interdisciplinary approach is practical?  
If not, why not?

5. In your opinion what qualities are needed in an interdisciplinary researcher?
6. What factors do you think are required to create a successful interdisciplinary team?
7. What obstacles might stand in the way of interdisciplinary collaboration?
8. What mediums of communication (email, telephone, meetings etc.) have you found to be most effective in enhancing interdisciplinary collaboration and why?
9. What activities/processes do you think encouraged interaction between people from different disciplines in REDCAFE/IMEW?
10. At the beginning, how did you think the REDCAFE/IMEW project would work with so many people involved?  
Had your ideas changed by the end of the project? If so, how?
11. What did you find most difficult about being a member of a large project?
12. What did you find most rewarding working within the REDCAFE/IMEW project?

Further comments:

## **SECTION II: *Integrating natural and social science datasets***

*This section can also refer to working with other disciplines within natural or social science. So, if you haven't worked with natural/social scientists, please think about other disciplines you have worked with.*

13. Given the pan-European scale of REDCAFE/IMEW, what impacts do you think differences in language, culture and values have on successful collaboration in interdisciplinary projects?

14. Do you think it is necessary for interdisciplinary researchers to understand more about the methods of other disciplines? Please explain and say whether you consider yourself to have such an understanding.
15. In your discipline (see answer to Q1), how do you assess whether research is rigorous and acceptable?
16. What are the key elements of your research that have to be understood in order that 'results' are not misinterpreted by others?
17. How does your disciplinary training (see answer to Q1), influence the ways in which you view contributions from other disciplines?

Further comments:

### **SECTION III: *Dissemination***

18. If you have published interdisciplinary research in a journal was it easier/harder than publishing single-discipline research? Why?

Further comments



## Appendix 2

Example of Questionnaire sent to Journal Editors:

### Calming Troubled Waters: Making Interdisciplinarity Work

Thank you for agreeing to take part in this study. The questions in this document aim to uncover as much as possible about your own ideas, thoughts and direct experiences of publishing *interdisciplinary* papers. Our funders are particularly interested in integrating natural and social science research and this is the starting point for the design of this questionnaire. Such a straightforward dichotomy may be valid for some journals but we are also interested in interdisciplinarity within disciplines such as ecology, geography and anthropology. Here such straightforward divisions (i.e. natural versus social) may well be non-existent. However, we are still very interested in exploring how editors deal with papers involving integrated research strands (e.g. genetics/population ecology or social/biological anthropology) within the different philosophies of, say, natural and social science, respectively.

Interdisciplinarity is often described as a buzzword, we would like to understand what, if anything, it means to you as a journal editor. And if it means something, how do you 'deal with it'?

Hope to hear from you in the next few weeks!

Name:

Journal:

1. What is the core discipline of the journal? What subjects does this include?

2. Does the journal you are editor of cover both natural and social science?

Yes

No

3. Can you provide brief definitions of:

a) Multidisciplinarity

b) Interdisciplinarity

4. What proportion of papers fall into a) single b) multidisciplinary c) interdisciplinary categories? Can you give examples?

5. Do you think there are different standards for assessing the 'scientific quality' of natural and social science papers?

Or between different research strands within a discipline?

Can you provide any examples where this might cause a problem when it comes to reviewing a paper that involves multiple disciplines/sub-disciplines?

6. As part of the refereeing process, referees and editors suggest authors make changes to papers in order to get them accepted. When you are dealing with interdisciplinary papers do you encourage natural scientists to suggest changes re: e.g. description of social science methods and *vice versa*? (OR do you encourage scientists from one sub-discipline to suggest changes to the work of another sub-discipline etc.)

7. How do you decide which referees to send interdisciplinary/multidisciplinary papers to? Does this differ from single-discipline manuscripts?

8. On what criteria (other than the 'quality' of the research), do you judge whether a paper may be suitable for publication?

9. What problems can you face with the processes outlined in Q7 and Q8?

10. It has often been said that successful interdisciplinarity depends upon the personalities of key participants. Can the same be said within the academic publishing world? To what extent do the personalities/personal interests of publisher's impact upon what finds its way to publication? Do you have any examples?

11. Researchers are often encouraged to proceed with interdisciplinarity especially through current funding regimes. However, many journals are discipline-specific and either natural science or social science based – there doesn't seem to be a format to accommodate multiple perspectives in one journal and especially within one paper.

(Refer back to Q4) Have you experienced difficulties publishing interdisciplinary papers? If yes, can you give examples?

If no, can you give examples of what researchers are doing right?

12. Have you instigated or noted any changes in your journal or other journals in recent years to accommodate a move towards interdisciplinarity?

If so, can you give examples of some of these changes and the reasons behind them?

13. Given the push for interdisciplinarity, do you think the current spectrum of journals available to authors is adequate? Is there a need to develop a new strategy for publishing interdisciplinary research?

