Please complete and send back to a.dalton@uea.ac.ukby 15th November 2012. Thank you!

Principal Investigator

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Discipline	Environmental Economics		
Role in team	PI		

Project team

Total number of people involved (75)	Academics	59	Interdisc NS/SS - 6
	Non-academics	16	
Of these, how many are	Natural scientists	13	Law: 1
	Social scientists	23	Arts & humanities: 3
	Economists	11	Engineering: 2

Project title (<120 Characters)

BRIDGE: Bridging the gap between supply of and demand for valuation evidence

Project objectives

BRIDGE aimed to directly address **VNN challenge 4** by developing a **transdisciplinary VNN hub** of researchers and decision-makers **to investigate how ecosystem service values obtained from natural, social and economic sciences can best be integrated into governance to improve decision-making and implementation**.

Objective 1: Assess the state of expert knowledge around VNN Challenge 4.

Objective 2: Clarify central concepts around the supply of and demand for ecosystem service valuation evidence and develop a common vocabulary and theoretical approach to integrating this evidence into decision-making.

Objective 3: Identify a future research agenda on how to best integrate ecosystem service valuation evidence into decision-making.

Objective 4: Establish a transdisciplinary VNN hub of researchers and decision-makers that will investigate the interaction between demand for and supply of ecosystem service valuation evidence.

Summary

Please provide a **one page** plain language summary of your project, aimed at a non-specialist audience. Please address the following:

- what is your project about?
- briefly state your key findings
- why are these important?
- what have you produced that other people or organisations might find useful: tools/models etc?
- who (what type of organisations) should be interested in your tools etc?

Nature provides a wide range of benefits to people including: providing goods that we consume (wildfood and timber); regulating our natural environment (trees store carbon, wetlands help regulate water flows and thus reduce flooding); and providing cultural benefits (such as the joy we attain from viewing wildlife). However, the capacity of UK natural resources to deliver these valued 'ecosystem services' has declined dramatically over the last 60 years. This decline is, in part, because these wider benefits of nature have not been fully accounted for in the decisions we make.

The NERC Valuing Nature Network 'BRIDGE' project aimed to address this challenge by **investigating how the way that natural, social and economic scientists measure the 'value' of nature and associated ecosystem services can help improve the decisions that policy-makers, businesses and the general public make**.

To address this question, the BRIDGE project ran a series of workshops in which academics and policy-makers from a wide range of natural and social science background discussed: (i) the current level of knowledge on the value of nature and the ways in which this value might be measured; and (ii) how this value evidence might best be integrated into decision-making.

Based on the discussions held during the workshops, a series of scientific papers were produced that address key issues relating to how the value of nature might best be integrated into decision-making:

- Christie, Church, Fazey, Hockley, Kenter, O'Brien, Russel, Williams (In Prep) 'Bridging the gap between ecosystem service values and decisions: key knowledge gaps and a future research agenda' Target journal: Frontiers in Ecology and Environment
- Kenter, O'Brien, Church, Christie, Hockley, Irvine, Fazey, Ravenscroft and Reed (In Prep) 'Shared and Social Values of Ecosystems'. Target journal: Ecological Economics
- Kenter, Ravenscroft, O'Brien, Church, Christie, Fisher, Hockley, Holzinger, Irvine, Fazey, and Jones. (In Prep) 'Can deliberative approaches enhance the legitimacy of ecosystems valuation in the eyes of decision-makers?' Target journal: Environmental Policy and Governance
- Jordan and Russel (In prep.) Editorial on 'Embedding an Ecosystems Approach? The Utilisation of Ecological Knowledges in Decision Making'. Environment and Planning C

During the discussions, it was also clear that there were currently significant knowledge gaps relating to how the values of nature are used in decision-making. Through BRIDGE, we identified the following 'Top 10' key research questions that need to be addressed to fill these knowledge gaps.

- ***Values for ecosystem services***: How can people's values for different provisioning, regulating and cultural ecosystem services best be identified, measured, aggregated and used in decision-making?
- ***How to express values:*** What preferences do people have for the way in which values are elicited (e.g. as individuals or in groups; using monetary or non-monetary measures), and why, and how can valuation techniques be adapted to account for these

preferences?

- ***Deliberation, participation and social learning***: What opportunities do deliberation, participation and social learning approaches bring to the development of valuation methods? Do these approaches influence people's values, do they provide people with different ways to express values, does their usefulness vary between different dimensions of value and types of ecosystem services, and how are the resultant values perceived by decision-makers?
- ***Evidence needs:*** What kind of evidence on the value of ecosystems and associated ecosystem services do decision-makers need to improve their decisions, and how do these evidence needs vary across different decision-makers, and in different decision-making contexts and venues?
- ***Decision-making processes:*** How do decision-makers incorporate ecosystem knowledge and value evidence in their decisions, and what factors account for this pattern of knowledge use?
- ***Risk and uncertainty:*** How do people's perceptions of risk, uncertainty and vulnerability (particularly relating to changes in ecosystems and the delivery of services) influence their held and expressed valuations and how might these perceptions be measured in a way that generates data useful for decision-making?
- ***Shared social values***: Can people simultaneously possess and express 'individual' values, 'social' values, and 'shared social' values, and if so, how do they relate to each other and how can they be defined, identified, measured, aggregated and used in decision-making?
- ***Knowledge:*** How does people's existing knowledge and new knowledge acquired in a valuation exercise influence their held and expressed valuations and how might the impacts of this knowledge be measured in a way that generates data useful for decision-making?
- **Empirical evidence**: How, why and in what circumstances has the adoption of value evidence, the ecosystems approach, the ecosystem services framework and/or ecosystem service assessments and value evidence led to 'better' policy decisions?
- ***Making evidence more useful:*** How can evidence on the value of ecosystems and associated ecosystem services be presented in such a way that it is more useful to particular types of decision-makers in different decision-making contexts and venues?

The above outputs would be of interest to both the academic and decision-making communities, and will lead to the creation of more targeted value evidence that better meets the demands of decision-makers.

Your project and the Valuing Nature Network

Please provide up to **four pages** of detail regarding the following:

1. Your insights into which of the four VNN Key Challenges (Appendix A) you addressed, according to your proposal
2. How you have evolved the overall VNN conceptual framework (content of boxes and flows between) (see Appendix B)
3. Your thoughts on the future agenda for VNN research (following on from initial ideas in April's meeting)
4. Your recommendations regarding mechanisms to maintain and grow the network

1. The key challenges

The BRIDGE project specifically addressed **VNN Key Challenge 4** '*How do we integrate natural and social science information on values for biodiversity, ecosystem services and natural resources into governance and so improve decision-making and implementation*?'

The capacity of UK natural resources to deliver ecosystem services has declined dramatically over the last 60 years. This decline is, in part, because nature is not fully accounted for in decision-making (Defra, 2011; NEA, 2011). Since the 1980s there have been significant developments in environmental valuation methods, while the 1990 Environment White Paper integrated crosscutting systems of environmental policy appraisal into UK central government decision-making. Yet systematic integration of the value of nature into decision-making remains poor, as the growing supply of valuation evidence has seemingly not matched the demands of decision-makers. Current research suggests that this is in part due to (1) lack of effective dialogue between researchers and decision-makers on evidence needs (Nilsson et al., 2008; Russel and Jordan, 2007) and (2) shortcomings in valuation to fully account for the complexities of social-ecological systems (Kay, 2008; Spash, 2008).

The BRIDGE project aimed to address these challenges through a review of current understanding of these issues and then propose a future research agenda to fill knowledge gaps. To achieve this, BRIDGE ran a series of workshops, which were attended by over 75 natural and social scientists and decision-makers. The output from these workshops included a series of 28 key research questions. We present these questions below under 5 themes- note that the list below does not indicate any order of priority.

A: Values

Although it was widely accepted that our understanding of the ways in which people value biodiversity, ecosystem services and natural resources has made significant developments over the past few decades and that academics and decision-makers now largely accept these values, a number of knowledge gaps were identified. First, much of the evidence on values is based on economic criteria, and it was felt that there was scope to explore other conceptualisations of value such as shared social value and non-monetary health and well-being values. It was also suggest that more research needs to be undertaken to understand how values change in different contexts e.g. how they change over space and time. Key research questions under this theme included:

- **Schools of thought**: How do different epistemological and ontological conceptualizations of value (economic, psychological, sociological, anthropological, ethical, ecological, etc.) relate to each other and how can they be identified, measured, aggregated and used in decision-making?
- **Plural values**: Do individuals possess and express 'plural' values, and if so, how do the multiple dimensions of value relate to each other, and how can they be identified, measured, aggregated and used in decision-making?
- **Values for ecosystem services**: How can people's values for different provisioning, regulating and cultural ecosystem services best be identified, measured, aggregated and used in decision-making?
- **Shared social values**: Can people simultaneously possess and express 'individual' values, 'social' values, and 'shared social' values, and if so, how do they relate to each other and how can they be defined, identified, measured, aggregated and used in decision-making?
- **Health and well-being values**: How can health and well-being values of ecosystems best be identified, measured, aggregated and used in decision-making?
- **Spatial and temporal values**: How do values vary across spatial and temporal scales, and in what ways does this influence how values should be identified, measured, aggregated and used in decision-making?
- **Inter-generational values**: How can the values and needs of future generations best be identified, accounted for, aggregated and used in decision-making?
- **Equity**: How can equity considerations (both procedural and distributive) best be identified and measured within environmental valuation and how might these considerations best be incorporated into decision-making?

B: Accounting for factors that affect people's values

A second theme related to understanding the dynamic nature of people's values. For example, factors such as people's beliefs, knowledge and perceptions of risk and uncertainty were all consider as key research questions.

- **Beliefs**: How do people's ethical, social-cultural and political beliefs and worldviews influence their held and expressed valuations and how might these influences be measured in a way that generates data useful for decision-making? How do these factors interact with demographic and social-economic characteristics?
- **Knowledge**: How does people's existing knowledge and new knowledge acquired in a valuation exercise influence their held and expressed valuations and how might the impacts of this knowledge be measured in a way that generates data useful for decision-making?
- **Risk and uncertainty**: How do people's perceptions of risk, uncertainty and vulnerability (particularly relating to changes in ecosystems and the delivery of services) influence their held and expressed valuations and how might these perceptions be measured in a way that generates data useful for decision-making?

C: Valuation

Although it was recognised by most participants that current valuation methods can produce valid value

evidence, there were suggestions that researchers need to revisit the way in which valuation is undertaken to explore novel ways in which to capture people's values that better relate to the way in which people might wish to express those values. Examples of suggested adaptations included incorporating deliberative / participatory methods and new technology in valuation, and further development of non-monetary methods. The development of these new approaches was seen to be particularly important for valuation of existence, bequest and altruistic values, and for valuation of the more intangible benefits of cultural ecosystem services such as spiritual values and sense of place. Many participants however generally considered these developments to be appropriate for valuation of biodiversity and ecosystem services, since these were considered as complex goods that were at the limits of valuation. Exploration of ways in which aggregation and value transfer / upscaling could be made more robust, and whether these could be applied to deliberative approaches, was also seen as important.

- **How to express values**: What preferences do people have for the way in which values are elicited (e.g. as individuals or in groups; using monetary or non-monetary measures), and why, and how can valuation techniques be adapted to account for these preferences?
- **New technologies**: What opportunities do new technologies (e.g. web-based surveys, social media, mobile phone apps) bring to the development of valuation methods? How do these technologies influence people's values, how do they provide people with new ways to express values, and how are the resultant values perceived by decision-makers?
- **Deliberation, participation and social learning**: What opportunities do deliberation, participation and social learning approaches bring to the development of valuation methods? Do these approaches influence people's values, do they provide people with different ways to express values, does their usefulness vary between different dimensions of value and types of ecosystem services, and how are the resultant values perceived by decision-makers?
- **Aggregation**: Given that values must be aggregated to inform decisions, what are the most appropriate methods to aggregating values, and how can aggregation be made more robust?
- **Value transfer / up-scaling**: When are value transfer / up-scaling techniques appropriate and how can these techniques be made more robust?

D: Matching value evidence generation and uptake by decision-makers

Workshop participants also expressed concerns that the value evidence generated by researchers were not always in a format that was useful to decision-makers. Thus, it was considered that research is required to identify what evidence is needed to improve decision-making, as well as ways in which to facilitate the uptake of this evidence.

- **Evidence needs**: What kind of evidence on the value of ecosystems and associated ecosystem services do decision-makers need to improve their decisions, and how do these evidence needs vary across different decision-makers, and in different decision-making contexts and venues?
- **Types of evidence**: How does the type of evidence on the value of ecosystems and associated ecosystem services and the manner in which it is collected and agreed upon affect the way it is perceived, understood and utilised by different groups of decision-makers and in different decision-making contexts and venues?
- **Making evidence more useful**: How can evidence on the value of ecosystems and associated ecosystem services be presented in such a way that it is more useful to particular types of decision-makers in different decision-making contexts and venues?
- **Legitimacy of evidence**: What factors affect the perceived legitimacy of value evidence by different groups of decision-makers and in different decision-making contexts and venues, and how can different legitimacy concerns be effectively addressed?
- **Common understanding of evidence**: Do scientists and decision-makers share a common language / understanding of valuation evidence, and if not, what needs to be done to attain this?
- **Evidence uptake**: What key factors (practical and political) facilitate or impede the level of evidence uptake by decision-makers?
- **Evidence sharing**: How is value evidence shared between different stakeholders and decision-makers and how might sharing be extended to improve decision-making?

E: Improving decision-making

The final area for future research related to how decision-making processes could be improved and made more transparent across the range of decision-making venues and contexts. Also, it was considered important to explore how policy guidance might be modified to better integrate value evidence in to decision-making.

- **Decision-making processes**: How do decision-makers incorporate ecosystem knowledge and value evidence in their decisions, and what factors account for this pattern of knowledge use?
- **Transparency of decision-making**: How can the use of ecosystem knowledge and value evidence enhance the decision-making process in terms of transparency and accountability?
- **Decision-making venues**: How can the ecosystems approach and the ecosystem services framework best be integrated into different decision-making contexts and venues to improve decision-making?
- **Policy guidance**: Where and how does policy guidance need to be modified to better integrate ecosystem service assessments and value evidence into policy and appraisal? How can we improve guidance on the quality of existing evidence?
- **Empirical evidence**: How, why and in what circumstances has the adoption of value evidence, the ecosystems approach, the ecosystem services framework and/or ecosystem service assessments and value evidence led to 'better' policy decisions?

The BRIDGE project also aimed to clarify central concepts around the supply of and demand for ecosystem service valuation evidence and develop a common vocabulary and theoretical approach to integrating this evidence into decision-making. The outputs from these tasks are reported in the first four papers listed in the 'Publications' section of this report.

2. Conceptual framework

BRIDGE aimed specifically to address VNN **Key Challenge 4** i.e. '*How do we integrate natural and social science information on values for biodiversity, ecosystem services and natural resources into governance and so improve decision-making and implementation*?'. BRIDGE thus aimed to advance knowledge and understanding of all issues within the 'Governance' box (with a key focus on the 'valuation' and 'decisions' boxes and associated flows to and from these boxes). BRIDGE also explored how knowledge of 'Natural Resources', 'Ecosystem Services' and the 'Goods for people 'flow into decision-making. Finally, BRIDGE explores the relationship between 'Individual and shared well-being values'. Below, we highlight BRIDGE's contribution to advancing knowledge on these various elements of the VNN conceptual framework by reference to four scientific papers produced as key BRIDGE outputs

Paper 1: Christie, Church, Fazey, Hockley, Kenter, O'Brien, Russel, Williams (In Prep) Bridging the gap between ecosystem service values and decisions: key knowledge gaps and a future research agenda' Target journal: Frontiers in Ecology and Environment

In this first paper, we provide a general overview of the activities undertaken during the BRIDGE project, before providing a discussion of how new insights attained during BRIDGE might link to and evolve the VNN conceptual framework. Key insights include discussions on a wider definition of value beyond individual utilitarian values to include e.g. social shared values and health and well-being values. We also discuss how the use of deliberation and participation in valuation might allow these broader conceptualisations of value to be captured, as well as better integrating decision-makers into the valuation process and hence helping to ensure that valuation evidence is more relevant to the needs of decision-makers. The paper then concludes by outlining key research questions needed to improve the valuation to meet the evidence needs of decision-makers.

Paper 2: Kenter, O'Brien, Church, Christie, Hockley, Irvine, Fazey, Ravenscroft and Reed (In Prep) Shared and Social Values of Ecosystems. Target journal: Ecological Economics

The topic of this paper directly links to VNN's box on 'Individual and shared well-being values'. In the paper we attempt to clarify the ambiguity that currently exists in terms of defining shared and social values, and propose a typology that differentiates between different types of social value, social values, and shared values. We discuss how these different concepts are linked, and how they are related to cultural services, and wellbeing. We also discuss how different conceptualisations of social shared values (SSV) might best be measured and aggregated, and illustrate how SSVs differ from aggregated individual values. We present arguments as to why SSVs should be taken into account when valuing nature. The paper concludes by outlining various avenues for further research on SSVs.

Paper 3: Kenter, Ravenscroft, O'Brien, Church, Christie, Fisher, Hockley, Holzinger, Irvine, Fazey, and Jones. (In Prep) Can deliberative approaches enhance the legitimacy of ecosystems valuation in the eyes of decision-makers? Target journal: Environmental Policy and Governance

Although there currently exists a wealth of valuation evidence, this knowledge base has had only limited impact on decision-making due to concerns relating to the legitimacy and usability of valuation evidence. In this paper we discuss how conceptions of legitimacy and usability between the producers and users of valuation evidence does not always match up. We consider that incorporating deliberative and participatory methods into valuation allows a more plural, broader conceptualisation of value to be captured, and discuss how this might address some of the key legitimacy concerns of decision-makers. We also discuss whether usability issues around deliberative approaches (e.g. around timescales and spatial scale) can be addressed. We attempt to clarify the ambiguity that exists in terms of defining the role of deliberative and participatory methods in valuation: in some cases deliberative approaches may replace conventional valuation (e.g. deliberative monetary valuation replacing conventional choice experiments), while in other cases they may take place in parallel (e.g. a discourse based valuation). Finally, we conclude by identifying a range of key research questions.

Paper 4: Jordan and Russel (In prep.) Editorial on 'Embedding an Ecosystems Approach? The Utilisation of Ecological Knowledges in Decision Making'

The final paper (which represents the editorial of a 10-paper special issue in Environment and Planning C on 'Embedding an Ecosystems Approach? The Utilisations of Ecological knowledge in Decision Making') seeks to better understand the interactions between the supply of, and demand for, ecosystem knowledge in different decision making arenas or venues. Specifically, the paper aims to:

- better understand the uptake and immediate influence of ecosystem knowledge in public, private and third sector decision making venues;
- investigate the sources and processes of ecosystem knowledge development, and how these facilitate or hinder its utilisation in different venues at different levels of governance;
- explore the scope for bringing ecosystem knowledge into decision-making processes, by examining critical decision making venues where knowledge is (or could in future) be used, such as land use planning, policy appraisal and cost benefit analysis.

3. Future agenda

Through the various exercises undertaken during the BRIDGE workshops, we initially identified over 800 suggestions for potential research questions relating to how ecosystem values might be better integrated into decision-making. This list was later refined to 28 broad questions (see above), which was then presented back to workshop participants to identify their 'Top 10' BRIDGE research questions. This Top 10 priority questions are listed below in order of highest priority (% in parenthesis relate to the proportion of BRIDGE participants who voted for the question to be included in their Top 10 research questions).

- ***Values for ecosystem services***: How can people's values for different provisioning, regulating and cultural ecosystem services best be identified, measured, aggregated and used in decision-making? (71.4%)
- ***How to express values:*** What preferences do people have for the way in which values are elicited (e.g. as individuals or in groups; using monetary or non-monetary measures), and why, and how can valuation techniques be adapted to account for these preferences? (55.6%)
- ***Deliberation, participation and social learning***: What opportunities do deliberation, participation and social learning approaches bring to the development of valuation methods? Do these approaches influence people's values, do they provide people with different ways to express values, does their usefulness vary between different dimensions of value and types of ecosystem services, and how are the resultant values perceived by decision-makers? (55.6%)
- ***Evidence needs:*** What kind of evidence on the value of ecosystems and associated ecosystem services do decision-makers need to improve their decisions, and how do these evidence needs vary across different decision-makers, and in different decision-making contexts and venues? (55.6%)
- ***Decision-making processes:*** How do decision-makers incorporate ecosystem knowledge and value evidence in their decisions, and what factors account for this pattern of knowledge use? (54.3%)
- ***Risk and uncertainty:*** How do people's perceptions of risk, uncertainty and vulnerability (particularly relating to changes in ecosystems and the delivery of services) influence their held and expressed valuations and how might these perceptions be measured in a way that generates data useful for decision-making? (54.3%)
- ***Shared social values***: Can people simultaneously possess and express 'individual' values, 'social' values, and 'shared social' values, and if so, how do they relate to each other and how can they be defined, identified, measured, aggregated and used in decision-making? (51.4%)
- ***Knowledge:*** How does people's existing knowledge and new knowledge acquired in a valuation exercise influence their held and expressed valuations and how might the impacts of this knowledge be measured in a way that generates data useful for decision-making?(51.4%)
- **Empirical evidence**: How, why and in what circumstances has the adoption of value evidence, the ecosystems approach, the ecosystem services framework and/or ecosystem service assessments and value evidence led to 'better' policy decisions? (51.4%)
- ***Making evidence more useful:*** How can evidence on the value of ecosystems and associated ecosystem services be presented in such a way that it is more useful to particular types of decision-makers in different decision-making contexts and venues? (47.2%)

We therefore recommend these questions to VVN to be included in their future research programme.

4.***Maintaining and growing the network***

One of the central aims of BRIDGE was to establish new partnerships across a wide range of natural, social and economic science disciplines. The BRIDGE project centred on a series of four workshops: a 'scoping' workshop, a 'values' workshop', a 'decisions' workshop, and a 'synthesis' workshop. Workshop participants included both academics and practitioners from a wide variety of backgrounds and career stages:

- 59 academics and 16 practitioners from national, devolved and local governments, agencies and business.
- 13 natural scientists, 6 natural/social interdisciplinary scientists, 11 economists, 23 other types of social scientists, 2 engineers, 1 law researcher and 3 arts and humanities researchers
- 19 early career researchers

We promoted trans-disciplinarity in our workshops through a series of carefully planned participatory exercises which emphasis cross-disciplinary dialogue across groups to develop a common understanding of the research problem and to then identify key questions for common future research agenda.

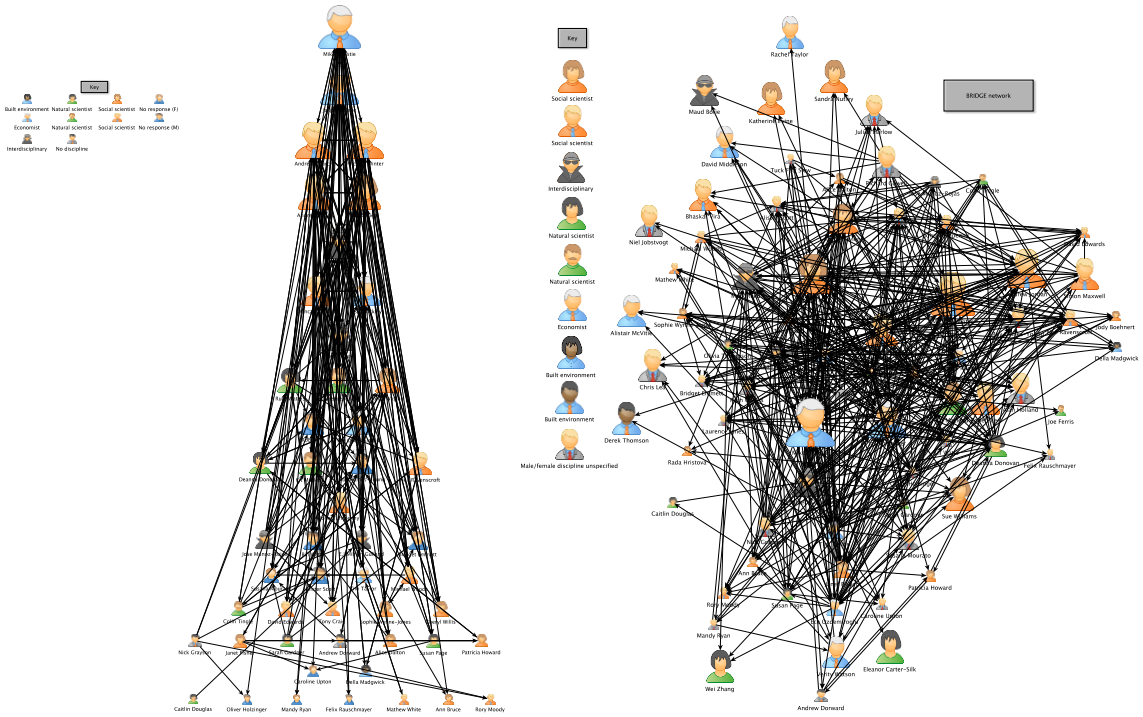
To test the effectiveness of the workshops in terms of establishing new partnerships across disciplines, a social network analysis was conducted before and after the workshops (Figure 1). The results indicate that BRIDGE has been extremely successful in terms of improving network connections. Initially, the network was hierarchical in that most links existed through the core management team at the top of the pyramid (Figure 1A). Following the workshops, many new linkages were established between people from different disciplinary backgrounds and between people from academic and non-academic institutions (Figure 1B). Our analysis also demonstrates that BRIDGE effectively engaged 19 self-defined early career researchers, thus bridging between different generations of valuing nature researchers.

Effectiveness in terms of networking can be attributed to:

- The intensive and participatory nature of the workshops. In the case of the Scoping, Values and Synthesis workshops this was achieved despite the large number (between 34 and 50) of participants through work in small groups, where participants were actively encouraged to reflect, deliberate and find answers to specific questions, asked to draw and present individual and group diagrams, etc., in such a

way that maximized the contribution of each individual. A ‘speed dating’ session was also included in the first workshop. The decisions workshop took a different approach by working intensively with a smaller group of participants (n=19) over two days time. The participatory and inclusive nature of the workshops was also strongly positively mentioned in workshop feedback surveys.

- An application process where participants were asked to commit to 3 out of 4 workshops. 23 participants (33%) did attend 3 or 4 workshops, and an additional 33% participated in two workshops.
- At the final ‘Synthesis’ workshop, participants strongly expressed interest in maintaining the bonds that had been forged. To aid this, a LinkedIn group will be set up, and participants were encouraged to sign up as a member on the VNN website.



A: Before the workshops B: After the workshops

Figure 1: Social Network Analysis of VNN BRIDGE participants before and after the four BRIDGE workshops. *(Please note that larger anonymised images are available from the Bridge team for publishing online if desired).*

Specific project details

Please provide brief details (**100 words** for each question) to address the following:

Progress

Did the research proceed as expected and on time?
If NO give details.

Progress on the BRIDGE project has been good. The four workshops were held as planned and the final report submitted on time. In terms of outputs, we currently have draft versions of 13 papers, which are in the process of being submitted for publication in peer-reviewed journals –see 'Publications' section below. The only activities that we have yet to deliver are the dissemination events, which are planned for early 2013.

Was there any significant change in the research compared with the original proposal?
If YES give reasons for changes.

The research undertaken was essentially the same to that originally proposed.

Were there any circumstances that aided or impeded research progress?
If YES explain how the work was affected and how any problems were overcome or opportunities exploited.

No

Publications

Dissemination of results.
List the following types of output: papers (both published and in press) and reports directly arising from the research; conference proceedings; book chapters; etc.

PAPERS

- Young, Jordan, Searle, Butler, Chapman, Simmons and Watt (2013) Does stakeholder involvement really benefit biodiversity conservation? Biological Conservation 158, 359-370.
- Christie, Church, Fazey, Hockley, Kenter, O'Brien, Russel, Williams (In Prep) Bridging the gap between ecosystem service values and decisions: key knowledge gaps and a future research agenda' Target journal: Frontiers in Ecology and Environment
- Kenter, O'Brien, Church, Christie, Hockley, Irvine, Fazey, Ravenscroft and Reed(In Prep) Shared and Social Values of Ecosystems. Target journal: Ecological Economics
- Kenter, Ravenscroft, O'Brien, Church, Christie, Fisher, Hockley, Holzinger, Irvine, Fazey, and Jones. (In Prep) Can deliberative approaches enhance the legitimacy of ecosystems valuation in the eyes of decision-makers? Target journal: Environmental Policy and Governance

In addition, 10 papers that were presented during the BRIDGE 'Decisions' workshop will be published in a special issue in Environment and Planning C on '*Embedding an Ecosystems Approach? The Utilisation of Ecological Knowledges in Decision Making*'

- Jordan and Russel (In prep.) Editorial on 'Embedding an Ecosystems Approach? The Utilisation of Ecological Knowledges in Decision Making'
- Nutley, Russell, Jordan and Russel (In prep.) Understanding and improving the use of eco-systems knowledge: learning from other sectors.
- Waylen and Young (In Prep). Ecosystem knowledge communication and utilisation: learning lessons from the UK National Ecosystem Assessment
- Turnpenny, Russel and Jordan (In Prep.) Knowledge utilisation in the venue of policy appraisal: exploring the impact of an ecosystem services approach
- Cowell and Lennon (In Prep) Getting environmental knowledge into place: understanding how environmental evaluation processes influence planning decisions
- Hockley (In Prep) Burying and praising Cost-Benefit Analysis: its role in integrating ecosystems knowledge for decision-making.
- Fish and Winter (In Prep) Local decision-making and the ecosystems approach: securing nature's prosperity?
- Haines-Young and Potschin (In Prep) Ecosystem Services and the Ecosystems Approach: What's the Added Value in Decision Making?
- O'Brien, Morris, Edwards and Waters (In Prep) How and why does government utilise ecosystem knowledge? Case studies of policy delivery bodies in the UK

- McKenzie, Posner, Tillmann, Bernhardt, Howard, Rosenthal (In Prep) How is ecosystem service knowledge used in decision-making? A systematic analysis of international case studies

Results and outputs

Have any significant datasets been generated from this research?
If YES give details.
No

Were there any circumstances that aided or impeded research progress?
If YES explain how the work was affected and how any problems were overcome or opportunities exploited.
Yes. We were able to extend the 'decisions' workshop to two days (as opposed to the original one day) with funding from the EU LIAISE project. The outcome of which was much more extensive discussions during the workshops, as well as opportunities to extend the BRIDGE network in terms of both academic and also decision makers/stakeholders involvement.

Results exploitation and knowledge transfer

Who do you think are the main users of this research?
Include any that apply: industry (please specify which sector); policymakers and regulators (e.g. Defra, Environment Agency), NGOs (e.g. RSPB, conservation bodies; other academics).

Given that the BRIDGE project aimed to explore how ecosystem knowledge and values can best be integrated into decision making, the results will be of significance to a wide range of decision-makers including policymakers and regulators, NGOs and businesses. In particular, our findings will help these decision-makers attain a better understanding of how valuation data is gathered, its strengths and limitations, and how it might be best used to aid and improve decision-making.

The results will also be useful for academics in that we identify key research questions relating to the valuation of ecosystem services and how these values might best be integrated into decisions.

Have any potential beneficiaries and/or users of the research outputs (in particular non-academic research users, such as private or public sector organisations) been involved at any stage in the research activity and/or been informed of the research outputs and achievements?
If YES give details.

Yes. Our project team included Liz O'Brien (Forest Research), Rebecca Sayles (United Utilities), Sue Williams (Countryside Council for Wales), Bill Watts (Environment Agency) and Eva Zabey (World Business Council for Sustainable Development). In addition, participants at our workshops included 16 people from: Birmingham City Council, Defra, Welsh Government, Natural England, Environment Agency, Forestry Commission, JNCC, BTO, New Economics Foundation, The Princes' Foundation for the Built Environment, Ouse Valley Economics Group, UK Business Council for Sustainable Development, and BMT Cordah Ltd Aberdeen.

Has the research led to any further collaborations with potential users or other academics?
If YES give details.

Yes. Individuals involved in the BRIDGE project have formed consortia that have attained funding from two of the NEA follow-on project: WP5 on 'Shared, plural and cultural values' and WP8 on 'Institutional Cultures and Behaviours'. Both of these projects have been set up to directly address key research questions identified during BRIDGE.

Also, the NERC BESS 'DURESS' project will address a number of research questions recommended from the BRIDGE project, including: the exploration of spatial and temporal values; incorporating deliberative and participatory approaches in valuation; and utilising new technologies for data collection.

Science in society

Has an opportunity arisen to promote the public understanding of the scientific results from this research?
Give details of work/activity undertaken
No.

Interdisciplinary working

To what extent didtheproject enable new working relationships a) between different academic disciplines and b) with non-academics?
Please give details

a) Participants of BRIDGE's workshops included people from a wide range of academic disciplines including: 23 social scientists, 13 natural scientists, 11 economists, 6 interdisciplinary scientists, 3 arts and humanities, 2 engineers and 1 law.
b) The workshop participants included 59 academics and 16 non-academics.

Interdisciplinarity was promoted during our workshops through the use of participatory methods that encouraged participants to develop shared frameworks drawing together discipline-specific theories, concepts and approaches to address a common problem, through the iterative learning process embedded in the project. Through network activities, new partnerships were formed across a wide range of natural, social and economic science disciplines – see Network Analysis above.

Evidence demonstrating the effectiveness of our approach includes the fact that our paper outputs have authorship from across different disciplines and also include non-academics.

What were the main challenges of working as a team consisting of people from different disciplines/sectors?
Please give details
One of the main challenges of working across disciplines was establishing a common language in which to discuss research issues. In particular, we found that different disciplines often used terminology to mean slightly different things. We addressed this issue in our scoping workshop by getting cross-disciplinary groups to discuss their understanding of key issues and identify areas where disciplinary concepts diverged. Once a common language was identified, it made more detailed discussions easier.

What methods did you use to successfully address these challenges?
Please give details and also include any recommendations for future VNN research.
See above for details.

Anything else?

If there are any other outcomes from your project that have not been captured above, or if you have any further comments, please add them here

Appendix A

The four Key Challenges

1. How can the **complexity of socio-ecological systems** be incorporated into valuations of biodiversity, ecosystem services and natural resource use?
2. How can **stock sustainability** be incorporated within valuations of biodiversity, ecosystem services and natural resource use?
3. How can issues of **scale** be incorporated within valuations of biodiversity, ecosystem services and natural resource use?
4. How do we integrate natural and social science information on values for biodiversity, ecosystem services and natural resources into governance and so improve **decision-making** and implementation?

Appendix B

The conceptual framework