CAPACITY BUILDING PROJECT ON BRINGING TOGETHER NATURAL AND SOCIAL SCIENCE PERSPECTIVES ON UNDERSTANDING DIFFUSE POLLUTION

FINAL REPORT ON PROJECT WORKSHOPS

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Introduction

The Rural Economy and Land Use programme (RELU) is a joint initiative involving the Economic and Social Research Council (ESRC), the Biotechnology and Biological Sciences Research Council (BBSRC) and the Natural Environment Research Council (NERC). It has a budget of £20 million, with additional funding from the Scottish Executive Environment and Rural Affairs Department and the Department for Environment, Food and Rural Affairs. The programme's aim is to advance understanding of the social, economic, environmental and technological challenges faced by rural areas. Central to RELU's ethos is this aim requires researchers from across the natural and social sciences to collaborate in new ways.

As part of the RELU initiative, a joint project between the Universities of Lancaster, Durham, Newcastle and Oxford is seeking to enhance and to expand capabilities for integrative, interdisciplinary research on rural issues, under the specific theme of diffuse pollution. The aim is to move towards the development of a cross-disciplinary approach to broaden our understanding of the causes and consequences of diffuse agricultural pollution. The aim is broadly defined, so as to include all land management activities that impact upon the quantity and quality of water in our rivers and groundwater, as well as the organisms that live within them. The project is funded by RELU as a 'capacity building' exercise, to bring researchers with very different backgrounds together with a diverse range of stakeholders and other researchers, rather than as a piece of primary research.

The central element of the project has been a series of four workshops, each designed to capture different sub-themes within the subject matter outlined above. Each workshop also had a different stakeholder co-sponsor. This document reports on all four workshops. The final workshop in the series was a plenary session, bringing participants from each of the first three workshops together with a group of international attendees. The outcomes of the first three workshops were therefore fed into the final one.

What we mean by 'capacity building'

As noted above, this project is not concerned with conducting original research on the topic of diffuse pollution. Rather it is intended to bring together different existing perspectives and information on the issue by using particular case studies as focal points. The research that is being carried out is concerned with new ways of bringing different perspectives and interests – different knowledges – to bear on the problem(s) of diffuse pollution. So the capacity that we refer to is the ability to work together (or even just think together) on a complex problem. In the sense that the workshops are a first step in this process, this could be thought of as action-research or participatory research, with a strong 'reflexive' (learning) element. In the first instance, then, the capacity being built is within the project team – a process of learning to work together across traditional disciplinary boundaries that can be transferred to future projects. No less significant are the working relationships being built between the team and other workshop attendees, whether they are other academics or representatives of policy and stakeholder groups. The workshops also offer an opportunity for attendees to network with each other, outside of the project group: three of the four workshops involved an overnight stay, and two of the four involved field site visits. The process of capacity building does not end with the workshops, because the outputs from the project, of which this report is the first, will continue the process of dialogue and offer a point of connection for the nascent networks that have been built.

Workshop 1 – Kings College, Cambridge (Slea Catchment) September 8th 2004

Title: Groundwater Dimensions to the Diffuse Pollution Issue: Challenges for Interdisciplinary Research

Co-sponsor: Environment Agency **Contact:** Bob Harris (bob.harris@environment-agency.gov.uk)

Convenor: Neil Ward (n.ward@ncl.ac.uk)

1 Context

The first workshop was run in conjunction with a one-day Water4All event that was held the following day, also in Kings College, Cambridge. Participants in the RELU workshop were invited to attend both events. Water4All is a project which looks at issues of sustainable groundwater management and is funded as part of the EU's Interreg-IIIb "North Sea Programme". There are four partner organisations involved in Water4All from Denmark, Germany, the Netherlands and Great Britain.

Water4All has a number of common aims across all the study areas that are pertinent to the RELU programme and the capacity building project on diffuse pollution in particular (taken from www.water4all.com):

- Rising awareness for the problem of groundwater
- Improving groundwater concerning quality and quantity
- Exchange of know-how and handling of groundwater among the cooperating EU-states
- Recommendations in order to realize the water framework directive (2000/60/EC)
- Guideline concerning optimised land-use in water protection area

The British partner is the Environment Agency, working in conjunction with researchers from the University of East Anglia. The case study area is the River Slea Catchment in Lincolnshire and this provided some empirical basis to the workshop discussions.

The River Slea Catchment

The River Slea flows from west to east, with its headwaters at a limestone escarpment that runs north-south through Lincolnshire. Between the source and the town of Sleaford, the river occupies a limestone valley; beyond Sleaford the river becomes a more typical fenland watercourse. The groundwater catchment is most significant for river flow and is estimated to cover an area of 80km^2; the river also drains approximately 40km^2 of intensive arable land. The catchment has relatively high levels of nitrate in ground and surface waters (exceeding the World Health Organisation standard of 50mg $NO3^-$ l^{-1} in places) and readily available monitoring data e.g. from public supply boreholes. The Slea was a pilot Nitrate Sensitive Area and is now designated as a Nitrate Vulnerable Zone.

As far as the RELU capacity building project is concerned an interesting feature of the Slea as a case study stems from the importance of groundwater catchment. How can public engagement be carried out when the problems in the catchment are invisible, in terms of the physical processes involved (impacts are hidden – underground and long-term) and, therefore, in terms of public and policy awareness.

Modelling work being carried out for the Environment Agency at the University of East Anglia (reported by Kevin Hiscock) suggested that for groundwater in this catchment to comply with the Water Framework Directive, approximately 50-60% of the agricultural land would have to come out of arable production.

2 Aims

- To expose the overall project aims and propositions to an audience of mainly natural scientists
- To begin to open up the key problems in public engagement and interdisciplinary working
- To think about problem framing through the 'groundwater dimension' to diffuse pollution

3 Activities

- Presentations:
    - RELU and capacity building project overview – Louise Heathwaite
    - Policy and institutional context – Neil Ward
    - Capacity building project propositions – Sarah Whatmore
    - The groundwater dimension to diffuse pollution – Bob Harris, Environment Agency
    - A natural scientist's viewpoint on diffuse pollution – Kevin Hiscock
    - International perspectives on interdisciplinarity and public engagement in water resource management – John Norton (Australia), Keith Porter (USA)
- Discussion groups focused on two dimensions to 'connectivity' (a term that emerged in the early discussions:
    - Scientists connecting with stakeholders and publics
    - Connections between scientists and social scientists

4 Outcomes

Group A – Scientists and Stakeholders / Publics

- Need for an intermediary to act as a translator / communicator
    - Asking researchers to engage directly with publics can dilute their value (i.e. take them away from research)
    - Intermediary more "efficient"
- Issues to be communicated need to be relevant / personal to the public to be understood
- Public interest groups can act through intermediaries (e.g. action through supermarkets in the case of GM)
- Public interest groups are selective in science – relates to need to personalise
- Using the right language is important, links back to need for translator

Group B – Natural and Social Sciences

- What context exists to encourage interdisciplinarity?
    - day-to-day proximity
    - common interest
    - similarity of skills and techniques might encourage cross-disciplinary understanding (e.g. quantitative sociologist finds it easier to work with a natural scientist modeller than with a social scientist using political theory)
- Main problem / constraint is institutional and reward structures
    - Pressures to publish in specific journals (within disciplinary structures)
    - RAE definitions of good research
    - UK Research Councils, particularly peer review of proposals
- Lessons to be learned from non-UK contexts about how to generate funding for interdisciplinary work

General Points

One key point raised at this workshop (and the next two) was the need for the team to rephrase or better explain our 4 propositions:

- reconceptualising environmental issues
- redistributing expertise
- relocating environmental politics
- building new knowledge competencies

By the time of the Oxford workshop the propositions had been revised (see below).

The wider issue of the importance of 'language' (which included the language used by the project team as noted above) was raised at this workshop for the first time and would develop into a major theme for the Oxford workshop.

Workshop 2 – Buckden, North Yorkshire (Wharfe Catchment) September 13th & 14th 2004

Title: Delivering a Better Rural Environment: challenges for interdisciplinary research on diffuse pollution issues in upland catchments

Co-sponsor: Defra **Contact:** Dr Peter Costigan (p.costigan@defra.gsi.gov.uk)

Convenor: Stuart Lane (s.n.lane@dur.ac.uk)

1 Context

This workshop was built around the first field-based case study of the project: Upper Wharfedale, North Yorkshire. One of the project team (Stuart Lane) had recently been responsible for addressing a series of scientific questions that had emerged from an Environment Agency-led project concerned with Best Practice in Upland Environments. A key component of this was the engagement of stakeholders and community members in a working group to identify what the key environmental concerns were within the Dale, and then to deliver a series of 'restoration projects' to address these concerns. During issue identification, the stakeholders had identified a series of problems that involved diffuse land management activities (including runoff generation, fine and coarse sediment delivery, microbiological risk). Given the participatory nature of the project, it was decided that this would provide a good case-study of one means of learning about how to manage diffuse rural land management issues.

2 The River Wharfe Catchment

The Upper Wharfedale Best Practice Project considered the Upper Wharfe catchment in the Yorkshire Dales National Park as far downstream as the village of Starbotton (72 km^2 in total). The catchment osils-vegetation comprises shallow blanket peat on the hilltop, rough grass and moorland on the middle slopes with sheep grazing and pasture land on the lower floodplain. Coniferous forests were planted commercially at Greenfield during the 1950s, these are due to be removed within the next five years. Some of the moorland headwater areas have been gripped, which has extended the channel network, and this has been hypothesised as leading to steeper hydrographs with both decreased time-to-peak and shortened recession limbs. This may have implications for both fine and coarse sediment generation and transport (Hey and Winterbottom, 1990). The catchment receives high rainfall in the region of 1750-2000 mm per year from the prevailing westerly air streams. The long-term average for the village of Buckden in the study area is 1710 mm, with just 433 mm of annual evapotranspiration (Heritage and Newson, 1997). The area appears to be very sensitive to both localised convective summer thunderstorms and winter cyclones, which tend to produce high-intensity rainfall events (Merrett and Macklin, 1999).

3 Upper Wharfe Best Practice Project

In 1997, the Upper Wharfe became the site for an important pilot study on best practice for the sustainable management of the land and water (Upper Wharfedale Best Practice Project, UWBPP). This is a partnership, managed by the Environment Agency, with a Steering Group. Membership of the latter included: (1) local landowners and farmers, both individuals and groups like the National Trust; (2) the Yorkshire Dales National Park; (3) the Forestry Commission; (4) the Department of the Environment, Farming and Rural Affairs; (4) Angling Associations; (5) English Nature; (6) environmental managers, including Tilhill Economic Forestry; (7) representatives of local decision-makers, notably parish councils and farmers; and (8) academics. The partnership received a grant from the European Commission's European Agricultural Guidance and Guarantee Fund, Objective 5b programme for the Northern Uplands and the Millenium Commission through Yorkshire Dales Millenium Trust. The aim of the UWBPP was to determine the principles, techniques and benefits of an integrated way of achieving good land and water management in an upland environment. It is based on an ecological approach, protecting habitats and water quality in the catchment, whilst encouraging a move towards more sustainable hill farming, and taking into account social and economic considerations. The extent of the UWBPP provided a fundamental focus for both the identification of individual and community goals and a process by which those goals could be identified and evaluated. Thus, the project was unusual: whilst it did begin by

commissioning consultants to scope the science of the problem, the problems were identified by the Steering Group, with strong consultation with the local community. Thus, from the beginning, the initiative was stakeholder-led, with science commissioned by the UWBPP in response to particular issues. A key midpoint was reached in 2000 when the UWBPP commissioned some major science in order to develop the associated science base.

4 Aims

- An introduction to the UWBPP as a case study (Day 1)
- Learning from the UWBPP on the following issues (Day 2):
    - Working with controversy?
    - Building interdisciplinarity?
    - Handling uncertainty

5 Activities

- Presentations:
    - Upper Wharfedale Best Practice Project – Liz Chalk, Environment Agency
    - RELU and capacity building project overview – Louise Heathwaite
    - Policy and institutional context – Neil Ward
    - Capacity building project propositions – Neil Ward
- A field walk to view the areas of river under discussion and the catchment more widely – Stuart Lane
- Discussion with members of the UWBPP on the following topics and questions:
    - What did the UWBPP achieve in a broad sense
    - What problems arose?
    - How were these resolved?
    - What made the UWBPP work?
    - What are the transferable outcomes?
    - What are the ingredients of success?
    - What barriers are there to using a UWBPP approach in other locations
    - What are the general lessons for successful land management that come from the UWBPP?
    - How does the 'bottom up' approach of the UWBPP interface with 'top down' initiatives and requirements?
    - Should it compliment or replace 'top down' initiatives
    - What were the knowledge sources that helped the UWBPP?
    - How was conventional science used by the UWBPP? And was this the right type of science?
    - What other forms of knowledge helped the UWBPP work?

6 Outcomes

Some key points relating to the UWBPP emerged during the discussion:

- The approach adopted by the project was to focus on the assets of the Dale, in particular "environmental capital" to widen the focus away from individual farming practices
- Success was built on utilising existing networks, predominantly the connections between farmers resulting from the long-running ESA scheme in the Dale
- The success of the ESA network was due to continuity (3 officers in 15 years), this was what the UWBPP required if it was to maintain a presence

- An integrated, shared catchment management plan was felt to be a platform for extending the longevity of the UWBPP's successful outcomes
- Visibility / ownership of problems was identified as a problem e.g. problems located on the York floodplain, not in the Dale
- In this instance the catchment itself is very visible (revealed by the field walk) no problems of boundary / territory definition and identity
- The way in which scientists were engaged (to provide options and develop understanding of the participants' own environmental knowledge, rather than to provide concrete answers) was very successful in overcoming sticking points and is a key transferable outcome from the project
- Regulatory framework is likely to cause conflicts in participatory actions such as UWBPP, local needs, values and desires versus inflexible regulatory standards (deriving from WFD etc) in the background
- A key theme in the UWBPP was the significant amount of time and energy required for this initiative, which raises questions as to how transferable the approach might be, especially from the perspective of public organisations. However, it was noted that the local emphasis on a community-led initiative had secured the project success and that this is the vehicle by which time and energy could be mobilised, provided the appropriate infrastructure and approach is in place (e.g. a willing and able locally-based NGO).

Workshop 3 – Slapton Field Studies Council (FSC) Centre, Devon, October 18th & 19th 2004

Title: Challenges for interdisciplinary research on diffuse pollution issues in lowland agricultural catchments exhibiting eutrophication

Co-sponsor: RSPB **Contact:** Jim Densham (j.densham@rspb.org.uk)

Convenor: Louise Heathwaite (louise.heathwaite@lancs.ac.uk)

1 Context

The workshop was built around the second field-based case study of the project.

The Slapton Catchment

The 46 km^2 mixed arable and grassland catchment has been the focus of water quality monitoring since the 1959 when detailed study of the Slapton Ley Nature Reserve began with the establishment of the Field Studies Council Centre (www.field-studies-council.org/slaptonley/). Since then, the monitoring programme has been sustained and extended, complemented by detailed experiments of a more short-term nature (Burt and Heathwaite, 1996).

Slapton Ley is a coastal lagoon, 10 km south west of Dartmouth, Devon (UK grid reference SX 825479). The Ley is part of a wetland 116 ha in area which is divided into two basins: the Higher Ley (39 ha) is mainly reed swamp; the Lower Ley (77 ha) is open water fringed with reed. The Ley, together with the surrounding woodland, ancient cliff-line and shingle ridge is a grade-1 Site of Special Scientific Interest (SSSI) and in 1993 was designated a National Nature Reserve (www.slnnr.org.uk/). Early studies of the reserve were concerned with the morphology and origins of the lake basin (Mercer, 1966; Morey, 1976), its climate (Ratsey, 1975), its flowering plants (Brookes and Burns, 1969), the phytoplankton community in the lake (Benson-Evans et al., 1967) and the fish (Kennedy, 1975). Research on the hydrology and hydrochemistry of the catchments which drain into Slapton Ley, and in particular the patterns and processes of diffuse nutrient export from land to stream are internationally renowned (e.g. Burt et al., 1996; Heathwaite et al., 1996). The latter is significant because in the 1960s it became apparent that the Ley was becoming increasingly eutrophic. In order to gauge water, sediment and nutrient inputs to the lake, measurements have been maintained on the main catchments since 1969. Hydrological and water quality records of this length are unique in Britain for small rural basins and have provided an important context for experimental studies of catchment hydrology, palaeo-environmental reconstruction within the lake basin and on adjacent floodplains using sediment cores, and for environmental modelling. More recently, there have been a number of attempts to integrate the natural science research with stakeholder and environmental policy needs with the aim of delivering a 'better environment' such as the Interreg IIIB Cycleau Project (www.cycleau.com/), which aims to find innovative ways of managing and improving the water environment by sharing knowledge and experience of water management and involving local communities in the management of local rivers.

Burt, T. P. and Heathwaite, A. L. (1996) Long-term studies of the natural environment at Slapton Ley. Field Studies, 8, 533-542.
Burt, T. P., Heathwaite, A. L. and Johnes, P. J. (1996) Stream water quality and nutrient export in the Slapton Catchments. Field Studies, 8, 613-627.
Heathwaite, A. L., Johnes, P. J. and Peters, N. E. (1996) Trends in nutrients and water quality. Hydrological Processes, 10, 263-293.

2 Aims

- An introduction to Slapton Ley as a case study (Day 1)
- Learning from the long-term research at Slapton on the following issues (Day 2):

3 Activities

- Presentations:
    - RELU and capacity building project overview – Louise Heathwaite
    - Policy and institutional context – Neil Ward
    - Capacity building project propositions – Neil Ward
    - The Cycleau Project – Ed Ferris, Cycleau
    - The RSPB perspective on diffuse pollution – Jim Densham, RSPB
    - DEFRA's Catchment Sensitive Farming initiative – Amy Sullivan
    - SCIMAP risk modelling for diffuse pollution – Stuart Lane
    - The community perspective – Val mercer, Slapton parish council

- A field trip to view the surrounds of the Higher and Lower Ley and key research sites to discuss the field experimental approaches used to examine diffuse pollution and explore some of the challenges in scaling-up field research. The field visit also explored some of the mitigation strategies aimed to reduce diffuse pollution (e.g. livestock watering exclosures and buffer zones) and the degree to which they have been taken up by land managers in the catchment.

- Open discussion on the following topics and questions:
    - How has the long-term programme of monitoring shaped perception and understanding of diffuse pollution issues in the Slapton catchment?
    - How has the science interfaced with community needs and understanding?
    - How should we deal with point vs diffuse pollution issues?
    - Are there general lessons for successful land management that come from the Slapton research programme?
    - Why hasn't the research solved the problems of eutrophication in Slapton Ley? Is this asking too much!
    - How has conventional science been used? And was this the right type of science?
    - What other forms of knowledge helped inform understanding of diffuse pollution issues in the catchment?

4 Outcomes

- In this catchment much more is known about the science issues than about the needs of the community
- There is a distinction between strategic 'textbook' science and a participatory science
- Until recently, all of the monitoring at Slapton has been strategic science and has not led to radical action in the catchment
- Although an integrated view of the catchment at Slapton has been attempted and is held as a long-term vision for the catchment (e.g. annual Slapton research seminars which are open to the whole community; specific meetings in the village hall to explore the social and economic issues of water quality degradation and specific problems such as nutrient discharges from the Slapton sewage treatments works into the Lower Ley), there has never been the funding available to start to pull this bigger picture together
- In discussions involving farmers with regard to changing their attitudes to the environment, there is an unfounded assumption that behaviours flow from attitudes
- 2 simple questions that raise awkward issues were put to the group in summing up:
    - what is the problem and for who is it a problem (there are lots of 'surrogates' for the problem in terms of ecological factors)?
    - What, and who, is the science for?

Workshop 4 – Linacre College, Oxford, November 1st 2004

Title: Delivering a Better Rural Environment: challenges for interdisciplinary research on diffuse pollution issues

Co-sponsor: UNESCO **Contact:** Mike Bonnell (m.bonell@unesco.org)

Convenor: Sarah Whatmore (sarah.whatmore@ouce.ox.ac.uk)

1 Context

The final workshop was a university-based plenary session, bringing together participants from previous workshops with international representatives of UNESCO's HELP programme. HELP stands for Hydrology for the Environment, Life and Policy and is a joint initiative between UNESCO and the World Meteorological organization. The programme is focused on developing a "new approach to integrated catchment management". This involves the creation of a framework for water resource managers, law and policy experts and water scientists to work together on water-related problems in areas of up to one million square kilometres. The framework is intended to be user-driven from the beginning and requires participation on the ground with delivery bodies. HELP is a global programme and currently has 67 river basins classified as *proposed*, *evolving*, *operational* or *world demonstration*.

2 Agenda for Workshop 4

10:30 Arrive and Coffee

11:00 Introduction

Outline for the day – Sarah Whatmore / Andrew Donaldson
Introduction to Capacity Building Project – Louise Heathwaite
Overview of previous Workshops – Stuart Lane
Introduction to HELP – Lotta Andersson

12:00 Viewpoints

Ronnea, Sweden (VASTRA) – Anna Joborn & Lotta Andersson
Eman (Sweden– Bodil Liedberg Jönsson
Mesta-Nestos (Bulgaria-Greece) – Jean-Marie Monget
Pays de Savoie-Mont Blanc-Lac Léman (France) – Pierre Lachenal / Pier Zingari**]**
Upper Wharfe best practice project (UK) – Liz Chalk
EU Cycleau project, Slapton– Ed Ferris
EU Water4All project – Bob Harris

13:15 Lunch

14:00 The 4 Propositions – Neil Ward

14:15 Break out groups (4/5 members per group depending on final numbers).

The task of the groups will be to gather and exchange views drawn from participants' work experience to help identify (i) key problems of interdisciplinary research on diffuse pollution issues; and (ii) good practice and /or priorities for improving interdisciplinary working.

15:15 Plenary discussion (break-out group presentations and discussion)

16:00 Pulling the 'capacity building' strands together (project team)

16:30 Finish

3 Activities

The main activity at the workshop was a discussion of the four propositions outlined below. These are the key ideas driving our thinking on interdisciplinary research and policy making within the context of diffuse pollution:

Proposition 1

- Environmental issues are not easily categorized as 'social' problems or 'natural' problems – they are an inseparable mixture of the two: a 'hybrid' problem.
- This should be the starting point for thinking about environmental problems.

Proposition 2

- Expertise exists everywhere in society – but no one is an expert in every field and not every expert has a certificate.
- Environmental problem solving needs a better understanding of different kinds of expertise.

Proposition 3

- Environmental politics is no longer the sole domain of specialists (policy makers and pressure groups) working in closed systems.
- Like expertise, environmental politics can be located anywhere in society.

Proposition 4

- Complex environmental problems require a sophisticated knowledge base.
- New ways of working around environmental issues need to be established to bring together diverse expertise, driven by a new agenda for science.

Also informing this discussion was the reporting, for the first time, of the overarching themes emerging from the previous workshops.

A The relationship between scientific and social aspects of diffuse pollution

- A growing theme - the 'social' tends to get stuck on to the end of many river basin management activities, rather than being developed with and as a part of those activities
- projects are more successful when they are 'owned' by those who are going to deliver them (e.g. Upper Wharfe)

B Science and doing science

- At least two different types of scientific activity
- 'Strategic' or 'generic' being explored in a particular location as a case example (Slapton)
- 'Local' or 'Issue driven' in relation to more 'bottom up' driven demands (Upper Wharfe)
- The two can iterate but problems emerge in places where the 'Strategic' promises/uses the 'Local' but doesn't deliver it because its priorities are strategic and not local

C Participatory science

- Reticence to break down traditional ways of doing science
- Little guidance on alternative ways of doing science within River Basin Management Practice
- Much less research on how to do it
- But very strong evidence that 'participatory science' really helps people to understand the difficult nature of environmental management
- Also delivers better schemes
- Controversy is good at securing participation (Wharfe) – but visibility is a key to this – this can make invisible problems (e.g. groundwater) hard in the context of securing participation

D Communication: some contrasting themes

- The view that scientists can't communicate and need good intermediaries (e.g. Slea)
- The view that scientists can communicate and that their active involvement in the communication process helps (e.g. Wharfe)
- The view that scientists can communicate but involvement in this has to be sustained (e.g. Slapton), which does not fit well with the, goals of individual scientists and the timescales of research grants, Universities, or government.
- The need for local, community scientists

4 Outcomes

Breakout groups

There were common strands in the reporting from all the breakout groups that can be summed up into points that appear abstract at first, but actually offer up practical understandings of the problems of doing interdisciplinary research in catchment and river basin management.

A) issues of communication:

- All the groups – although they expressed it in different ways – focussed on the problem of having limited common vocabularies between various actors *i.e.* different disciplines, different types of scientist, publics etc. We need to acknowledge that all specialist knowledge communities develop shorthand vocabularies for complex concepts that are taken for granted but which others have to learn to be included in debate. It is too easy to label the terminology of others as 'jargon' in a dismissive way. It is important that everyone recognises the demands that their own vocabularies place on others and responds accordingly.
- Linked to this, but on a more fundamental level, there are different ways of framing problems *e.g.* there is assumptions from different disciplines, methodologies, and within different publics.
- It is not possible to define a specific problem in a single way. Problem definition depends on starting point. Importantly for our project, what begins as being viewed as an issue of terminology and communication in interdisciplinary work becomes an issue that requires a different way of thinking about communication *i.e.* there are effectively multiple problems being talked about that cannot be rolled into one problem that everyone involved can 'buy into'.

B) issues to do with time:

- Time was prioritised both as an obstacle to doing interdisciplinary research and as a factor that could most improve the chances of doing effective interdisciplinary work.
- Considerable time required to build trust (again between all points of connectivity) and learn vocabularies. Time taken to build trust can overcome inadequacies in common vocabularies.
- Time taken to learn and develop new working practices: things that aren't in a methods manual.
- Doing good interdisciplinary work requires researchers to commit a significant proportion of their time.
- All of the time taken to do interdisciplinary research on the part of researchers requires recognition from those demanding and funding such research that doing it means working differently and requires more time to produce results. Therefore, funding bodies need to spend more time understanding what interdisciplinary research requires and adjust their standard models for funding and evaluating research *e.g.* rethink what constitutes a legitimate part of the research process in terms of extra training and public participation and not just focus on fieldwork.

C) issues to do with space:

- Marginally less important than time dimension in group feedback but still significant.
- Questions of scale: at what scale can public constituencies relate to the kind of problems that arise in catchment management? If improving interdisciplinary work means improving the role of publics, is it important for scientists to be 'closer to the ground' to integrate local knowledges?

Points raised during discussion:

- How can the benefits of better integration between social and natural scientists (often intuitively acknowledged) be demonstrated to policy makers and funders?
- The issue can be turned on its head by demonstrating that natural science alone is demonstrably failing to induce change in polluting behaviours and activities (e.g. Slapton) – i.e. science may help in saying what the problem might be, but does not necessarily make people do anything about it (i.e. the sort of visibility created by science is not always, on its own, sufficient to mobilise change).
- In cost benefit analysis terms, public engagement should be seen as a benefit and lack of public engagement as a cost
- The cost of not involving publics more effectively in the science and policy process are demonstrated time and again in the public disputation of scientific intervention in environmental management issues that has become the norm (e.g. GM, BSE)
- The linking of 'hard regualtion' and 'hard science' is problematic as regulation is often about negotiation and knowledge more akin to 'soft' social sciences
- The terminology of 'hard' and 'soft' science that is often used is, possibly unconsciously, value – laden, with hard science appearing more solid and robust than soft, but the value can be reversed by seeing hard solutions as inflexible and soft solutions as adaptable
- Diffuse pollution has not been made into a "Big Science" issue in the same way as climate change, people do not realise that increased water costs are a result of pollution treatment– the public are detached from the problem

Concluding Remarks

This report is the first output from our capacity building project and – as perhaps we should expect to be the case at this stage – raises many more questions than it answers. The workshops were only the first stage of an exercise in framing the way we currently view and tackle diffuse pollution issues through policy and the social and natural sciences.

The next output from the project will aim to distil the points raised in this report (along with other material we have collected) into a catalyst for future action by providing a generic framework for interdisciplinary working on diffuse pollution problems.

For the latest information on the project, including links to partners and projects mentioned in this report, see the project website at http://diffuse.ncl.ac.uk/.

Finally, we would like to thank all of the participants in the workshops for attending with open minds and providing us with some invaluable insights. Obviously, collecting information and making valuable connections outside of the project team would not have been possible without willing contributors. But equally, capacity building within the team would have been considerably hindered without the focus provided by the workshops.

Appendix 1 – Attendees by Workshop

Workshop 1 – Cambridge

Project Team
Andrew Donaldson
Louise Heathwaite
Neil Ward
Sarah Whatmore

Others
Alistair Bailey (Imperial College, Wye)
Hadrian Cook (Imperial College, Wye)
Bob Harris (Environment Agency)
Kevin Hiscock (University of East Anglia)
Andrew Lovett (University of East Anglia)
John Norton (Australian National University)
Keith Porter (Cornell University)
Mary Porter (Cornell University)

Workshop 2 – Wharfedale

Project Team
Andrew Donaldson
Louise Heathwaite
Stuart Lane
Neil Ward
Sarah Whatmore

Others
Ian Barrett (Defra)
Liz Chalke (Environment Agency)
Martin Davies (National Trust)
Claire Harris (Defra RDS)
Kate Hilditch (Yorkshire Dales National Park Authority)
Clare Robinson (English Nature)

Workshop 3 – Slapton

Project Team
Andrew Donaldson
Louise Heathwaite
Stuart lane
Neil Ward

Others
Jim Densham (RSPB)
Ed Ferris (Cycleau project)
Jamie Lorimer (Bristol University)
Val Mercer (Slapton Parish Council)
Mike Shurmer (RSPB)
Amy Sullivan (Defra)

Workshop 4 – Oxford

Project team
Andrew Donaldson
Louise Heathwaite
Stuart Lane
Neil Ward
Sarah Whatmore

Others

Lotta Andersson	(UNESCO HELP)
Daniel Baird	(Defra)
Paul Bryson	(Environment Agency)
Liz Chalk	(Environment Agency)
Jim Densham	(RSPB)
Ed Ferris	(Cycleau project)
Bob Harris	(Environment Agency)
Anna Jöborn	(UNESCO HELP)
Pamela Kempton	(NERC)
Dominic Bellefontaine	(UNESCO HELP)
Bodil Liedberg Jönsson	(UNESCO HELP)
Jamie Lorimer	(Bristol University)
Jean-Marie Monget	(UNESCO HELP)
Ben Page	(University College London)
Geoff Whitman	(Newcastle University)
Pier Zingari	(UNESCO HELP)

Appendix 2 – Attendees affiliations, expertise and contact details

Attendee	Affiliation	Expertise	Contact
Project Team			
Andrew Donaldson	Centre for Rural Economy, Newcastle University	Knowledge practises; rural governance	Andrew.Donaldson@ncl.ac.uk
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Others			
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Daniel Baird	Defra Land Use and Rural Affairs Science Unit		
Dominic Bellefontaine	UNESCO HELP		
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Liz Chalk	Environment Agency, Dales Area, North East Region	Catchment based environmental improvement projects; biodiversity	Liz.Chalk@environment-agency.gov.uk
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Ed Ferris	Slapton Cycleau Project / Field Studies Council	Conservation / land management	edferris@btconnect.com

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Kate Hilditch	Yorkshire Dales National Park Authority		
Kevin Hiscock	School of Environmental Sciences, University of East Anglia		
Anna Jöborn	Swedish Water Management Research Programme, VASTRA Department of Political Science, Göteborg University / UNESCO HELP		
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Bodil Liedberg Jönsson	The Em River Basin Stakeholder Association / UNESCO HELP	PhD Co-ordinating director	
Jamie Lorimer	School of Geographical Sciences, Bristol University	Bio-politics, knowledge practises and biodiversity conservation	Jamie.Lorimer@bristol.ac.uk
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Val Mercer	Slapton Parish Council		
John Norton	Integrated Catchment Assessment & Management Centre, Australian National University and Dept. of Electronic, Electrical & Computer Eng., U. of Birmingham	Environmental modelling, sensitivity and uncertainty assessment	john.norton@anu.edu.au j.p.norton@bham.ac.uk
Ben Page	Department of Geography, University College London		
Keith Porter	Water Resources Institute, Cornell University		
Mary Jane Porter	Water Resources Institute, Cornell University		
Clare Robinson	English Nature		
Mike Shurmer	RSPB Farmland Bird Officer Wessex Downs & Chilterns Project		
Amy Sullivan	Defra Catchment Sensitive Farming	Soil hydrology; catchment processes;	

	Programme	catchment management	
Geoff Whitman	Centre for Rural Economy / School of Agriculture, Food and Rural Development, Newcastle University	Environmental knowledge; upland ecology and Less Favoured Areas policy	G.P.Whitman@ncl.ac.uk
Pier Zingari	European Observatory of Mountain Forests / UNESCO HELP		