

The Environmental Change Biodiversity Network

Supporting Document



The Environmental Change Biodiversity Network (ECBN): Establishing the Impact of Air Pollution and Climate Change on UK Biodiversity

Prepared for: ECBN Steering Group

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Contents

1. Introduction to the Supporting Annex.....	1
2. Overall Approach.....	1
3. Consultation – Surveys of Potential Users	4
Appendix 1: Consultation Plan	11
Appendix 2: Risk Register.....	15
Appendix 3: Terms of Reference for Steering Group	20
Appendix 4: Further Statistical Analysis to Inform the Choice of Sites and Provide Information on the Representativeness of Candidate Sites	23
Appendix 5: Proposed Statistical Analysis to Inform Further Site Selection for the ECBN.....	26
Appendix 6: Monitoring Schemes Consulted	28
Appendix 7: Background Document Sent To Consultees	29
Appendix 8: Core Measurements Proposed for Site-based Monitoring Network.....	35
Appendix 9: User Consultation Form	37

List of Tables

Table 1: Planned implementation of ECBN sites.....	24
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List of Figures

Figure 1: Explaining biodiversity trends in the context of climate change and air pollution	6
Figure 2: Understanding ecosystem processes on designated sites.....	7
Figure 3: Reporting on biodiversity trends for particular habitats	7
Figure 4: Accessing source data for further analysis with other data from other initiatives or for further research.....	7
Figure 5: Testing the output of models of climate change or nitrogen deposition impacts on biodiversity	8
Figure 6: Helping to interpret changes detected in other monitoring schemes.....	8
Figure 7: Detecting the recovery of soil and plant communities (since the decline of acid deposition).....	8
Figure 8: Providing biodiversity trends of particular species (e.g. birds, butterflies).....	9
Figure 9: Relating changes in soil (incl. carbon content) with changes in above ground biodiversity	9

Figure 10: Are there any other benefits? 9
Figure 11: Clusters of environmental space identified using the “long list”: 23
Map 1: Targeted Monitoring Network Sites in the UK (November 2007) 30

Version Control

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Version 2. Incorporating Steering Group Comments, further work detailed in a contract variation and edited to a shortened version. Presented to Defra PO on 6 June 2008.

Version 3. Final formatted version. Presented to Defra PO on 14th July 2008

1. Introduction to the Supporting Annex

The Project Supporting Document describes the various tasks undertaken to produce the Business Development Plan, in particular it provides details of the consultation with potential users of ECBN outputs and the results of that survey.

The Supporting Document also contains some products of planning such as the Risk Register (at the time of publication), Terms of Reference for the ECBN Steering Group, a specification for further statistical work to inform site selection.

2. Overall Approach

The project was conducted through desk-study and consultation. The consultation was supported by a consultation plan (Appendix 1).

During the tender review process, further work additional to that described in the project specification was identified. Changes were made to the original proposal to take account of these changes; the main changes were:

ADAS agreed to review the costs of the ECBN in light of more up to date information and to prepare costs for coastal habitats.

It was agreed the original “efficiency review” would be replaced by work to identify and describe both the benefits ECBN could receive and those that it could provide if it were part of a co-ordinated programme of long-term biodiversity monitoring in the UK.

Objectives

Following initial discussions at the outset of the project, the objectives of the ADAS project were agreed as:

To produce a Business Development Plan that:

1. Clearly defines the Network, its purpose and deliverables; identifies an effective organisational structure; sets out plans for communication, data management, risk management and quality management;
2. Identifies and describes both the benefits the Network could receive and those that it could provide if it were part of a co-ordinated programme of long-term biodiversity monitoring in the UK;
3. Sets the framework for the long-term development of the Network;
4. Provides a Business Case, providing participants with a clear statement of the policy and scientific benefits of the Network, users and uses, interests and inputs of participants, establishes value for money and sets out funding requirements and commitments;
5. Provides the information required by potential sponsors to support bids for funding;

6. Provides enough detail to allow the preparation of specifications for the implementation of the network;
7. Strengthens and extend the existing partnership, leading to the establishment of a founding partnership and bring about the engagement required to attract sponsors and participation in the creation of a UK wide Site Based Monitoring Network.

A project Inception Plan was produced for the Steering Group to describe the approach to the project as a whole and demonstrate how ADAS intended to ensure the timely delivery of the project objectives and deliverables. Production of the Business Development Plan involved the tasks and processes described below.

Defining the ECBN (to deliver Objective 1 above)

The process of Project Definition was designed to ensure a common understanding of the purpose and nature of the ECBN. It involved discussions to agree a new name, produce objectives, identify key deliverables (at implementation, and as it develops in the longer term) and encapsulate the essence of the ECBN in a vision statement.

A Risk Register (Appendix 2) was produced and has been updated over the course of the project. It identifies the risks associated with implementing the ECBN and records the management strategies to control them.

Through consultation and review of the proposed organisational structure, ADAS further clarified and defined roles and responsibilities and developed other aspects of project management and governance. Terms of reference for the ECBN Steering Group (Appendix 3) were agreed with the Steering Group and proposals produced for how the ECBN will interface with the ECN Steering Group.

Plans for data management built on work already undertaken by CEH. The Business Development Plan provided proposals covering the principles of data management, dealing with issues such as data access, data integration, data supply and transfer and data verification. ECBN Sites with historical data compatible with the proposed measurements were identified.

The Communication Plan produced by CEH (Morecroft et al. 2006) was summarised and a statement of Quality Assurance drawn up.

Benefits of Programme Management (formerly Efficiency Review; Objective 2)

This task was not delivered as envisaged. It was confined to an assessment of the mutual benefits to be gained by ECN and ECBN and evaluation of the efficiency and added value gained by extending the ECN through a more economical subset of ECN measurements which can be replicated on a larger number of sites than ECN.

Developing the ECBN (to deliver Objective 3)

It was established during the project that further analysis is required to ensure a good representation of environmental space and habitats of interest from the pilot sites and further candidate sites identified by national agency co-ordinators in each country.

To progress this requirement BioSS produced a proposal to provide a statistical analysis and interpretation of the representativeness of candidate sites, which will allow the ECBN Steering Group to make an informed decision on the sites to include in the implementation phase of ECBN. Details of the specification of requirements of the analysis and the BioSS proposal produced in response to this are provided in Appendix 4 and Appendix 5.

Synergies were identified with a range of strategic initiatives including the ERFF Environment Observation Framework, the JNCC surveillance strategy and NERC's Living with Environmental Change programme.

The relationship between monitoring schemes and selected co-ordination initiatives (Appendix 6) was examined. Key monitoring initiatives already in progress, or in preparation, that record biodiversity, air pollution and climate change variables and that could work closely with or contribute to ECBN were identified (such as the BTO Breeding Bird Survey, the UK Butterfly Monitoring Scheme) and their potential relationships and opportunities for data or resource sharing were established through consultation (see section 3).

The links and potential interest in ECBN outputs from a wide range of other monitoring schemes, such as Countryside Survey and agri-environment scheme assessments, were also assessed through the consultation process. Similarly, potential links were identified with long-term experiments such as the Park Grass experiment at Rothamsted. The general procedures by which data analysis and interpretation can be linked to these other schemes were established.

Drawing on the paper produced by Garbutt et al. during the preparation of the technical specification (Morecroft et al. 2006), the case for inclusion of coastal sites has been summarised in the Business Development Plan. Indicative costings presented by Garbutt et al. have been recalculated based on new categories of costs developed during this project for presentation of the total cost of ECBN.

Business Case (to deliver Objective 4 & 5)

A business case has been produced to set out the argument for investment in the ECBN and demonstrate that the project will:

- Meet the needs of the collaborating organisations, describing what is required;
- Be achievable and affordable; and
- Provide for sound organisational arrangements including value for money.

It drew together material produced to meet objectives 1 to 3 (above) to demonstrate the vision, objectives, strength of existing partnerships, governance and future potential development of the ECBN. Desk study and targeted consultation with a wide range of key policy and science stakeholders was used to describe the relevance and benefits of ECBN outputs (see section 3). It set out the justification for establishing the ECBN based on the estimated cost of implementation and the anticipated benefits to be gained. It makes the case for the ECBN in terms of value for money for what is to be done and provides reasons for why ECBN needs to be established now. The Business Case includes detailed costs, funding requirements, a proposed funding formula to assist in negotiations between partners, a summary of

the main risks. A provisional timetable and deliverables are set out based upon a proposed implementation plan and funding model.

Estimated costs, published in the CEH report, were reviewed with CEH using more up to date information obtained from country agency representatives. Costs were presented as Full Economic Costs using revised categories of cost agreed with sponsors. Knowledge and experience gained by CCW and NE when setting up pilot sites in England and Wales during 2006/7 has led to improved information on capital costs, agency and site staff time and costs of analytical services and these costs were sought and the original estimates updated. Central co-ordination costs and salary costs have also been reviewed and updated. In addition, costs for coastal habitats have been produced.

Value for money was assessed by comparisons with other similar monitoring networks or projects and by comparing the cost of ECBN to expenditure on UK BAPs. The value for money assessment also took into account the likely value of ECBN to science and its role in the avoidance of fines associated with Natura 2000 sites designated under the Habitat Regulations.

A number of possible approaches to producing a funding formulae were considered; including those based on inputs (e.g. relating to numbers of sites in countries or regions), ability to pay (for example based on the economic value added of regions or countries, or some proxy for this such as population) or shares of benefits. The approach proposed takes into account both the costs that vary depending on the number of sites and fixed costs such as for the CCU. It is a pragmatic approach based partly on funders' current contributions to categories of cost and tries to take account of their ability to pay, but also allows the statutory conservation agencies, as potential funders, to contribute based upon the number of sites in their respective countries. To some extent this model reflects the way CCW and NE have funded the set-up and monitoring of sites in their respective countries.

3. Consultation – Surveys of Potential Users

Approach

A draft document describing the ECBN and summarising its rationale, approach to monitoring and potential uses was produced early in the project to assist with the consultation (Appendix 7). A survey of potential users of, and collaborators with, the ECBN took place about mid-way through the project in December 2007 / January 2008.

The survey of potential users had the following objectives:

- Extending knowledge of and enhancing engagement with the ECBN, and
- Identifying potential users
- Identifying anticipated benefits and uses of the ECBN outputs.

Organisations to be consulted were identified in advance, through discussion with the Steering Group and included potential sponsors, participating organisations, monitoring schemes and co-ordination initiatives and other interested parties.

A questionnaire was developed with the assistance of selected SG representatives (Appendix 8). Twenty one organisations and 35 long-term monitoring schemes and associated co-ordination initiatives (Appendix 6) were consulted by means of a short questionnaire to identify specific planned uses, interests in a range of more general outputs arising from ECBN, potential interest in coastal monitoring and in the inclusion of further measures. Questions also sought to identify any added value that could be gained by co-operation with other monitoring schemes.

Working on the basis that ADAS did not expect all organisations to know at this stage exactly how the proposed ECBN might inform their work, the questionnaire provided options for users to categorise their likely use of a range of potential outputs from the ECBN. These were described as statements such as “Explaining biodiversity trends in the context of climate change and air pollution” (Question 2, Appendix 8).

The questionnaire for organisations included an additional question (Question 3, Appendix 8) requesting details of how they anticipated evidence generated by the ECBN might inform key policy, scientific and /or regulatory areas.

Eight key monitoring schemes (Appendix 6) were considered to have potential for sharing resources such as data collation and analysis. These schemes were asked an additional question relating to the potential for sharing resources (Question 6, Appendix 8).

Response Rate

An overall response rate of 81% was achieved.

Of the 21 organisations contacted the 16 that responded were from:

- Central Govt Departments: Defra (7 Divisions), WAG, SG, MOD, FC,
- Agencies and advisory bodies: EA, CCW, NE, SNH, JNCC, FR
- Research institutes and universities: CEH, Universities (2); and
- NGOs: Woodland Trust, RSPB

In addition, 29 out of 35 monitoring schemes and co-ordination initiatives responded.

Some of the monitoring schemes included were not directly responsible for collecting data but were a repository of information from other schemes (e.g. BARS, BAP reporting, NBN) and accounted for most of the non-responses to individual questions. They did, however, contribute valuable information from their own particular perspective.

In many cases, the organisations producing responses to the consultation were also responsible for funding the monitoring schemes consulted.

Results

The consultation demonstrated willingness to support or participate in the project and helped identify potential users and uses of the data that the ECBN could generate. The consultation process was key to identifying the science to policy benefits of the ECBN.

The high return rate and the fact the responses had generally been carefully considered and provided good levels of supporting information meant the objectives of the consultation were achieved both in terms of extending knowledge of and enhancing engagement with the ECBN and in identifying potential users and anticipated benefits and uses of the ECBN outputs.

There was new and positive engagement from organisations (e.g. RSPB & Universities) and from monitoring schemes.

Covering emails and other submissions were received providing specific comment, placing caveats on the responses provided or raising valid and specific issues, for example about the representativeness of sites, survey methods or targeting of habitats. For organisations unfamiliar with the ECBN, covering emails often coupled tentative support with seeking reassurance that the ECBN was underpinned by scientifically robust and sound monitoring.

The responses to the question asking respondents from both organisations and monitoring schemes and co-ordination initiatives to identify their interest in the anticipated outputs of ECBN are shown in Figures 1 to 10 below. The responses from both monitoring initiatives and organisations are shown side by side to facilitate comparison.

Within a single organisation several individuals may have completed a survey. A survey form was sent to the leader of each monitoring scheme. In addition, an organisational representative was identified to complete a form to provide an overview of the policy and evidence needs of the organisation as a whole. There was a lot of common ground between the organisation and monitoring scheme responses in terms of interest in similar outputs, although this might be expected with 11 of the 16 organisations responsible for the monitoring schemes also completing organisational responses.

Figure 1: Explaining biodiversity trends in the context of climate change and air pollution

Organisations (*Base: 21*)

Monitoring Schemes (*Base: 29*)

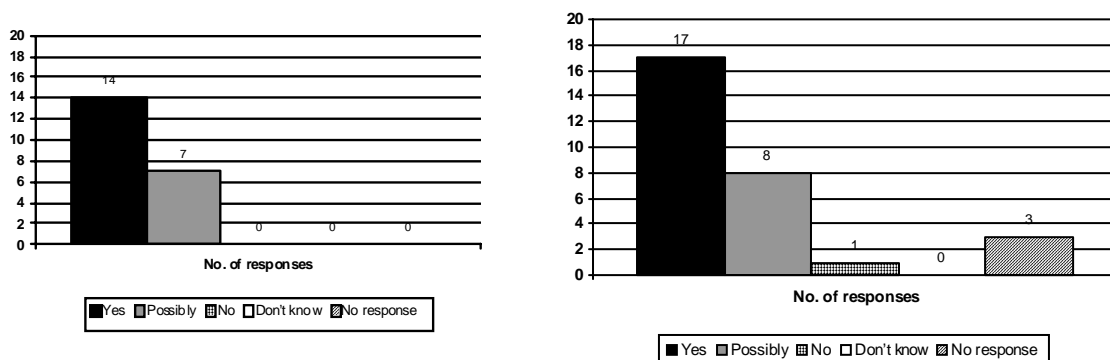
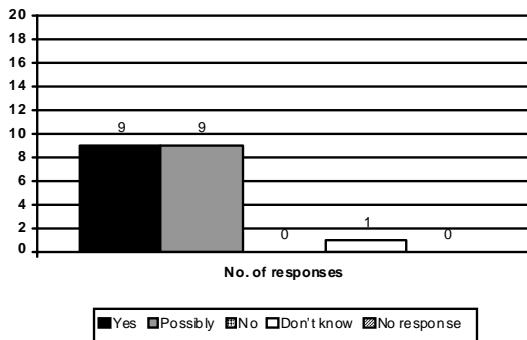


Figure 2: Understanding ecosystem processes on designated sites

Organisations (Base: 21)



Monitoring Schemes (Base: 29)

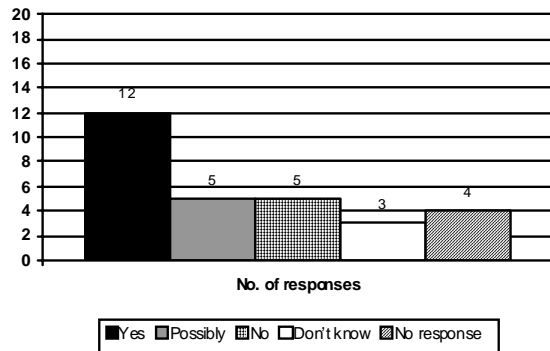
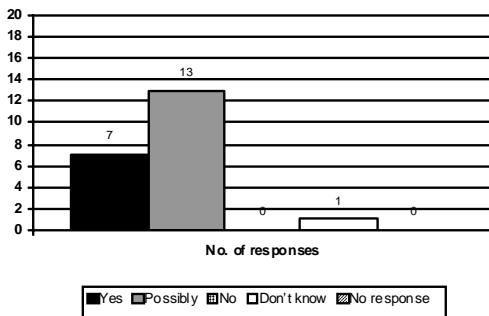


Figure 3: Reporting on biodiversity trends for particular habitats

Organisations (Base: 21)



Monitoring Schemes (Base: 29)

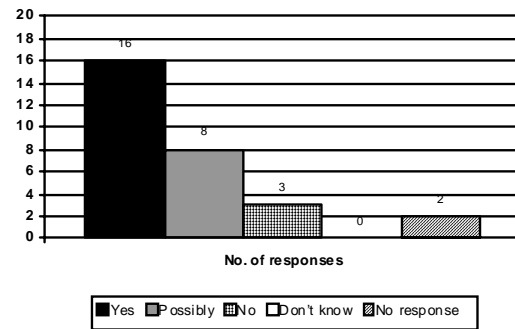
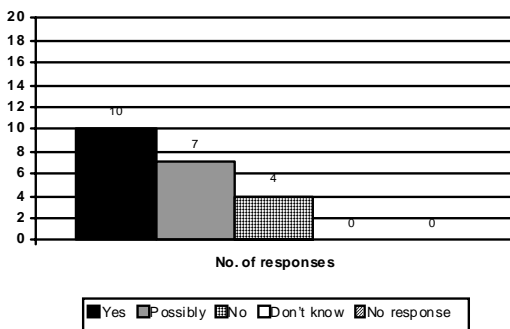


Figure 4: Accessing source data for further analysis with other data from other initiatives or for further research

Organisations (Base: 21)



Monitoring Schemes (Base: 29)

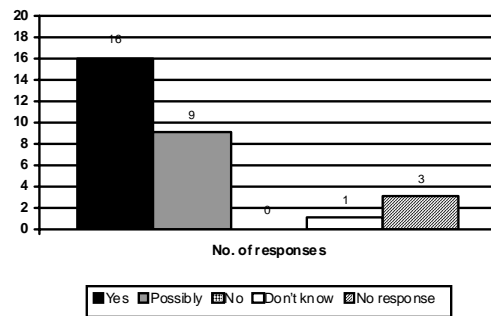
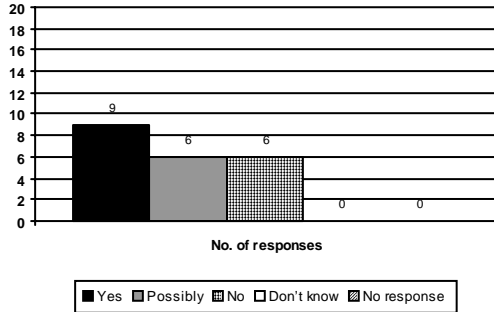


Figure 5: Testing the output of models of climate change or nitrogen deposition impacts on biodiversity

Organisations (Base: 21)



Monitoring Schemes (Base: 29)

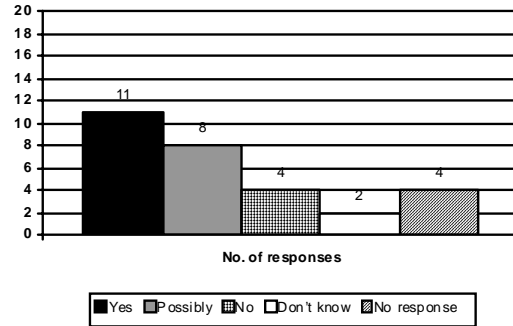
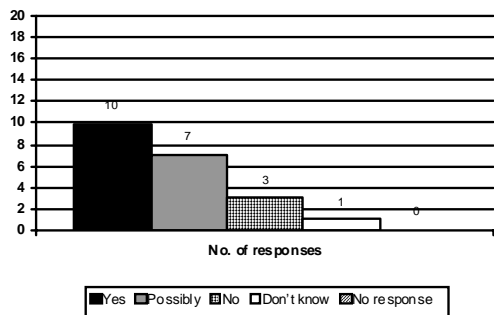


Figure 6: Helping to interpret changes detected in other monitoring schemes

Organisations (Base: 21)



Monitoring Schemes (Base: 29)

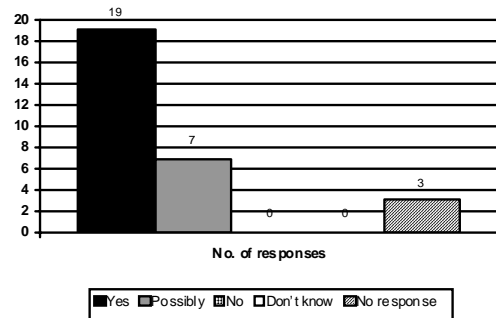
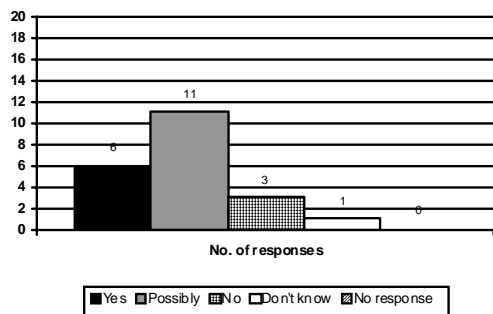


Figure 7: Detecting the recovery of soil and plant communities (since the decline of acid deposition)

Organisations (Base: 21)



Monitoring Schemes (Base: 29)

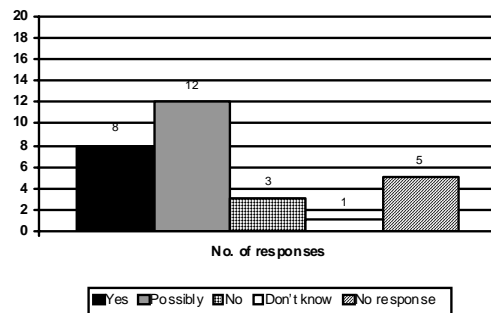
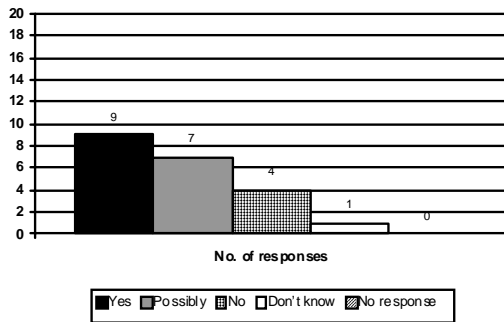


Figure 8: Providing biodiversity trends of particular species (e.g. birds, butterflies)

Organisations (Base: 21)

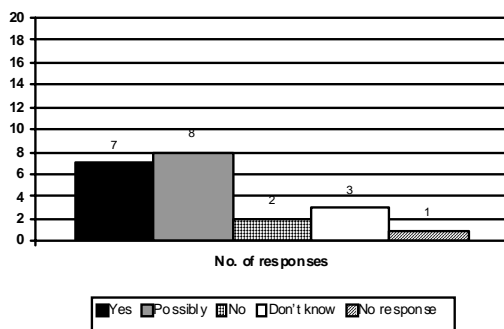


Monitoring Schemes (Base: 29)



Figure 9: Relating changes in soil (incl. carbon content) with changes in above ground biodiversity

Organisations (Base: 21)



Monitoring Schemes (Base: 29)

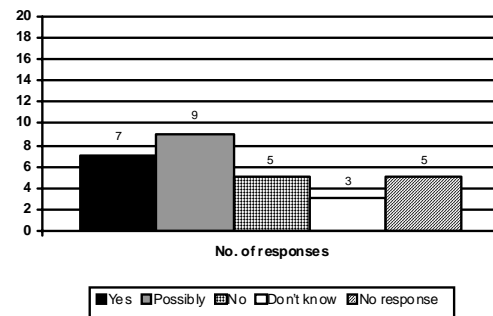
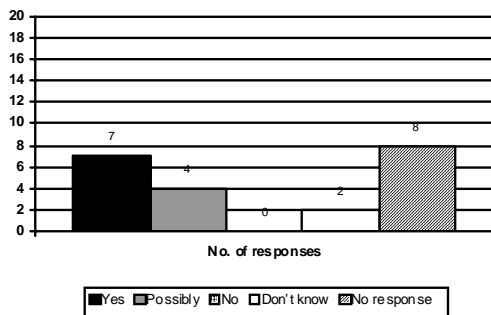
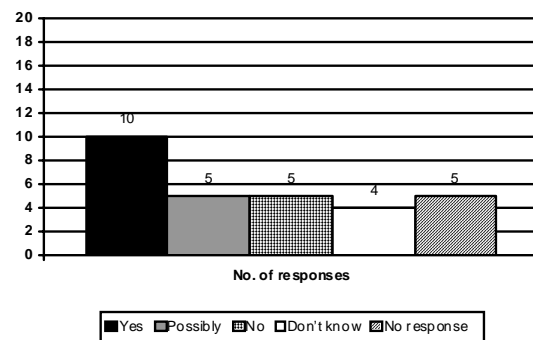


Figure 10: Are there any other benefits?

Organisations (Base: 21)



Monitoring Schemes (Base: 29)



There were good reasoned responses for the possible future inclusion of other measurements and also for the inclusion of coastal habitats.

A wide range of policy, scientific and regulatory drivers were identified by organisations, as well as more general statements of support from cross-cutting initiatives.

The responses are a valuable resource, for example for informing decisions on the type and nature of information or case-studies that will support users in identifying specific ways in which Network data and outputs can be used.

This process of identifying benefits, user by user, allowed ADAS to establish the extent to which the ECBN will generate benefits for particular categories of user. A list of end users and anticipated uses for both confirmed and potential participants was produced.

Appendix 1: Consultation Plan

The consultation plan identifies participants with particular interests or expertise and the stage(s) of the project when they will be consulted. We have sought to make good use of the facilitation that can be provided by the existing Network Steering Group and CEH as well as drawing on our own network of contacts to ensure we prioritise consultation to reach the most appropriate people in the right organisations.

A number of issues were taken into account:

- The project requires sensitivity and security of information
- The need to minimise the burden on consultees
- Broad project brief with a wide range of topics to address
- Relatively short project timescale given the breadth of the project
- Wide range of stakeholders, with different needs/interests
- Similar groups of stakeholders at different levels of engagement
- Wide geographic distribution of stakeholders
- Risk of some stakeholders not being available within the required timeframe
- Risk of stakeholders not wishing to participate

Stage 1: Identify consultees & type of consultation they require

The consultation approach for each organisation is based upon a set of common methods and approaches developed for the project. Representative(s) in each organisation are being identified and their relationship to the Network assessed in relation to the following topics on which we will be consulting:

- Data Use
- Interfaces with the Network (e.g. other networks, monitoring programmes & research initiatives)
- Establishment of the Network
- Funding

A spreadsheet has been set up to record consultees, their contact details and relationship to the Network. It will be maintained throughout the project and will act as a record of the consultation and as a monitoring tool to assess progress. At this stage we anticipate that the following organisations will be consulted (these are not listed in any priority order):

- Steering Group Member Organisations (Defra, Scottish Government, WAG, EA, JNCC, CCW, NE, SNH, SEPA, CEH incl. ECN)
- NIEHS
- DoENI
- NERC & BBSRC

- MoD
- Met Office
- FC
- BTO
- Butterfly Conservation
- Forest Research
- Regional Development Agencies
- Universities
- Research Institutes (incl. Rothamsted research)
- Wildlife Trusts.
- ERFF
- UKCIP
- NETGAP
- Woodland Trust
- Businesses
- Site Managers (National Nature Reserves, others).

We recognise that some individuals (particularly members of the SG) will be consulted in relation to more than one topic (e.g. funding and data use) and some organisations (e.g. Defra) have several representatives covering different topics.

We may contact Steering Group members to identify suitable contacts and clarify individual roles and responsibilities within organisations.

Stage 2: Establish policy and science uses of the Network outputs

The Business Case builds upon the planned policy and scientific uses of the Network. Establishing and documenting the anticipated uses and benefits of the Network, with clear links to specific uses and users is key to the Business Case. The process of identifying benefits, user by user, will allow the Steering Group to establish the extent to which the designed network will generate benefits.

This task will begin by agreeing with SG members, the stakeholders to be consulted to establish uses of Network outputs (stage 1). Desk study and targeted consultation with key policy and science stakeholders will be used to identify and describe the relevance and anticipated benefits of the Network. Most consultees, in particular those already familiar to some extent with the Network, will be contacted by email and asked to complete a short structured self-completion questionnaire to identify and categorise their organisations (or particular divisions) anticipated uses of Network outputs. A document describing the Network and summarising its deliverables (at implementation, and as it develops in the longer term) will be provided to consultees together with brief instructions to assist them in identifying potential uses and benefits. Desk study will be used to collate existing information on anticipated uses for some organisations and some questionnaires may be pre-

populated with this information. For organisations that have not previously been contacted about the Network, a telephone call will be made to brief consultees prior to the questionnaire being sent. The results of the questionnaires will be collated and a list of end users and anticipated uses (such as indicator development) for both confirmed and potential participants will be produced.

Stage 3: Willingness of sites to participate

Site managers have been contacted previously by CEH to assess their willingness to participate and the results of that consultation will be used as a start-point. Prior to contacting sites, we will first consult CEH and representatives of the current and proposed sites (e.g. ECN representative, agency co-ordinators from CCW, NE, SNH NIEHS, FR) to establish current levels of activity and engagement at potential sites and to ensure the approach is right, contact details are correct and the consultation correctly pitched and targeted.

On the basis of this initial consultation with co-ordinators, we will recommend whether, at this stage, some or all sites should be contacted to establish their willingness to participate. If it is decided that it is best to contact a sub-set of sites then the rationale for this will be documented to ensure appropriate prioritisation. We anticipate writing to site managers (e.g. NNR managers, MOD sites, and existing experimental sites) directly, on behalf of the Steering Group members, to update them on progress in establishing the Network and to engage them in participating in the Network. This standard covering letter will be sent together with a short self-completion questionnaire to establish the willingness of sites to participate.

Interfaces

Consultation will be required to support the tasks “Developing the Network”, “Business Case” and “Benefits of Programme Management”. We will use a range of methods including desk study, email correspondence, telephone calls and face to face meetings to identify synergies with strategic initiatives and programmes and interfaces with monitoring initiatives that could join or contribute to the Network, extensive monitoring schemes and long-term experiments. We expect to contact the following organisations/initiatives:

- CEH - ECN
- ERFF – UK environmental monitoring strategy
- NERC - Living with Environmental Change programme
- JNCC - JNCC surveillance strategy/Common Standards Monitoring
- FR – ICP forests/ICP vegetation
- CEH & NIEHS - Countryside Survey
- NE - Countryside Quality Counts
- NE - Agri-environment assessments
- CEH - EU ALTER-Net project
- UKCIP
- NETGAP

- UK Phenology Network
- BTO – Breeding Bird Surveys
- CEH / Butterfly Conservation - Butterfly Monitoring
- Rothamsted – Park Grass Experiment

Stage 4: Funding

Potential sponsors will be contacted by the Defra PO or ADAS towards the end of the project to establish pledged and potential funding for inclusion in the Business Case. This will include pledges of funding in kind. The list of potential sponsors will be agreed in advance with the Defra PO.

CEH will be reviewing costs and these will be presented in the Business Case in a way that sponsors agree is suitable for supporting bids for funding. Prior to obtaining pledges, ADAS will provide potential sponsors with the funding formula, costs of the Network and other relevant information from the Business Case.

To establish how best to engage businesses with funding of the Network we intend to consult a key business to seek their views on funding the Network and to discuss the extent to which the Business Case, in its current form, would be used to obtain funding. A structured interview approach will be used and is likely to involve a face to face meeting. Feedback will be provided to sponsors and recommendations made on attracting business funders based on the information gathered.

Appendix 2: Risk Register

To provide a repository of information about risks, their analysis, countermeasures and status.

Issue 1.3 – for review by Defra PO prior to inclusion in Business Plan – covering risks related to implementation of the ECBN

Role of ECBN Steering Group:

- Notify PM of any external risk to the project.
- Make decisions on PM's recommended counter-measures and provide advice and guidance on avoiding, reducing or dealing with risks.
- Strike balance between level of risk and potential benefits that project may achieve.
- Notify Defra PO (or member responsible for risk) of any risks that affect ability to implement or develop the Network
- Periodically review risks and asses ratings on the register.

ID	Description of risk to Implementation of the Network	Impact	Probability	Proximity	Counter-measures	Owner	Date Identified	Last update	Current status
1.	Funders still need to obtain high level agreement to take the project forward.	High	Medium to low	2009	Plan meetings to facilitate discussion on benefits and ways in which participation can be achieved. This can be to achieve high level commitment from organizations and also country level meetings to extent knowledge and interest. Nominated organisation and individual to drive forward negotiations between partners	PC	May 2008		Open

ID	Description of risk to Implementation of the Network	Impact	Probability	Proximity	Counter-measures	Owner	Date Identified	Last update	Current status
2.	<p>Delays- The network is a deliverable for 2008, as published in the EBS Report. Delays to implementation could be associated with:</p> <ul style="list-style-type: none"> • Reaching agreements for funding • Reaching agreements for contracting and starting the contracted work • Reaching agreements for the organizational structure, data management and coordination • Recruitment and allocation of staff • The need for special training for site work • Equipment purchase, delivery and installation • Provision of data management, analysis tools and staff • Unforeseen complications such as access to sites due to animal disease, flood or fire. 	high	medium	near	<p>Careful attention to detail in the proposed schedule for implementation, flexibility in implementation plan, effective communications and reporting to the SG</p> <p>Nominated organization and individual to drive forward negotiations between partners</p>	PC	Jan 08	May 08	Open
3.	Northern Ireland does not engage in the Business Planning process or join the ECBN during its implementation phase.	High	Medium	2009	<p>Seek to re-engage Northern Ireland through consultation process and to extend knowledge of and interest in the Network within NI EHS and DOE. Build this into the BDP.</p> <p>Business Plan sponsors set date for decision on whether it will be necessary to develop contingency plan to e.g. secure engagement of NI in the longer term, plan for ECBN without NI, or develop ECBN with one ECN site in NI.</p>	HP	Dec. 2007	May 08	Open
4.	<p>Insufficient overarching (UK level) co-ordination of ECBN during implementation phase leading to:</p> <ol style="list-style-type: none"> 1) sub-optimal choice of sites – resulting in gaps in the coverage of desired types of sites or overrepresentation of others and increased time taken to pick up trends in measured variables. 2) missed opportunities - for taking advantage of economies of scale when negotiating discounts on the supply of goods and services. 3) excessive administration and related costs spent seeking ongoing funding and duplication of effort in 	Med to High	Med	Immediate	<p>Business Case commissioned to support bids by sponsors and to build on pilot work by agencies to actively promote a co-ordinated approach for implementation of the Network as a UK wide initiative.</p> <p>CEH involved in the SG and Business Plan team to facilitate input of technical and strategic advice.</p> <p>ECBN SG continuing to operate to ensure continuing to keep engagement of stakeholders and promotion of a UK wide co-ordinated approach.</p> <p>Agencies selecting only those sites where there is</p>	HP	Dec 2007		Open

ID	Description of risk to Implementation of the Network	Impact	Probability	Proximity	Counter-measures	Owner	Date Identified	Last update	Current status
	organising the supply of goods and services. 4) Missed opportunities - for technical and strategic advice on implementation from the central co-ordination facility.				clear understanding of the long-term commitments and nature of the Network. Means for achieving efficiencies in the supply of goods and services to be recommended in Business Plan.				
5.	Costs estimates are <u>inaccurate</u> being either: 1) overestimated – ECBN unnecessarily expensive – seen as poor VFM by potential sponsors - doesn't attract the necessary funding leading to shortfall of sites and lack of investment in ECBN development. 2) underestimated - funding shortfall will arise with insufficient funds available to cover agreed programme of implementation & development. 3) Incorrectly profiled – leading to funding shortfalls or resources being available ahead of the ability to implement sites or some types of monitoring.	High	Low	6 months	Costs have been reviewed to take account of actual costs of site set-up already incurred by Agencies in England and Wales and likely profile of set-up and operation of sites. Review of costs planned within the implementation phase so that improved future forecasts can be made based on actual costs incurred .	HP	Project Initiation of Business Plan	May 08	Open
6.	Cost estimates do not show <u>sufficient detail</u> to enable investment decisions by potential sponsors – causing loss of confidence and lack of support from potential sponsors & stakeholders. Funding and other opportunities missed.	High	Low	2 weeks	Cost estimates have been reworked to a more detailed format agreed with the Defra PO	HP	Project Initiation of Business Plan		Open
7.	Key personnel or organisations no longer available to work on the project – e.g. Mike Morecroft (CEH), National agency co-ordinators, frequent changes of site-based staff, specialist technical input. NERC limits on staff numbers leading to CEH not having sufficient staff resources available to take on new work Loss of experienced remote sensing staff from CEH.	Medium	High.		Early discussion and negotiation with CEH management to secure key staff for the CCU. Use of formal QA and PM methods to ensure adequate documentation of decisions and work undertaken. Use of established well documented protocols. Identify staff to replace key staff. Ensure adequate documentation of project as it progresses and sufficient communication of progress and plans between members of the central co-ordination unit. Agencies to track changes in staff and assess impact on costs and management of Network where this occurs. SG to periodically take an overview of this information to establish trends. SG to keep abreast of national policy of NNRs so that implications of any strategic change in policy can	HP	Dec. 2007	May 2008	Open

ID	Description of risk to Implementation of the Network	Impact	Probability	Proximity	Counter-measures	Owner	Date Identified	Last update	Current status
					be assessed. Consider outsourcing or adapting methods where staff or volunteer shortages an issue (remote sensing, country agency co-ordination – Scotland, butterfly, bird and vegetation surveys, specialist statistical advice).				
8.	Lack of firm commitment of funders makes it difficult to exploit the potential cost reductions through bulk purchasing. In addition, phasing of funding in different devolved administrations and England may not be synchronised. Unless there are definite plans and known quantities to purchase with funding assured, bulk purchasing becomes harder to organise and the discounts available from suppliers reduce.	Medium	Medium		Best solution is to have certain funding, but this may be hard to achieve.	HP	Jan 2008		Open
9.	Differences in opinion about the scientific approach or methods underpinning the Network: 1) delays in reaching agreement to proceed with the ECBN 2) money wasted on inappropriate or inefficient methods. 3) results inconclusive or slower to emerge 4) incompatibility with other initiatives	Medium	Medium	Immediate to several years	ECBN developed following extensive Pilot studies and involvement and buy-in of key stakeholders. Seek advice on next steps to ensure best sites to introduce into the Network. Consultation with wide range of policy and science stakeholders during production of the Business Plan will identify any new or outstanding issues.	HP	Dec 2007	May 2008	Open
10.	Insufficient synergy with other monitoring and related strategic initiatives resulting in duplication of effort and missed opportunities for adding value to ECBN or other schemes.	Low	Low		Previous scientific work and current Business Planning activities seeking to identify and realise opportunities in relation to other monitoring at strategic and monitoring scheme level – e.g. close link to ECN, incl. use of established techniques and protocols, links to experimental research, sharing resources (data collection, analysis), offering co-ordination & analysis facilities to other schemes. Use of established methods and protocols to increase opportunities for co-analysis of data.	HP	Dec 2007		Open
11.	Short-term changes in priorities for policy, funding of projects and monitoring needs	medium	medium	Weeks to months	Effective communication, demonstration of the value of the network results	HP	Jan 2008	May 2008	Open

ID	Description of risk to Implementation of the Network	Impact	Probability	Proximity	Counter-measures	Owner	Date Identified	Last update	Current status
12.	<p>Insufficient research and reporting/ failure to meet end user needs leading to withdrawal of support</p> <p>Lack of use of the data and acknowledgement of uses of the data</p> <p>Failure to identify trends or contribute to indicator development</p>	High	Low	12 months	<p>BDP and Specification of work for the ECBN CCU to include plans for nature and timing of reporting and other outputs.</p> <p>SG members to provide specialist advice and feedback to ensure all potential benefits recognised, delivered and reported.</p> <p>SG to promote data access</p> <p>All sponsoring partners to be involved in specification of reporting and other outputs.</p>	PC	Jan 08	May 2008	Open
13.	Lack of long term commitment; funding from industry for bio-monitoring of air pollution seeks evidence of commitment by partners of at least 5 years.	Medium	Medium	2 months	MoU negotiations to seek commitment in principle for 5 years	HP	May 2008		

Appendix 3: Terms of Reference for Steering Group

Introduction

It is anticipated that climate change will have significant impacts on biodiversity in the UK over the next 20 years and beyond that for the foreseeable future. Such impacts will be compounded by air pollution and other more site specific factors. The effects on any particular species, habitat or site are currently highly uncertain. Effective management and policy responses will require reliable observation, and improved prediction, of impacts across the range of habitats in the UK.

Early detection and discrimination of impacts of climate change on biodiversity are an essential component of an adaptive management strategy. We need to gather evidence to understand how the condition of habitats is being impacted by climate change and atmospheric pollution and to discriminate these impacts from each other and other management factors. The England Biodiversity Strategy – Taking it Forward, published in November 2006, includes a key deliverable by 2008 to have in place monitoring systems for early detection of climate change impacts on biodiversity, including a targeted site-based monitoring network.

Purpose and Objectives

The Steering Group for the Environmental Change Biodiversity Network (ECBN) provides the organisational structure to co-ordinate the scientific development, funding and implementation and set the strategic direction of the network. The Steering Group ensures the ECBN is scientifically robust, designed to meet strategic policy and scientific needs and provides value for money. Steering Group activities include the commissioning of scientific studies, preparatory work, periodic reviews and associated studies and projects. The specific objectives of the Steering Group are:

- To collate and prioritise the high level objectives and specific requirements of sponsors of the ECBN;
- To assess the progress of the ECBN in achieving these objectives and manage risks;
- To co-ordinate preparatory work for ECBN implementation, associated studies and projects;
- Advise on forward planning and co-ordinate development work, periodic evaluation and review of Network effectiveness;
- To ensure that the ECBN is, and remains, viable, sustainable and represents VFM;
- To establish a joint secretariat to support potential sponsors in planning and preparing for the implementation and development of the ECBN;
- To facilitate liaison between potential sponsors about management and funding arrangements;
- To ensure synergy with strategic initiatives and collaboration with other monitoring;
- Ensure policy, science and business user needs and expectations are being met or managed; and

- Ensure internal and external communications are working effectively

Steering Group composition

The Steering Group has been established as a forum for potential sponsors and key stakeholders of the ECBN and is chaired by Defra. Members consult with their respective organisations to ensure that the full range of their interests is represented. Representatives attend Steering Group meetings and events at their own expense. Additional experts may be invited to join the group.

The group also has “corresponding members”, who are kept informed of the business of the group and who engage with the group, but who do not regularly attend Steering Group meetings. Typically, corresponding members will have colleagues who are representatives on the Steering Group.

The Steering Group may recommend establishing a separate technical advisory group, consultation group or workshops to enable the views of a wider range of users or experts to contribute the development of the Network.

The Secretariat duties may be provided by contractors.

The Organisations and Defra Policy Divisions represented on the Steering Group at present are:

Defra AEQ, Defra Climate Change, Defra ELM, Defra NESD, CCW, EA, NE, SNH, CEH, FC, ERFF, JNCC, NIEHS, Scottish Government, SEPA, WAG-EPC.

Current membership of the ECBN Steering Group

Steering Group Representative	Division / specialism	Type of representation
Peter Costigan	Defra NESD	Chair
Helen Pontier	Defra NESD	Defra Project Officer for Business Plan contract
Andrew Stott	Defra NESD	Corresponding
Soheila Amin-Hanjani	Defra AEQ	Representative
John Rea	Defra AEQ	Corresponding
Sara Honour	Defra AEQ	Corresponding
Kathryn Humphrey	Defra Climate Change	Representative
Mark Bayliss	Defra ELM (AE policy)	Corresponding
Sal Burgess	Defra ELM (soils)	Representative
Steve Langton	Defra FFG	Corresponding
Sarah Moon	Defra NESU	Corresponding
Mike Morecroft	CEH	Representative, ECBN co-ordinator
Don Monteith	CEH	Representative, ECN co-ordinator
Maggie Hatton-Ellis	CCW	Representative, Wales agency co-ordinator
David Allen	CCW (policy)	Corresponding

Steering Group Representative	Division / specialism	Type of representation
Simon Bareham	CCW (air pollution)	Corresponding
Rob Kinnersley	EA	Representative
Simon Gillam	FC	Corresponding
Beth Greenaway	ERFF	Representative
Lawrence Way	JNCC	Representative
Chris Cheffings	JNCC	Corresponding
Clare Whitfield	JNCC	Corresponding
Karen Dickenson	JNCC	Corresponding
Clive Bealey	NE	Representative, England agency co-ordinator
David Viner	NE	Corresponding
Keith Porter	NE (policy)	Representative
Mark Wright	NIEHS	Representative
Geeta Wonacott	Scottish Government	Representative
Scot Mathieson	SEPA	Representative
Ian Strachan	SNH	Representative, Scotland agency co-ordinator
Sally Johnson	SNH	Representative - agency co-ordination
Martin Gaywood	SNH	Corresponding
Megan Davis	SNH	Corresponding
James Skates	WAG EPC	Representative
Havard Prosser	WAG EPC	Corresponding

Appendix 4: Further Statistical Analysis to Inform the Choice of Sites and Provide Information on the Representativeness of Candidate Sites

Further statistical analysis is required to ensure a good representation of environmental space and habitats of interest from the candidate sites selected by national agency co-ordinators. This will ensure the Network uses the candidate sites to greatest effect (within the practical constraints of site selection) and thus delivers value for money.

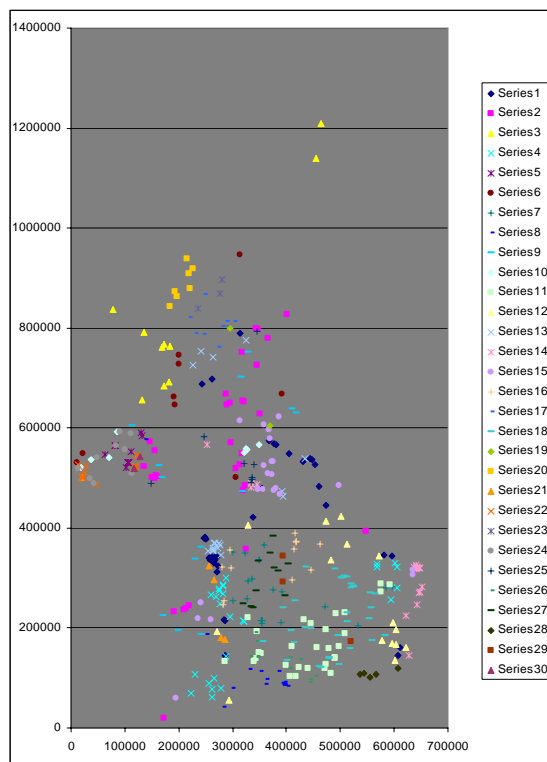
Overall Objectives of Additional Analysis

- Provide a statistical analysis and interpretation of candidate sites that provides information on the representativeness of sites and information to allow the ECBN SG to make an informed decision on the sites to include in the implementation phase of the Network.

Background

A clustering exercise, using nitrogen and sulphur deposition estimates, meteorological baseline data and climate change scenarios was used to group a “long-list” of sites based on 'environmental space'. Country agency representatives ruled sites in or out based on certain practical considerations (e.g. accessibility, staffing available, etc). That took us from a long list of sites, to a short list (106 sites) of mainly NNRs. The majority of clusters were represented in this short list, although there were some gaps. There was also a reasonable representation of the habitats of interest, again, with some gaps.

Figure 11: Clusters of environmental space identified using the “long list”:



BioSS also carried out power analysis to estimate the number of sites that would be needed for the monitoring to be able to identify trends within a realistic timeframe.

Current Situation

Since this work was carried out, both Natural England and Countryside Council for Wales have made use of available funds to put in place some of the necessary infrastructure and have deployed automatic weather stations at some of their potential sites. Whilst, the network has not been formally established, most of the sites that NE and CCW have instrumented were on the original short list of 106 sites, though a few are new to that list.

There is a planned profile for implementation of sites across the UK during the next four years (Table 1). This planned implementation needs to be informed by the proposed statistical analysis.

Table 1: Planned implementation of ECBN sites

	Year 1 2008/09		Year 2 2009/10		Years 3 & 4 2010 -2012	
	<i>Sites Implemented</i>	<i>Sites to be equipped</i>	<i>Sites Implemented</i>	<i>Sites to be equipped</i>	<i>Sites Implemented</i>	<i>Sites to be equipped</i>
Wales	13	-	13	-	13	-
England	10	(5)	15	-	15	-
Scotland	1	(3)	4	(4)	8	-
Northern Ireland	0	(0)	0	(4)	4	-
<i>Subtotal</i>	24	(8)	32	(8)	40	-
ECN sites*	12	n/a	12	n/a	12	n/a

*Wales 1; N. Ireland 1; Scotland 3 ; England 7

Specific objectives of the analysis:

- Assess the representativeness of the sites selected for Year 1 (08/09) of the environmental space and habitats of interest.
- Provide advice on which sites should be added in Year 2 to optimise representativeness and statistical power.
- Develop an analysis procedure that will allow:
 - I. similar repeat assessment so that further groups of candidate sites (including those which were not in the original short list of 106) can be reviewed for their inclusion from time to time as the Network develops; and
 - II. assessment of the implications of candidate sites being withdrawn from the Network
- Assess the effect on representativeness and statistical power for a UK network if the only site for NI is the ECN site. Advise on which sites from GB could be added to compensate for this.

The following information is available or will be made available for further analysis:

1. Original long list (*with information needed for the analysis?*)
2. Original short list (*with information needed for the analysis?*)
3. Candidate sites for Year 1 (*with information needed for the analysis*)
4. Candidate sites for Year 2 (England & Scotland only) (*with information needed for the analysis*)
5. List of terrestrial ECN sites

There may be a need to target the habitats monitored in the Year 2 sites to get the representation required - guidance on the habitats of highest priority will be provided.

There is no candidate list of sites for Northern Ireland – suggest use information from NNRs on the short list of sites.

List of candidate sites selected by national agency co-ordinators, includes a few sites which were not part of the original statistical analysis.

Appendix 5: Proposed Statistical Analysis to Inform Further Site Selection for the ECBN

Produced by BioSS – 26/02/08

1. Assessment of sets of sites

The relative suitability of different sets of monitoring sites can be assessed without recourse to power calculations by considering the information they contain about the coefficients in linear regressions containing either a single covariate or a set of covariates.

To do this, we will standardise all covariates for mean and variance according to the distribution of covariate values from UK 10km squares. For any given set of sites, we will calculate the efficiency with which covariate-specific trends can be calculated from the precision with which regression coefficients can be estimated. Note that these will be expected rather than realised precisions as the covariates are either interpolated from data or extrapolated using climate models with subsequent downscaling. If the standardised covariates for a particular set of sites form the design matrix X , the relative precision depends on the elements of the inverse of the matrix $M = \text{transpose}(X) * X$.

From this starting point, we will:

- 1a) produce code to calculate the determinant (the statistic for what is called D-optimality) and the trace (for A-optimality) of M for a given set of sites in a multiple regression;
- 1b) calculate the distributions of these statistics using random subsets of candidate sites with the constraint that ECN sites are always included;
- 1c) assess the same statistics for the year 1 sites against these distributions;
- 1d) extend the code to allow dropping of each non-ECN site in turn and use this code to look for redundancy in the year 1 sites;
- 1e) extend the code to allow sequential additions of new sites to find beneficial sets of additional sites, and compare the properties of these beneficial sets with those proposed in any implementation plans;
- 1f) iterate between dropping and adding sites to reach a set of sites, constrained by sample size in each country, that has at least local optimality properties.

2. Statistical power calculations

For some of the above sets of sites, estimate the power to detect covariate-dependent trends (i.e. interactions between covariates and trends) either:

- a) with just a single covariate present in the model;
- b) with multiple covariates (and hence competing covariate-dependencies in trends).

Previous power calculations used indices across species within three taxonomic groups: birds, butterflies and plants. It is intended to use the same summary indices in this work.

To calculate the powers, we will have to specify the number of years over which monitoring will take place and size of the covariate-dependency in trend. The latter is perhaps best thought of as the difference in trend between the 25th and 75th percentiles of the distribution over UK 10km squares of the covariate. Variances for the power calculations will be taken from the training data used as part of the previous report.

3. Guidance of selection of habitats for monitoring

The spread of habitats to include in the monitoring scheme is an important decision but one for which it is difficult to envisage reaching a decision by objective analysis. Some thoughts as to how this decision might be approached will be included in the report.

What we will need is the original long list of sites with covariate information, with additional columns indicating:

- Cluster grading for suitability (effectively the short-list, but indicating some exclusions) whether instrumented in yr 1
- Whether intended instrument in yr 2
- Whether currently monitored as part of ECN

Andy Sier (CEH) has already done some of this.

Appendix 6: Monitoring Schemes Consulted

Scheme	Organisation
ALTER-Net	CEH
BAP reporting framework / Biodiversity Action Reporting System (BARS)	JNCC
Biosoil	Forest Research
BRC voluntary recording schemes	CEH
Breeding Bird Survey (BBS) (incorporating Common Birds Census)*	BTO
BTO Integrated Population Monitoring (IPM)	BTO
Butterfly Monitoring Scheme (BMS)*	CEH
Climate Data Support Initiative	Met Office
CLIMOOR/VULCAN climate change experiment	CEH
Common Plants Survey	Plantlife
Common Standards Monitoring	JNCC
Countryside Quality Counts (CQC)	NE
Countryside Survey (CS)	CEH
International Co-operative Programme on Assessment and Monitoring of Air Pollution Effects on Forests Level II (ICP Forests)*	FR
International Co-operative Programme Vegetation (ICP Vegetation)	CEH
Inventory of long-term studies on terrestrial habitats (metadata)	JNCC
Long-term agri-environment monitoring England	NE
Long-term agri-environment monitoring Northern Ireland	AFBI
Long-term agri-environment monitoring Scotland	SG
Long-term ecological change in British woodlands	NE
Meteorology Network (Forest Research)*	FR
National Biodiversity Network (NBN)	NBN
National Expert Group on Transboundary Air Pollution (NEG-TAP)	CEH
National Inventory of Woodland & Trees (NIWT)	FC
Northern Ireland Countryside Survey (NICS)	NIEHS
Recovery Roof Project – Peaknaze Moor, Peak District	CEH
Rothamsted long-term experiments	Rothamsted Research
Terrestrial Umbrella	CEH
Tir Gofal monitoring Wales	WAG
UK Acid Deposition Monitoring Network (ADMN)*	AEA Technology
UK Climate Impacts Programme (UKCIP)	Oxford University
UK Environmental Change Network (ECN)*	CEH
UK National Ammonia Monitoring Network (NAMN)*	CEH
UK Phenology Network	CEH
UK Surface Observations Networks*	Met Office

**Key schemes*

The Scottish Native Woodland Survey was also subsequently identified as an additional scheme with potential links.

Appendix 7: Background Document Sent To Consultees

Title

Targeted Monitoring Network (*title under review*)

Background & Rationale

It is anticipated that climate change will have significant impacts on biodiversity in the UK over the next 20 years and beyond that for the foreseeable future. Such impacts will be compounded by air pollution and other more site specific factors. The effects on any particular species, habitat or site are currently highly uncertain. Effective management and policy responses will require reliable observation, and improved prediction, of impacts across the range of habitats in the UK.

Early detection and discrimination of impacts of climate change on biodiversity are an essential component of an adaptive management strategy. The Climate Change Bill will commit the Government to report regularly to Parliament on the impacts of climate change on the UK and the associated risks and vulnerabilities, and to set out a programme to address this. This programme must contribute to sustainable development. The natural environment is key in this regard.

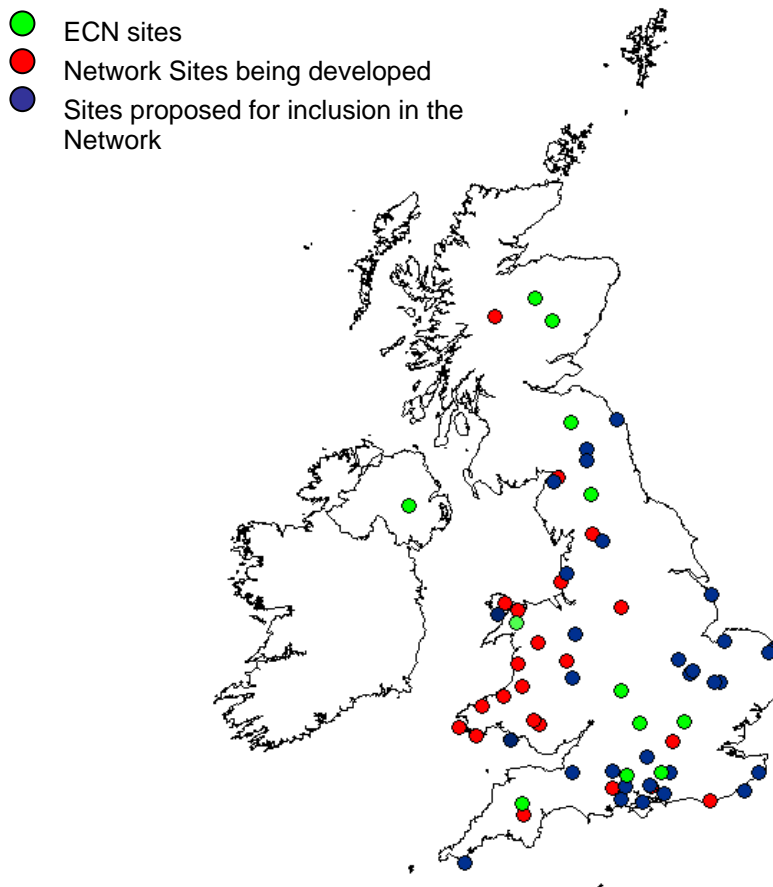
We need to gather evidence to understand how the condition of habitats is being impacted by climate change and atmospheric pollution and to discriminate these impacts from each other and other management factors. The England Biodiversity Strategy – Taking it Forward, published in November 2006, includes a key deliverable by 2008 to have in place monitoring systems for early detection of climate change impacts on biodiversity, including a targeted site-based monitoring network.

Natural England, Scottish Natural Heritage, the Countryside Council for Wales and the Joint Nature Conservation Committee consider that targeted site-based monitoring is essential to help address implications of climate change on Common Standards Monitoring methodology and to provide appropriate recommendations for management of designated sites.

CEH and partners (Morecroft et al., 2006) developed a technical specification, and made recommendations, for a UK Network to provide targeted monitoring of air pollution and climate change on biodiversity. In this proposal, the 12 existing Environment Change Network (ECN) terrestrial sites form an essential core to the Network. These would be expanded to include a further 40 or more sites on semi-natural ecosystems, mainly on National Nature Reserves, to form a purpose designed monitoring network. The costs of implementation of the Network were estimated and project management, data management, communication and other arrangements proposed.

A number of pilot projects have already been implemented within the Agencies and some monitoring is taking place on about 20 sites (Map 1). Further sites have been identified for implementation in England and Wales. In Scotland further sites are currently being assessed for their suitability for implementation.

Map 1: Targeted Monitoring Network Sites in the UK (November 2007)



These proposals and pilot work are currently being further developed and underpinned by a Business Plan to provide a firm foundation for the development, implementation and funding of the Network. The Business Plan will clearly define the Network, its purpose and deliverables; identify an effective organisational structure; and set out plans for communication, data management, risk management and quality management. The Business Plan will set the framework for the long-term development of the Network and include a Business Case, providing participants with a clear statement of the policy and scientific benefits of the Network, users and uses, interests and inputs of participants, establish value for money and set out funding requirements and commitments.

Objectives of the Network

- Establish a co-ordinated UK wide network of long-term monitoring sites that increases our ability to detect, discriminate, understand and predict the effects of climate change and air pollution on biodiversity;
- Enhance the evidence available to underpin and develop policy objectives and targets for selected UK Biodiversity Action Plan (BAP) priority species and habitats, SSSIs and regulation of emissions.

- Inform conservation management in relation to BAP targets, Commons Standards Monitoring and assessment of favourable condition/favourable conservation status;
- Provide a robust scientific evidence base capable of informing the development and implementation of climate change adaptation strategies, including adaptive management, and a wider range of policy and science users building on and complementing existing environmental monitoring;
- Promote, implement and develop the Network through a partnership approach, building upon a sound business case and plan for implementation and an appreciation of the objectives and long-term nature of commitments;
- Provide a central data management and coordination facility for the Network and linked initiatives and facilitate the delivery of Network objectives through effective governance and project management;
- Utilise recognised standardised monitoring methodology and protocols (Sykes and Lane, 1996), but providing method development and revision as required;
- Enable access to data and provide communication about the Network, measurements and protocols and uses of the Network data and outputs.
- Engage with others by encouraging participation in sharing data, data analysis and interpretation, site measurements, workshops and review groups.

Scope

A network of potential sites has been provisionally selected to enable comparisons to be made for a particular habitat across contrasting geographic regions, climatic zones and prevailing levels of atmospheric pollution. The proposed network design and the co-measurement of variables at each site will maximise the chances of explaining biodiversity trends in the context of climate change and air pollution.

Site selection is based on the need to provide coverage of different habitats across the UK, and the need to balance statistical and practical considerations. Sites are concentrated on the following terrestrial habitats:

- Acid grasslands
- Dwarf shrub heath
- Broad-leaved mixed & yew woodland
- Calcareous grassland
- Bogs
- Montane habitats
- Coastal

The proposed analyses will also enable general trends to be detected across contrasting sites. Testing the output of models of climate or nitrogen deposition impacts on biodiversity will also be an important function of the new network.

The larger the site network, the greater the chances of detecting small differences and over shorter periods of time. To strike a balance between the chance of detecting change and costs incurred in running an unnecessarily large network,

statistical power analysis (using existing data from a number of initiatives) suggests that the best option is to establish a network of around 100 sites. Statistically this represents the most efficient sample size, being capable of detecting biologically meaningful trends in a range of variables for vegetation, birds and butterflies between contrasting groups of sites in about 12 years.

For the initial implementation of the Network a suite of about 50 sites, largely comprising National Nature Reserves as well as the existing ECN sites (www.ecn.ac.uk) has been proposed. This is the minimum number of sites recommended to enable detection of change over different time periods (12, 24, and 48 years). A list of 100 sites has been drawn up for possible incorporation into the network in the longer term. Other sites may be included if they meet the criteria for the network and enhance the level of engagement. Such sites would need to be funded with a long-term commitment.

A 'site' is defined by the boundaries of a land holding or management unit, such as a nature reserve. This approach ensures compatibility with the existing ECN and with condition assessment of designated sites. Practicality of carrying out monitoring work at the potential sites was taken into account in site selection (in terms of remoteness, existing monitoring work and availability of suitable staff).

A key set of variables identified during consultation (Morecroft et al., 2006) will be measured at each site according to standardised protocols. These offer greatest practicality, cost effectiveness and potential returns for end user needs and include measurements of climate, atmospheric deposition, soil chemistry, vegetation, butterflies and birds.

Assumptions

Sites will be brought into the network in stages, over a number of years.

Links with existing monitoring networks will be maximised, by, for example, sharing sites and data to give added value and better value for money. The objectives and long term vision for the Network should be aligned and retain synergy with strategic plans for long term environmental monitoring in the UK.

The Network will seek to make maximum use of existing data collation systems. For example, the Butterfly Monitoring Scheme could co-ordinate data collection as part of their wider sampling' using existing data handling and collation systems and then provide the relevant outputs to a centrally co-ordinated unit for analysis and reporting. Monitoring could be carried out by a combination of specialist teams visiting sites on a periodic basis, by local wardens and by trained volunteers.

Data handling procedures used for the existing ECN provide a cost effective framework and will be used as far as possible for the new network, including the existing centralised data management facility. Maximising freedom of information will be a priority. A communications plan has been developed to promote the work and results of the Network and it will be updated to encourage use of the data, which will be made readily available to the wider scientific community and others.

Interpretation of data for individual sites should be possible, and for NNRs, the network should inform and complement Common Standards Monitoring by identifying

where climate change or air pollution may be preventing the achievement of “favourable condition”.

The Network will help to interpret changes detected in other monitoring schemes, such as the BTO Breeding Bird Survey, the UK Butterfly Monitoring Scheme, Countryside Survey, Countryside Quality Counts, National Biodiversity Network and agri-environment scheme assessments. In addition, the monitoring would feed into the EU ALTER-Net project and the International Long-term Ecological Research (ILTER) Network, GMES and GEOSS. Integration of results from the network with those from long-term field experiments will substantially strengthen the evidence base provided by the Network.

The monitoring methodology will mainly follow ECN protocols, but adaptation of existing techniques or development of new techniques will be considered where these offer substantial advantages or efficiency gains.

Deliverables & Summary of Approach

Annex 1 presents the measurements to be taken at all sites from the outset and summarises the rationale, identifies the key set of environmental variables that would be measured at each site, the method and frequency of monitoring.

During the implementation phase, real-time data, rapid assessments, annual reports, summary datasets, presentations of results and promotional material will be produced to increase awareness of the Network. Pilot work will be summarised in a final contract report during this implementation phase (including costed recommendations for continuation of the network and a case study).

Longer Term Strategy

The long term objective is to extend the Network to approximately 100 sites (including the 12 existing ECN sites) through a phased implementation, depending on the growth of the extended partnership. Further analysis of the data collected from the initial network will be reviewed to assess whether the sample provides adequate statistical power to detect the trends and relationships.

Coastal Habitats (saltmarshes and sand dunes) have been identified and it is intended to tailor and develop monitoring methodology specifically for these habitats. They respond sensitively to sea level rise and their careful long term monitoring can allow them to be used as an ‘early warning system’ that enables the pro-active management of the coastal zone as a whole (Garbutt et al, 2006). They also have a wide geographical spread, providing opportunities to compare similar or equivalent habitats and communities throughout a range of climatic and pollution regimes.

A number of other measurements have been identified, that could be introduced at a later stage depending on technical and methodological developments. These are foliar nitrogen concentration (a bio-indicator of N deposition), ozone, atmospheric sulphate & sulphur dioxide and total S deposition, soil mineralisation & nitrification (to understand total N supply available to plants), carabid beetles, other invertebrates, vertebrate herbivores or their impact and bats. Many of these are either too costly or the techniques are not yet fully developed. They will be kept under review for future inclusion in the Network.

Constraints

During the implementation phase, the adoption of a relatively small number of sites means that the capability to detect change and relate biodiversity trends to environmental variables will be reduced, although the power analysis suggests there is sufficient probability of detecting change with 50 sites. This analysis was based on historical data, and there may be differences as new data is collected, which could indicate accelerating rate and severity of change. The power analysis will need to be repeated to test this.

Some habitats or environmental zones might be under-represented in the initial sample, but this sample will serve to help define the development and expansion of the network.

Whilst the network is intended to be statistically representative of the UK, representation of countries or regions within the UK is a possibility depending on the requirements and level of engagement of others.

References

Morecroft, M.D., Sier, A.R.J., Elston, D.A., Nevison, I.M., Hall, J.R., Rennie, S.C., Parr, T.W. & Crick, H.Q.P. (2006) Targeted Monitoring of Air Pollution and Climate Change Impacts on Biodiversity. Report to the Department for Environment, Food and Rural Affairs, Countryside Council for Wales and English Nature (CR0322).

Garbutt et. al. (2006) Targeted Monitoring Of Atmospheric Pollution And Climate Change Impacts On Biodiversity: The case for the inclusion of coastal habitats. Supporting Document. Report to Defra, CCW & EN(CR0322).

Sykes, J M & Lane, A M J (Eds) (1996). The United Kingdom Environmental Change Network. Protocols for Standard Measurements at Terrestrial Sites. London: The Stationery Office.

Appendix 8: Core Measurements Proposed for Site-based Monitoring Network

Category	Measurements	Rationale/ Reason for recording	Methodology	Frequency of monitoring			
				Daily/ continuous	weekly	monthly	other
Climate	Total solar radiation; air temperature; relative humidity; wind speed and direction; rainfall; soil water content and temperature.	To detect relationship between biological variables and climate; and to compare contrasting trends at different sites.	Measurements using automatic weather stations (AWS). Data should then be made available over internet. Existing sites should be used where possible (to exploit historic datasets and keep costs down).	X			
Air pollution	Wet deposition of pH nitrate, ammonium & sulphate	Contributes to total N deposition estimate (see below), Acidification drives changes in vegetation, soil processes etc. Sulphate provides background measurements to support regulation of large industrial plant. Ratio of nitrate to ammonium important for some plant species.	Collected using standard precipitation collector and analysed for NO ₂ ⁻ , NH ₄ ⁺ , SO ₄ ⁻ and pH.			X	
	Ammonia concentration	Contributes to total N deposition estimate (see below), Dry deposition of ammonia directly impacts some species.	Ammonia concentrations measured using Alpha samplers or diffusion tubes i.e. passive sampling techniques.			X	
	Total nitrogen deposition	Major cause of change in semi-natural vegetation and threat to conservation of species adapted to low nutrient conditions	Derived from wet deposition of NO ₂ ⁻ and NH ₄ ⁺ and estimated dry deposition of NH ₃ , based on concentration measurements and site characteristics, together with interpolated national data for NO ₂ and nitric acid (NO ₂ concentration unlikely to be affected by local factors; nitric acid concentration difficult to measure and needs mains power)			X	
Soil	pH, soil organic carbon, total N, base saturation, exchangeable NH ₄ ⁺ and NO ₃ ⁻ , PLFA, bulk density, microarthropods, profile description	Necessary in order to understand mechanisms of change and attributing effects to causes, esp. for changes in ecological communities caused by climate change and air pollution.	Follows ECN sampling methodology. 6 blocks with permanent grid set of 16 cells. Rather than 6 permanent blocks in a 1ha block, they should be spread across the site in representative vegetation types and adjacent to vegetation monitoring plots.				5- yearly and 20- yearly
Butterflies	Counts of butterfly species on transect	Mobile organisms with short generation times so first indicators of change. Butterfly Monitoring Scheme (BMS) methodology detects long-term trends, year-to-year variations and effects of extreme events.	Many existing BMS transects are on NNRs and these reserves will be preferentially included within the new network. BMS method is recommended - transect count carried out between April and September in suitable weather conditions.		X		
Birds	Breeding Bird Surveys	Valuable for monitoring ecosystem health; birds make good biomonitors.	Breeding Bird Survey (BBS) line transect census method				2 visits each breeding season

Category	Measurements	Rationale/ Reason for recording	Methodology	Frequency of monitoring			
				Daily/ continuous	weekly	monthly	other
Vegetation composition	Species composition, cover, vegetation height, and where possible, bryophytes and lichens	Species composition is an important aspect of biodiversity and may also determine habitat condition and value to other species. Using Ellenberg numbers allows assessment of composition of plant communities in terms of the prevailing environment such as species nutrient requirements - an effective bioindicator of N deposition.	ECN Coarse grain method (roughly 50 permanently marked 2x2m quadrats on a grid system). Presence/ absence of each species recorded. Species cover and vegetation height (ideally bryophytes, lichens etc to be included). Ellenberg numbers to assess composition in terms of prevailing environment.				3-yearly
	Tree height and diameter (at woodland sites only)	Indicator of tree health, timber production and carbon sequestration	Where vegetation plots fall in woodland, a 10x10m plot to record tree species, height and DBH of up to 10 trees per plot.				
	Epiphytic lichens (at woodland sites/ sites with trees only)		Inclusion is recommended but technique currently being refined (to be confirmed).				
	Ground-based phenological measurements (subset of sites)	Provides mechanistic link between meteorological variables and biological processes, which have the potential to drive change in communities. Minimal time commitment if staff are site based/ visit regularly.	Noting down first occurrences of certain species.		X		
Satellite remote sensing of phenology	Vegetation phenology	Provides mechanistic link between meteorological variables and biological processes, which have the potential to drive change in communities. Can detect many aspects of vegetation phenology, and enables these aspects to be monitored objectively across the whole network.	Once CEH National Vegetation Phenology Observatory (NVPO) is operational, a GIS based system could be set up to extract cloud-cleared NDVI values. Summary statistics extracted. Can include processing of archive of data.	X			
Site/ land management	Location, timing and intensity of site management activities	Management can obscure climate change and air pollution impacts so need to check that management of sites in network is stable/ consistent.	Using new ECN protocol, record management operations for defined management units and store in database format.				Annual, more freq for intensive agric

Appendix 9: User Consultation Form

Establishing the Benefits of the Targeted Monitoring Network



Background

ADAS Ltd have been contracted by Defra, CCW, NE, SNH, and the EA to produce a Business Case for the Targeted Monitoring Network, a co-ordinated UK wide network of long-term monitoring sites capable of detecting changes in biodiversity attributable to the effects of climate change and air pollution. A background document describing the proposed Network accompanies this questionnaire.

One of the main purposes of the Business Case is to help sponsoring and collaborating organisations make decisions about their support for the Network and it is therefore important to ascertain its value for policy, scientific research and conservation management. The anticipated uses of the Network and its synergies with other monitoring schemes will form a key argument in the rationale for the Network.

ADAS are consulting potential users of and collaborators with the network from a range of stakeholder organisations to identify its possible uses and benefits. We would very much value your views and ask that you complete this questionnaire. The information you provide will be used to develop the Business Case, which will describe uses for individual organisations or groups of organisations with similar interests (e.g. universities) and ways in which added value can be gained by co-operation with other monitoring schemes.

Please consult with colleagues within your organisation/department so that we can build up a complete picture within each organisation.

If you need any guidance to help you complete this questionnaire please call Jacqueline Parker on 01962 856635.

Please save this file to your hard disk, complete the questionnaire on your computer, and then return it by email to jacqueline.parker@adas.co.uk.

To fill in, type in the grey open response area - reached by using tab. For tick boxes, click on tick box with mouse, it will check, click again to uncheck or tab across and press space bar to check or uncheck.

Organisation:	Defra NESD
Monitoring Schemes	n/a
Contact:	Helen Pontier
Tel:	

Q1. Please list the specialisms of the people in your organisation consulted to complete this questionnaire.

Department / Specialism	Department / Specialism

Please read the accompanying document describing the Network before completing the following questions.

Q2. A key set of variables will be measured at each Network site according to standardised protocols and include measurements of climate, atmospheric deposition, soil chemistry, vegetation, butterflies and birds.

We do not expect all organisations to know at this stage exactly how the network will inform their work and have provided options for you to categorise the likely nature of benefits using statements describing the anticipated benefits.

Q2. For each of the following anticipated benefits of the network please tick the appropriate box to show whether or not you believe it is likely to support the work of your organisation / Defra Dept:

Benefit / Output type from Network	Is the benefit likely to support policy or scientific research or conservation management in your organisation?				Comment
	Yes	Possibly	No	Don't know	
a. Explaining biodiversity trends in the context of climate change and air pollution	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
b. Understanding ecosystem processes on designated sites	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
c. Reporting on biodiversity trends for particular habitat(s) – listed below	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

If you answered **yes** or **possibly** to this benefit, tick the habitats that are of interest:

Dwarf shrub heath <input type="checkbox"/>	Acid grasslands <input type="checkbox"/>	Coastal habitats <input type="checkbox"/>	Broad-leaved, mixed & yew woodland <input type="checkbox"/>
Bogs <input type="checkbox"/>	Neutral grassland <input type="checkbox"/>	Montane habitats <input type="checkbox"/>	Calcareous grassland <input type="checkbox"/>

	Yes	Possibly	No	Don't know	Comment
d. Accessing source data for further analysis with other data from other initiatives or for further research	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
e. Testing the output of models of climate change or nitrogen deposition impacts on biodiversity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
f. Helping to interpret changes detected in other monitoring schemes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
g. Detecting the recovery of soil and plant communities (since the decline of acid deposition)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
h. Providing biodiversity trends of particular species (e.g. birds, butterflies).	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
i. Relating changes in soil (incl. carbon content) with changes in above ground biodiversity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
j. Are there any other benefits?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<i>Please describe:</i>

Q3. a. Please describe the key policy, scientific and /or regulatory areas where you anticipate the Network outputs will be used by your organisation.

b. For each area please describe how you anticipate the network outputs will be used. If not known, please go to Q4.

Note: The response boxes will expand as you add text. There is no limit to the amount of text that can be used in the responses.

a. Policy / Science Programme or Regulatory areas (e.g. England Biodiversity Strategy, Living with Environmental Change)	b. Anticipated use of the network outputs (if relates to a particular indicator or policy measure or objective within a programme please specify)
1.	
2.	
3.	
4.	

Q4. A number of other measurements have been identified, that could be introduced at a later stage depending on technical and methodological developments. These are foliar nitrogen concentration (a bio-indicator of N deposition), ozone, atmospheric sulphate and sulphur dioxide and total S deposition, soil mineralisation and nitrification (to understand total N supply available to plants), carabid beetles, additional invertebrates, vertebrate herbivores or their impact and bats. Many of these are considered to be either too costly to introduce or the techniques are not yet fully developed.

4. If the inclusion of any of these measurements would be of particular benefit to your organisation please explain / describe the benefit and use below – refer to particular monitoring schemes where applicable.

5. It is intended to develop methodology specific to Coastal Habitats (saltmarshes and sand dunes). If you have a particular use / interest in coastal habitats and the type of data the Network will provide, please explain / describe below.

6. There could be mutual benefits if certain procedures or resources are shared with other existing monitoring schemes. Please consider the issues below for the scheme for which you are responsible.

Note: If you answer 'yes' or 'possibly' please expand under the Comments. The response boxes will expand as you add text. There is no limit to the amount of text that can be used in the responses.

Are there procedures or facilities that could be shared with the Network?		Yes	Possibly	No	Don't know	Comments
a.	Fieldwork	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
b.	Data collation or storage	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
c.	Data analysis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
d.	Interpretation or reporting of data	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
e.	Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
f.	Are there any additional existing protocols that would be beneficial for the Network to adopt?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Thank you for your help. Please save the completed questionnaire to a file on your computer then return by email to jacqueline.parker@adas.co.uk.