Policy Impact and Future Options for Countryside Survey

(Future Options for CS)

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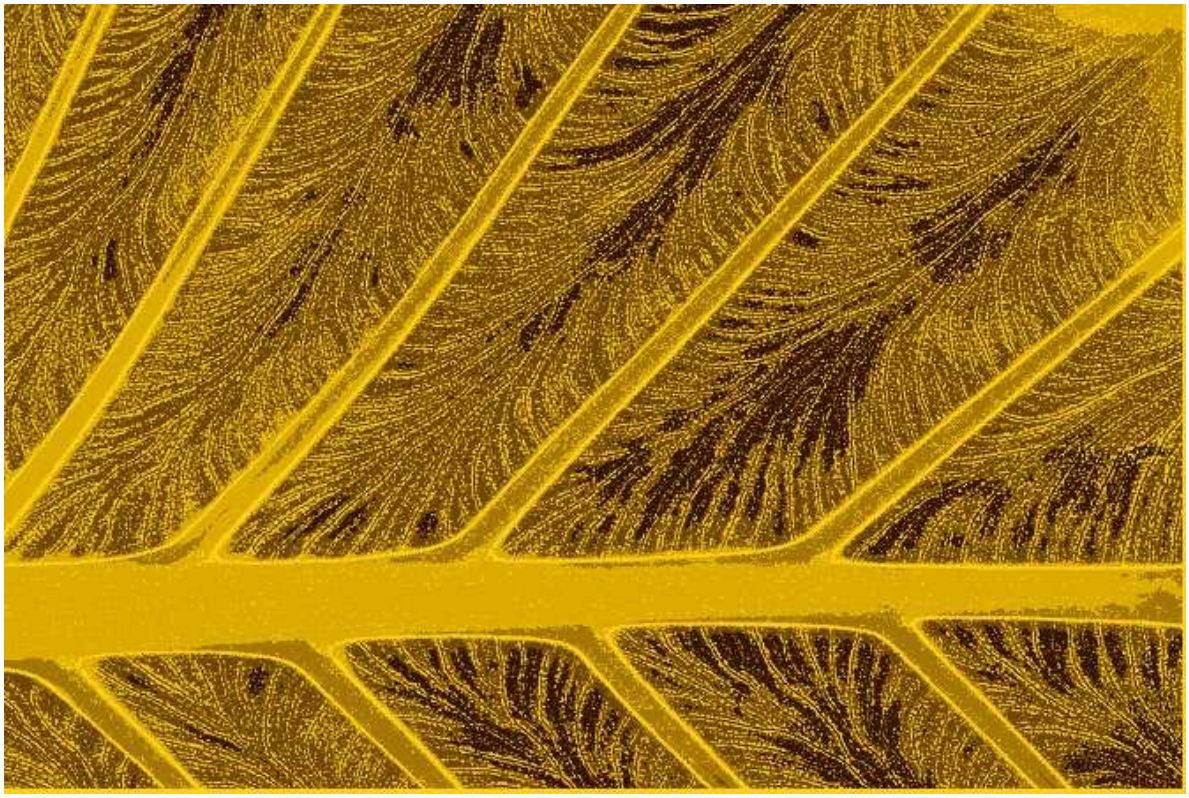

Final Report

The University of Nottingham

CEM
Centre for Environmental Management

Project Team:

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Defra/JNCC Project Officer:

Lawrence Way, Programme Leader Surveillance and Monitoring, Joint Nature Conservation Committee +44 (0)1733 866860, email: Lawrence.Way@jncc.gov.uk

Project Principal Investigator: Prof Roy Haines-Young, CEM, University of Nottingham

Project Manager and Contact: PD Dr Marion Potschin, CEM, School of Geography, University of Nottingham, Nottingham, NG7 2RD, email: Marion.Potschin@Nottinghamac.uk

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Contents

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Executive Summary

Background

1. Successive Countryside Surveys undertaken by the Centre for Ecology and Hydrology (CEH) have provided the UK science and policy communities with a detailed picture of the wider countryside and the way it has changed over time. The Survey was initiated in 1978 and repeated in 1984, 1990, 2000 and 2007. This study reviews the policy contribution of the most recent survey, Countryside Survey 2007 (CS2007). It focuses on the cost-effectiveness of its design, and assesses the policy case for continuing with the programme.

2. The value of Countryside Survey lies in the range of data that it assembled:

   - In the 2007 Survey a large, integrated field survey programme visited nearly 600 sample locations across England, Wales and Scotland. It recorded information on the landscape features, habitats and vegetation that were found there. Freshwater habitats and soils were also sampled. The sample locations were largely the same as those used in earlier surveys, and so the changes in important characteristics of our countryside could be recorded.

   - Alongside the Field Survey programme, the work also involved creating a national (UK) Land Cover Map (known as Land Cover Map 2007, LCM2007). It was based on the classification of remotely-sensed satellite data using advanced image processing techniques. The resulting map, which can be used in conjunction with the Ordnance Survey's MasterMap, provides a detailed picture of the stock of habitats and their spatial distribution.

3. The cost of CS2007 was approximately £10.3M. Given the scale of funding required it was supported by a partnership between NERC, Defra, Countryside Council for Wales, Environment and Heritage Service Northern Ireland, Natural England, Forestry Commission, Scottish Government, Scottish Natural Heritage, Welsh Government, and the Joint Nature Conservation Committee. This study has been commissioned by Defra on the behalf of these funding organisations to enable them to review what has been achieved and to look at future options.

The current contribution to policy

4. The contribution of CS2007 to current policy was investigated through a desk review and a questionnaire survey of key informants from the partner organisations. It found that:

   a) The 2007 Field Survey has made a significant contribution to policy related to: sustainable agriculture (specifically in the design and evaluation of agri-environment schemes); soils (especially in relation to long term trends in soil carbon); air pollution (especially the nitrification of soils, the impact of nitrogen deposition on vegetation and the development of dynamic models of nitrogen

impacts); and climate change (calculation of GHG inventories using land cover change data from the Field Survey). Although the policy contribution of the Field Survey to biodiversity reporting and species monitoring was less strong than expected, this did not mean that the collection of such data was unnecessary because this information was needed to support these other policy uses. **All of the areas where the strongest applications were identified used essentially the same biodiversity data from the mapping of area and linear features and the monitoring of vegetation plots and soils**.

b) The strongest contributions of LCM2007 were in those areas where an area-wide perspective was needed, such as landscape and sustainable agriculture, where it provided useful contextual information. However, the use of these data is limited because they have only recently been made available.

5. Across all the policy topic areas investigated it was found that CS data mainly helps people at the early stages of the policy cycle. It provides information that helps them frame issues and understand the context in which policy measures must operate. Given the range of information that it provides it also helps them to look at the way issues are linked across sectors. No major areas of data deficiency or redundancy were found in CS2007.

6. The uptake of CS data by policy advisors is dependent on the flexibility of the underlying database and the ways the results can be tailored to meet user needs. The evidence we have collected suggests that the reporting outputs were generally regarded as appropriate and useful, but that further work may be needed to ensure better access to the raw data in customisable ways. The complexity and size of the CS dataset means that in general, expert support is needed for the detailed analysis of policy questions and that this may slow the rate of uptake. It was noted that exploitation of the evidence base depends fundamentally on the investments made by the core organisations in the further analysis of these data, and that this might have limited their current contribution to policy.

Value for money

7. The analysis of the costs of the different components of CS2007 suggests that just over half of expenditure can be attributed directly to scientific and policy-relevant outputs. This we suggest represents good overall value for money in relative terms. In relation to absolute costs it remains the case that the resources needed for CS are substantial and are likely to remain so given the sample size and the types of data that need to be collected. There are few opportunities for significant immediate cost savings, although there are opportunities to spread any future spend more evenly by adopting a rolling survey programme.

8. The investment in the informatics work package also represents good value for money, because it speeded up the processing of the data and the publication of the

results from the Field Survey. It allowed better use of the data from all the previous Countryside Surveys. The rapid reporting from the Field Survey was also assisted by the innovation of digital recording devices (tablet computers), which also appeared to be an effective investment.

Future policy needs

9. A number of common themes have emerged from the analysis of prospective needs that have implications for the design of any future Survey. Key amongst them is the general requirement for information of higher spatial and thematic resolution, potentially targeted on species and sites of high conservation importance. Such a requirement clearly poses a challenge for Countryside Survey which, by its very nature is sample based and general in character.

10. The requirement for data of high thematic and spatial resolution is particularly evident in the area of agri-environmental monitoring, where more stringent auditing and surveillance regimes are likely to emerge in the future. For habitats and species of conservation importance (e.g. Annex I Habitats and Species, Protected sites etc.) detailed information on their distribution and condition will be needed for reporting purposes in relation to 2020 targets, and for assessing the impact of policy interventions designed to sustain ecological function and the integrity of our natural capital. The success of measures to create coherent and resilient ecological networks and monitor and sustain ecosystem services will also be a concern for future monitoring.

11. **Nevertheless the need for strategic information on the state and trends in the wider countryside has not been eliminated, and CS still has a role to play here**. In fact, the requirement for more robust monitoring systems suggests that better and more effective integration of specific and general forms of data collection are required. Our findings suggest that it may be fundamental for embedding an ecosystems approach in decision making, which needs a cross-sectoral perspective, and increasingly more detailed understandings of the links between different policy domains in terms of underlying biophysical processes. **The strength of CS is that it supports both general monitoring needs and policy relevant research, and that this research base can potentially provide a richer understanding of the environment than surveillance directed to a more narrow set of policy outcomes.** The long-term advantages of such a data resource should not be overlooked by the policy community.

Future Options and Recommendations

12. **On the basis of our analysis of the current policy contribution of CS2007 and an assessment of future needs a further field survey is justified.** In terms of the policy requirements identified above it would be advantageous if the next CS Field Survey results were available in 2017 or 2018. Although other monitoring systems have been

developed in recent years, no other initiative appears to provide such an integrated and wide ranging body of information as CS. We found no strong evidence to suggest that the kinds of output generated by the Field Survey component of CS could be provided by some combination or extension of other sources.

13. **While the case for a future Countryside Survey can be made, it is clear that the context of any future Survey is very different to that for CS2007.** Three key characteristics are apparent. First, the need for data at higher thematic and spatial resolution than CS currently provides. Second, the need to more effectively use CS data alongside other evidence sources by standardisation of protocols or calibration of sampling methods. Third, the need to manage survey costs at a time when resources are limited. All of these differences may require significant modifications to the way any field survey is undertaken.

14. The need for data at **higher thematic and spatial resolution** is particularly challenging for Countryside Survey, because the sampling strategy currently used means that rarer or more specialised habitats and species (such as those listed in Annex I of the Habitats Directive) are poorly represented. Similarly the requirement to map and report habitat information at level three in the EUNIS Classification, would be a challenge for any land cover product based on earth observation data that used the approach adopted for LCM2007. Meeting such requirements is likely to involve, for example, adapting current survey methods and designs to enable stratified random and targeted sampling to be used in tandem, and the design of novel analytical and survey tools to ensure that reporting outputs can support the emerging needs of policy customers.

    - *We recommend that CEH work with policy customers to identify a range of new metrics that a future CS might provide to support the assessment of the state of biodiversity and soils in the wider countryside and their capacity to generate ecosystem services. These metrics must support the task of reporting against the 2020 biodiversity targets at country level, and the reporting needs that arise in the context of the Habitats Directive.*

15. The need to **use CS data more effectively alongside other evidence sources** by standardisation of protocols and/or calibration of sampling methods arises because it is apparent that no single monitoring source can provide policy customers with all the ecological and land management information they will require. The integration of data between monitoring systems will demand greater partnership working. In relation to CS, several priority areas have been identified, including the relationship to the *National Forest Inventory* (NFI), the monitoring of freshwater habitats in the context of the Water Framework Directive by the Environment Agency, Natural Resources Wales and SEPA, and the monitoring of agri-environment schemes at country level.

- *In the context of the relationship between the CS and the NFI it would appear that there may be opportunities for some integration of the two data streams and we recommend that this should actively be explored in the short term. However, we note that integration may be technically challenging and difficult to achieve because of their different institutional monitoring objectives.*
- *Our investigation suggests that the data on the chemical and biological condition of headwater streams appears to be an under-used resource, and recommend that opportunities for collaboration and exploitation of these data actively be explored between CEH and the Environment Agency in England, Natural Resources Wales and SEPA. Fine-scale information about the pressures on the water environment was identified as an important future evidence need. By building on the experience of the CS2007 Integrated Assessment, the design of both the Field Survey and the land cover mapping components of CS could be developed to support such work.*
- *The better use of CS Field Survey data as a baseline against which the effectiveness of agri-environmental measures could be judged was identified as a potentially important contribution that CS might make to policy in the future. For this to be achieved, there would need to be a better 'read-across' between the data collected in CS and the more targeted recording that is needed at scheme level. We recommend that CEH actively work with the policy community to determine how this could be done in a cost-effective way. It would be valuable to share more widely the experience that is being gained from the new agri-environmental monitoring work that draws on CS methods being initiated in Wales.*

16. The need to **manage survey costs at a time when resources are limited** will clearly place new constraints on the design of any future Countryside Survey. In addition to design of new metrics to meet emerging policy needs and close partnership working, the case for a future Survey is also likely to depend on ensuring that the most cost-efficient technical options are adopted. We have reviewed a number of key issues and make the following recommendations.

17. **That the Field Survey and Land Cover Mapping components of CS are treated as separate work and funding programmes**. This would facilitate more effective technical partnerships and may assist with justification of the funding cases that both need to make. These separate technical partnerships would:

    - ***Enable the core funders to focus on the development of a national land information system in which LCM type outputs could be embedded****. While modern Earth Observation (EO) techniques can and should, where possible, be used to collect information on ecological condition, in the short term only marginal cost-savings for the Field Survey might be achieved if change-only update mapping of Broad Habitats in the Field Survey squares could be automated using such techniques. The major benefits of this kind of innovation would be through the*

added value it would bring to a general land cover mapping product, especially if that product could be used to integrate a range of different sources of land related information.

- ***Emphasise that efforts to add value to Field Survey component of CS are most likely to be achieved in the medium term by close integration and partnership working with the other monitoring and surveillance systems that are supported or being planned by the policy community****. Clearly field survey data could be incorporated in any future national land information system. While methods to achieve this are a relevant topic for research, we suggest such a focus tends to obscure the case for the Field Survey component of CS. The latter is more likely to be judged in terms of this relationship of its relationships with other evidence sources used by policy customers. There seems little prospect of EO methods replacing or eliminating the need for ground-based measurements in the sample squares in the medium term, and so it would be wise primarily to direct effort towards ensuring that the outputs of the Field Survey are relevant to policy needs over the next 8-10 years.*

18. **That the case for adopting a rolling survey approach for the field component of CS is examined in detail.** Our preliminary investigation suggests there appear to be no major technical or statistical arguments against a rolling survey. In terms of managing the future Field Survey programme and securing its funding, this may represent the best technical option because it requires a more even spend profile and ensures that the technical capacity required to mount any survey is maintained and developed on a continuous basis. A rolling programme may also provide more flexibility in terms of future planning. However, the transition to a rolling programme will involve a number of technical challenges and choices, and the costs of making such a change or of the different options, could not be investigated fully here. **We recommend that a detailed technical study is undertaken in 2013 to determine the costs of a rolling programme and the detailed design options.**

    - *It is important that the technical case for a rolling programme be investigated with some urgency in 2013. Our preliminary study suggests that a rolling programme would take about 5 years to complete a full reporting cycle. Thus if the general case for a rolling programme is accepted, then survey work would need to begin in 2014. Given a reporting window of 2017/8 the transitional programme therefore may need to involve 'kick-starting' the process with a more rapid initial sweep that could then be scaled back beyond the first full report.*

    - *If the case for a rolling programme is rejected following the detailed study in 2013, then this would leave time for planning of a more standard periodic*

survey to be undertaken in 2014/5, so that would could start in 2015/6 for a final report in 2017/8.

19. **Whatever Survey approach is adopted, however, our investigation suggests that the capability for country-level reporting should be retained together with the option of reporting at the UK level**. The latter will therefore require that the planning that is undertaken in 2013 must include consideration of the situation in Northern Ireland, and the options for maintaining consistency of methods and timing between the two Countryside Surveys.

Part 1 Introduction

1.1 Background and Context for the Study

The successive Countryside Surveys which have been undertaken by the NERC Centre for Ecology and Hydrology (CEH) and its predecessor ITE, are an established part of our national environmental data infrastructure. Historically the results have been an important platform for a range of scientific work. They have also supported a range of policy needs that depend on understanding change in the wider countryside. The Surveys began in 1978, and were repeated in 1984, 1990, 1998 and 2007. With each phase the scope and character of the work evolved, to exploit new scientific opportunities and policy needs. However, the core objectives of the Surveys have remained the same and so the results collectively provide an unparalleled time series describing the way the British countryside has changed. It is also highly regarded internationally as a model for rigorous ecological survey.

The policy contribution of the most recent Countryside Survey, which was undertaken in 2007, was the focus for this Study. CS2007, as it is called, consisted of two major components: a detailed Field Survey (FS) across Great Britain, and the creation of a land cover map for the UK based on the analysis of remotely sensed satellite imagery (Land Cover Map 2007, LCM2007).

The Field Survey was targeted on a set of 1kmx1km grid squares in England, Scotland and Wales[1], and involved mapping and recording information for Broad Habitats[2] and some of the important Priority Habitats associated with them. It also collected information on landscape features such as hedges, walls and veteran trees, and the vegetation and soil characteristics within the squares at a set of fixed points. Other information collected included the condition of streams and ponds. The locations of the sample squares were randomly sampled from an environmentally based stratification describing a regularly distributed population of squares so that they provided a statistically robust picture of the state of the countryside across the whole of GB. Most importantly since many of the sample squares had been visited during previous surveys, a record could be established of the changes that had occurred. The detailed, sample-based information collected through the Field Survey can therefore be used to make national and regional estimates of the stock and change of key elements of our natural capital.

In contrast to the Field Survey component of Countryside Survey, LCM2007 provides a more general but complete census of the land cover at national scales. The work combined the analysis of remotely sensed satellite imagery with digital cartographic and ancillary data. Although such mapping was also undertaken in 1990 and 2000, advances in

[1] Historically Northern Ireland has its own survey programme which is not formally part of Countryside Survey although in the past it has been timed to enable UK-wide reporting.

[2] As defined by the UK Biodiversity Action Plan (UKBAP), 1992-2010.

the technology over time have meant that these earlier data are not directly comparable to LCM2007, so that change information is not available. Nevertheless, LCM2007 can be used in conjunction with the latest Ordnance Survey (OS) Master Map information to give a picture of the UK land cover mosaic at high spatial resolution.

Countryside Survey is therefore a complex monitoring programme. With each Survey the challenge has been to maintain the integrity of the core data series and extend and adapt the information obtained so as to ensure the scientific and policy relevance of the work. In this Study we take stock of what has been achieved by the 2007 Survey. In the same way that the earlier review of CS2000[3] made a contribution to the subsequent design of CS2007, this study seeks to help map out the road that lies ahead. If CS is to continue, it is essential that we explore the extent to which its design can anticipate and respond to changing policy demands. This may involve adapting the types of data that are collected and the way these are analysed and reported so that they can be used more effectively. It may also involve closer integration with other monitoring evidence sources to strengthen the evidence base or even recognition that evidence is more effectively collected by means other than CS. This study seeks to make a critical but balanced investigation of these issues.

1.2 Aims and Objectives

This study was commissioned by Defra, who were supported by a Steering Group made up of other organisations with a policy and science interest in CS, and which provided the funding for CS2007 (Table 1.1).

Table 1.1: Funders and Co-Funders for Countryside Survey 2007

Defra	Wildlife and Countryside Environmental Stewardship Soils Natural Environment Strategic Unit Water Quality Air Quality Sustainable Food and Farming
Other funders and co-funders	Countryside Council for Wales EHS, NI Natural England Forestry Commission NERC, Centre for Ecology and Hydrology Scottish Government Scottish Natural Heritage Welsh Government JNCC

Although the Survey was undertaken by CEH and part-funded by NERC, these other organisations provided support because of the potential value of the Survey for their work. This Review began in December 2011, three years after the publication of the Field Survey results[4] and six months after the release of LCM2007. The work consisted of two parallel, but integrated streams of activity that considered the utility of CS2007 outputs against current policy needs and the extent to which a similar survey might continue to be needed in the future. In line with the brief for this Study the specific aims and objectives were as follows.

Aim 1: To assess the policy impact and cost-effectiveness of Countryside Survey 2007

The purpose of this component of the work was to understand the current policy context for CS2007 and thus provide the foundation of the overall study. The specific objectives set were to:

- Identify and evaluate the contribution of CS2007 to the policy applications set out in the original Survey contract and to policy applications that have emerged since its release; and,
- Identify the added-value and/or cost savings generated by new innovations introduced in CS2007.

The achievement of both objectives hinged on understanding the ability of CS2007 to detect change in the countryside in a cost-effective way, and involved an analysis of the extent to which the Survey was fit for the various purposes initially envisaged and for the policy requirements that emerged since its inception. The outputs of this component of the work were designed to provide funders with a sense of which elements of CS provided the best 'value for money', so that they could gain a better appreciation on the investment that they had made.

Aim 2: To identify future options for Countryside Survey

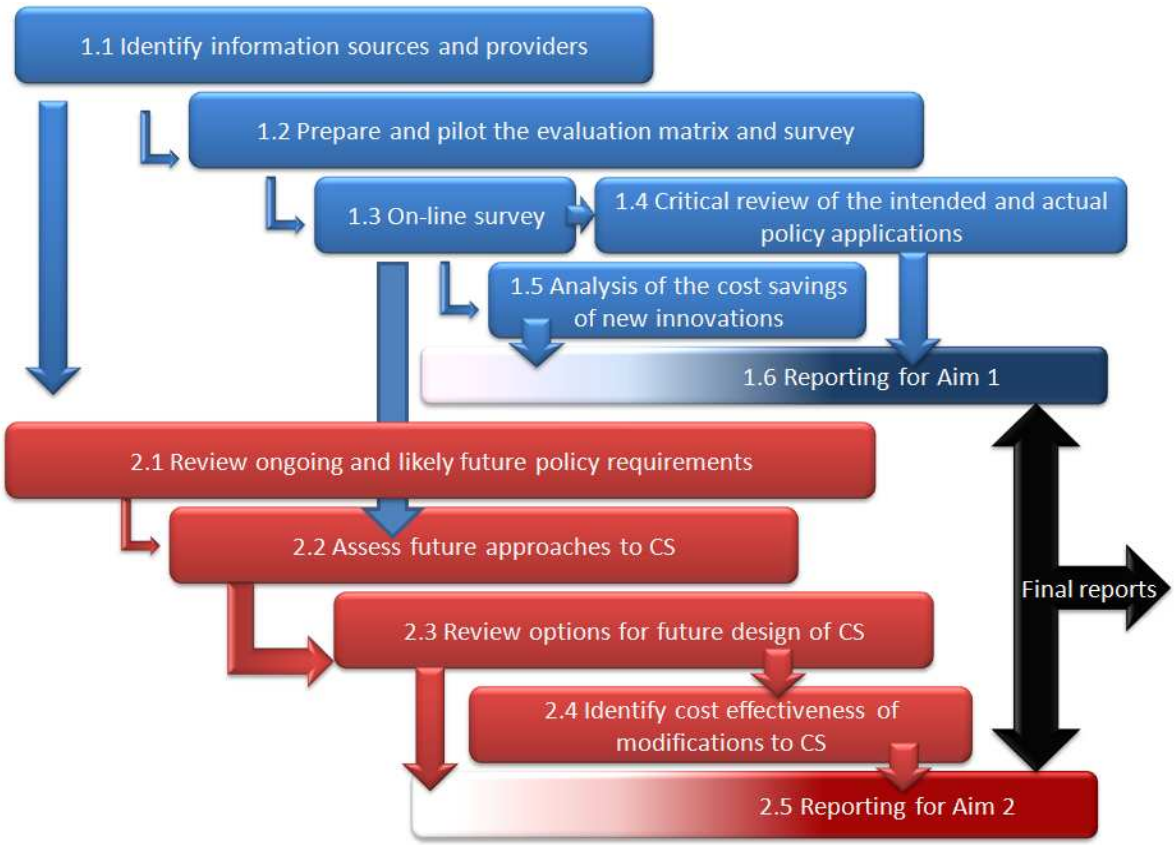
While the work undertaken in relation to the first aim sought to identify the strengths and weakness of CS in relation to current policy needs, the second component reviewed emerging policy needs to better understand the contribution that any future CS might make. Thus the objectives were to:

- Identify ongoing and likely future policy requirements for measuring land use, soil, water quality, landscape character, biodiversity and ecosystem change in the countryside, at national (UK or country) scales, and local scales; and,
- Make a critical review of the likely contribution of the current Field Survey and land cover components of Countryside Survey, to ongoing and future policy requirements.

[4] Note: limited freshwater results were published in 2008; the more complete freshwater (streams and ponds) results were published in 2010

As a result of this 'forward look', it was felt that the funders would be better placed to consider the business case associated with different monitoring options and therefore the role that CS might play in the future, given the possible limitations on resources and the evolution of other monitoring programmes in England, Scotland and Wales.

Figure 1.1: Structure of the work programme of this study



1.3 Approach and Methods

1.3.1 Structure of the work programme

The design of the work programme for this study is shown in Figure 1.1.

To achieve an understanding of current needs and the contribution of CS2007 the work involved:

- Making a critical review of the intended and actual policy applications of CS2007 through a desk study (Task 1.1, Figure 1.1);
- Using this policy framework to design an evaluation matrix against which the effectiveness and relevance of the outputs from CS2007 could be judged (Task 1.2); and,
- Undertaking a questionnaire survey and initiating a series of workshop discussions and target interviews with users and organisations concerned with the main policy areas relevant to the assessment of CS2007, to gauge their views on the effectiveness of the Survey (Tasks 1.3, 1.4).

Although a major focus for this work was those organisations that contributed funding to CS2007 (the 'core organisations'), it was also considered important to broaden the analysis to include two other key audience groups, namely: organisations delivering change in the countryside (e.g. Wildlife Trusts and Local Authorities), and research organisations, such as CEH and Forest Research, who make use of evidence to undertake work that supports policy development. Both groups were considered to be important potential users of CS2007. By consulting them we sought to understand the wider societal or public benefits of CS2007 that might be considered alongside the specific organisational ones enjoyed by the core funders. There was no attempt to make the coverage of the wider circle of users exhaustive, however, and the principle recommendations to emerge from the review are based on evidence collected from the core-funding organisations.

To make the critical evaluation of the potential contribution of CS to these future policy needs, we undertook an horizon scanning exercise (Figure 1.1, Task 2.1) that sought to map out the emerging 'monitoring landscape' and to examine the niche of CS within it (Task 2.2). In this way we were able to review the possible design options for CS (Tasks 2.3 & 2.4), and explore:

- how CS could be modified to provide a better match between data production and reporting requirements;
- any redundancy in CS by identifying alternative data sources that would also meet policy requirements;
- how costs might be reduced by spreading the expenditure across years by the design of a rolling survey programme; and,
- how technological advances might be used to improve the ability of the survey to detect and understand change over time.

The extent to which future Countryside Surveys might be coordinated with other monitoring programmes to create a more cost-effective, integrated national framework for assessing biodiversity and ecosystem services has also been examined.

1.3.2 Analytical Rationale

The work programme shown in Figure 1.1 was underpinned by a methodology that was designed to make an evidence-based assessment of the contribution of CS. It consisted of four key steps.

First, the identification of the relevant policy areas or topics against which the outputs of CS2007 could reasonably be judged. To do this we drew on the original specification for CS2007 and the tender response, which described the intended relevance of the work. The policy areas recognized by this process were: biodiversity, ecosystem services, landscape, sustainable agricultural and agri-environment schemes, water resources, soil protection, sustainable forestry, urban development, air quality, climate change and

access to nature. It is important to note that CS was not primarily designed to fulfil any single specific policy requirement, but rather to inform thinking across a range of science and policy issues. This characteristic of CS meant that any assessment of its contribution was complex, because while some of the potential uses could be predicted, others only emerged after CS2007 was undertaken. Thus the second methodological step consisted of formulating a set of hypotheses describing what reasonably might be expected given the perspective we now have in 2012.

The design of this second methodological stage was based on our understanding of the types of output from CS2007, and the types of policy needs that exist in the topic areas identified. In constructing the hypotheses or statements of expectation we found that it was helpful to distinguish between the different ways in which CS2007 results might potentially be used because they affected the way judgments about the contribution of the Survey might be made; three types of hypothesis were identified:

1. Where a policy requirement for data had been built in to the specification for CS2007, and especially where the information was seen as the primary or only source of evidence for a particular reporting need. Clearly this type of contribution could be tested most easily, although as noted above, CS was not mainly intended for such purposes.
2. Where there was a more general opportunity for CS2007 data to feed into the policy cycle because of the types of information that it could provide. In these situations it was assumed that CS2007 might not be the primary or only source of evidence for policy customers, but used to provide context for their work, or to corroborate other evidence. In the specification for CS these kinds of use were highlighted in statements about the 'general relevance' of the work, and influenced more strongly the way CS2007 was reported rather than its design. Although this type of contribution is more difficult to test than the first, it was felt that the way outputs had been used across the policy topic areas identified could also enable an assessment to be made, albeit in a more qualitative way.
3. Finally, where a new opportunity for CS2007 to provide evidence had arisen after the survey had taken place or after the publications of the results. It was felt that it was important to examine these types of contribution because they enabled the claims about the flexibility of CS and its role as a basic and essential data source for policy customers to be examined.

The identification of the policy topic areas that were to be used for the evaluation of the contributions of CS and the expectations about applications within them were undertaken through a desk study by the project team. However, in recognition of the important role that the hypotheses about the use of CS data played in the overall assessment of CS2007, we tested them in a workshop that included policy advisors and

members of the team in CEH responsible for Countryside Survey. The hypotheses and the changes that were made to them will be described in Part 2 of this Report.

Having constructed the hypotheses about the expectations we might reasonably have for the contribution of CS, the third methodological step involved assembling the evidence that could be used to test them. Two principal sources were used: the responses from an on-line questionnaire survey, and a review of policy relevant project work that had used CS2007 data. As noted above, the questionnaire was mainly directed to members of the core-funding organisations. The intention was not to collect a statistically representative sample of views, but rather the responses of a set of key informants. The aim was therefore not to base any judgement about the contribution of CS on a 'majority view', but rather on the existence of 'critical' policy applications that might demonstrate the value of the Survey. The results of the questionnaire survey, and the way they were used to test the hypotheses about expected policy contributions of CS will be described in Part 3 of this Report.

In addition to the on-line survey, a second e-mailed questionnaire was used to collect information from the principal investigators of projects that had used CS2007 data. Nineteen projects were identified for consideration by CEH. These were judged to make up the bulk of the analytical work that had been based on CS2007, because generally such studies are either led by CEH or in partnership with them due to the sensitivity of the location of the field sample squares. The results of this work and the expertise required are also presented in Part 3 of this Report. In general the questionnaire survey and the analysis of project work provided evidence across all the relevant policy areas, but where any deficiencies were identified, a small number of interviews with key informants who had not taken part in either of the surveys were made. The information gathered from these interviews is presented alongside the other material in Part 3.

The final methodological element of this Study involved the horizon scanning exercise designed to identify likely future policy needs in the areas covered by CS2007 and the contribution that any future CS might make. The work involved extracting from the on-line questionnaire survey the views of the key informants on their likely future needs, and testing and refining these propositions via a second expert-based workshop. The workshop included policy customers and people familiar with the structure of CS and the technologies that can support such work. The meeting was designed to help identify the place of CS amongst the other sources of monitoring data, and the technical and design options that might be needed to ensure that any future work was cost effective. The outputs from this workshop, which are described in Part 5, provided an input into the final phase of the desk study undertaken by the team that has led to the set of recommendations about the way forward for the funders of CS.

1.4 Scope and Structure of the Final Report

This Report provides the results and conclusions arising from the work undertaken in relation to Aim 1 and Aim 2. Together they will form the basis for the exploration of the technical options for the future design of CS and the discussion of its place alongside other types of monitoring.

The structure of this Report follows the methodological stages described above. The results of the desk study and review of policy areas and hypotheses that provide the framework for the evaluation are described in Part 2. In Part 3, the results of the questionnaire survey are presented, as well as the review of project work associated with CS2007. Part 4 investigates cost-savings arising from the innovations made in the design and implementation of CS2007. Part 5 makes an analysis of future policy needs and the implications for the future design of CS are then considered in Part 6. The main findings and recommendations arising from the study are summarised in Part 7.

Part 2 Policy Drivers and Applications of Countryside Survey

2.1 Introduction

A number of approaches for evaluating the policy contribution of CS2007 were considered at the design stage for this Study. One way would have been to examine the outputs from the Countryside Survey and the work that had been undertaken since its publication and look at the way it supported the policy process linked with specific policy needs. Despite the simplicity and directness of this approach it was considered too narrow. By focusing only on outcomes or products, it was considered that the *potential* of the Survey and the extent to which this potential had been realised would tend to be overlooked. Since the core-funders were interested in understanding this issue more fully, the evaluation approach started by identifying the kinds of policy areas for which CS2007 might reasonably be expected to be relevant to. These potential policy applications could then be used as one axis of an evaluation matrix against which the different types of output could be judged. The advantage of this alternative approach was that the specific outputs from CS2007 could still be examined, but their contribution could then be seen from a much wider perspective.

2.2 The Policy Relevance of CS2007

The commitment to undertake the fifth Countryside Survey in 2007 was made in *Securing the Future – Delivering UK Sustainable Development Strategy*[5], with the goal of assessing 'the status of natural resources in the UK countryside'. From the outset, therefore, and during the design of CS2007, it was recognised that the results would have broad application across a range of policy topic areas, as well as maintaining continuity with the previous Surveys.

The briefing documents for this Study included a summary of policy topic areas that CS2007 was most likely to support (See Appendix 1 of this Report). The summary was based on material provided in the CS2007 tender document which sought to highlight the potential applications of the Survey and the way the technical protocols developed in the preparatory phases were reflected in the proposals. The topic areas were: biodiversity, the natural environment, sustainable agriculture and agri-environment schemes, water resources, soil protection, sustainable forestry, urban development, air quality, climate change and unexpected changes. This framework was subsequently reproduced in a modified form, in the introduction to the *England Results*[6] published in 2009 (Table 2.1).

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[5] TSO (2005): Securing the future – delivering UK sustainable development strategy. Command 6467. (Defra Publication PB10589)

[6] Countryside Survey: England Results from 2007 (published September 2009). NERC/Centre for Ecology & Hydrology, Department for Environment, Food and Rural Affairs, Natural England, 119pp. (CEH Project Number: C03259). download: http://www.countrysidesurvey.org.uk/reports-2007

Table 2.1: Relevant policy applications cited in the England Report (see FN 5 for reference)

Biodiversity: assessment of status and trends in Broad and Priority Habitats, measuring progress towards the 2010 target of halting biodiversity loss.

Natural environment: measurement and improved understanding of ecosystem goods and services.

Sustainable agriculture and agri-environment schemes: understanding effects of agricultural policy on the natural environment, including assessment of farmland habitats such as grasslands, hedges and cereal field margins.

Water resources: context and baseline assessment for the EU Water Framework Directive, especially for headwater streams and ponds.

Soil protection: measurement of long-term trends in soil quality, including soil carbon.

Sustainable forestry: information on isolated trees and plant diversity within woodlands, to supplement the National Inventory of Woodlands and Trees.

Urban development: estimates of areas of habitat affected by urban development.

Air quality: assessment of impacts of air pollution on terrestrial habitats, soils and headwater streams.

Climate change: provide information to help estimate carbon emissions from land cover change and soils, and to detect impacts of climate change in the countryside.

Uplands: assessment of changes in uplands habitats (such as bracken) and landscape features (such as hedgerows and walls), and changes in land management (such as grazing) and increase in Built-Up and Gardens Broad Habitat.

Pesticides: assessment of plant species richness in cropped areas, and in agricultural landscapes in general.

Landscape: assessment of changes in landscape features, especially in particular regions of England where particular habitats or features may contribute to landscape quality.

Given the lapse of time since the policy topic areas were identified during the preparatory work for CS2007, our Study began by reviewing them to ensure that they continued to map out the kinds of area where the Survey might reasonably be expected to make a contribution in 2012. Nine of the original set were carried over as remaining relevant, with 'natural environment' being re-labelled 'ecosystem services' to reflect the growing interest in this topic area that had developed since the planning for CS2007. Two new topic areas were added: 'landscape' and 'access to nature'. The former was included because it was listed as one of the key policy topics in the *England Report* (Table 2.1); for economy it was assumed also to cover the issues identified under 'uplands' in this listing. 'Access to nature' was added to recognise the policy interest in recreational access to the countryside and the allied health benefits that this can provide although arguably it could be subsumed in the new category of ecosystem services. 'Unexpected changes' was dropped as a topic area from the original list in the CS2007 tender, because it is not a recognisable policy area. However, the importance of evaluating the ability of the CS database to address different and new policy issues was noted, and was explored more closely through the questionnaire survey. 'Pesticides' were also dropped from the list

shown in Table 2.1, being assumed to be covered in any analysis of the data on the agricultural Priority Habitats associated with species monitoring under 'biodiversity'.

Although the eleven policy topic areas were considered a reasonable basis for evaluating the potential policy contribution of CS2007, they were nevertheless rather general. Thus in order to make the analysis more focused, the desk study made a review of relevant national and international policy statements in order to further clarify the types of evidence and analysis that CS2007 might provide. This review was checked by cross-referencing the material to the principal types of data that the Survey was designed to generate. This process led to a number of sub-topics being identified within the broader policy categories. The full list, that formed the basis of the evaluation matrix used in this Study, is shown in Table 2.2. This matrix and the steps that led to its construction are described in detail below.

2.3 The Evaluation Matrix

The evaluation matrix shown in Table 2.2 was developed by reviewing the policies that related to each of the topic areas identified. These were identified using the expertise in the Project Team, combined with inputs from JNCC. Where sub-topics within a broader policy area were recognised, these are listed on the left hand side of the table. Each of the relevant national and international policy drivers that relate to them are shown in the next column. In order that the coverage was as comprehensive as possible, the policies and policy statements included reflect current (2012) requirements rather than just those identified in 2007. From our reading of the requirements of each of the policies and our understanding of the structure of CS2007, the types of contribution that CS2007 might reasonably be expected to make are shown in the next column in the Table. Finally, on the right hand side of the Table a set of the 'hypotheses' that describe a set of 'reasonable expectations' are listed. These formed the basis for the analysis of the different sources of evidence about the use of CS data that are presented in Part 3.

Table 2.2: The Evaluation Matrix

Topic area	Potentially relevant policy area	Potential application of CS2007	Hypothesis
Biodiversity			
Distribution and condition of Priority Habitats Distribution and condition of Broad Habitats	• UK Biodiversity Action Plan	• Monitoring of terrestrial Broad and some Priority Habitats at UK and country level, allowing assessment of status and trends and identification of major threats and the cumulative outcomes of policy interventions	B.1: For four Priority Habitats (hedges, arable field margins, ponds, and blanket bog) CS FS data are the primary source of evidence on which targets in the UK Habitat Action Plans were monitored.(1)
		• Assessment of achievement of the 2010 biodiversity target through updating of indicators on plant diversity, extent of habitat features and habitat fragmentation at UK and country levels.	B.2: Data on both Broad and selected Priority Habitats contributed to assessment of achievement of the 2010 biodiversity target through updating of indicators on plant diversity, extent of habitat features and habitat fragmentation at UK and country levels.(2)
	• EU Habitats Directive	• Results for Priority Habitats potentailly contribute to assessment of Favourable Conservation Status	
	• National Planning Policy Framework, England, 2012, and equivalent in Planning Policy Wales and Scottish Planning Policy	• Provide evidence that helps planning policy identify any areas or sites for the restoration or creation of new priority habitats.	
	• National Planning Policy Framework, England, 2012 and equivalent in Planning Policy Wales and Scottish Planning Policy	• Results will contribute to the identification and mapping of local ecological networks including international, national and local sites for biodiversity and areas identified by local partnerships for habitat restoration or creation	
	• National Planning Policy Framework 2, Scotland, 2009 and Scottish Planning Policy, 2010	• Inform the preservation, restoration and re-creation of priority habitats, ecological networks and recovery of priority species population linked to national and local targets	
	• Local Biodiversity Action Plans • UN Convention on Biological Diversity Aichi Targets (e.g. Target 5) • Country Habitat Action Plans • England Biodiversity Strategy 2020 • Natural Environment Framework in Wales, 2010 (Living Wales) • Scottish Biodiversity – It's in your hands, 2005	• Targeting of habitat restoration/creation and integration of biodiversity into country and regional programmes and strategies	B3: Mapping of Broad Habitats by FS and LCM2007 has supported the targeted delivery of biodiversity programmes. (2) and (3) B4: By reporting on the extent and condition of habitats, CS2007 has provided evidence of progress against a range of international and national biodiversity policies. (2) and (3)
	• National Ecosystem Assessment • In England, Natural Environment White Paper: Natural Choice; Securing the Value of Nature (July 2011)	• Land use and biodiversity in relation to Nature Improvement Areas	
		• Land use and biodiversity in relation to Local Nature Partnerships	
	• Country agency conservation objectives for SACs and SPAs	• Provide national /regional contextual information to supplement monitoring within protected sites	
	• Natural Environment and Rural Communities Act, (2006)	• Inform the publication of a list for SoSs for England and Wales of the living organisms and types of habitat which in the SoSs opinion are of principal importance for the purpose of conserving biodiversity	

Table 2.2: Evaluation matrix, cont.

Topic area	Potentially relevant policy area	Potential application of CS2007	Hypothesis
Biodiversity			
Ecological networks and landscape permeability	• Article 10 of the EU Habitats Directive • Pan-European Biological and Landscape Diversity Strategy (1995) • Lawton Report (2010) informing policy in England, including the England Biodiversity Strategy 2020	• Describe and assess ecological networks and landscape permeability	B5: Data on the spatial distribution of Broad Habitats across the UK obtained from LCM has enabled improved understanding of the spatial pattern of ecological networks. (2) and (3) B6: Data on the changing condition of Broad Habitats from FS has enabled improved understanding of the resilience of ecological networks. (2) and (3) B7: CS has been used in conjunction with other datasets to understand ecological networks.(2) and (3)
Species monitoring including spread of invasive non-native species	• Bern Convention (1979) • Convention on Biological Diversity (1992) • In England, Natural Environment and Rural Communities Act, (2006), in Scotland, Wildlife and Natural Environment (Scotland) Act 2011, and Living Wales Framework (2012) • Non-Native Species Framework Strategy for Great Britain (2008)	• Inform spread of invasive non-native species *The Non-Native Species Framework for GB (2008) is based on assessment of risks and the monitoring of pathways of species change, not on changes to specific species*	B8: Data collected from the FS vegetation plots and boundary plots has allowed monitoring of change in the prevalence of non-native species in the countryside.(2)
Ecosystem Services (previously listed under Natural Environment)			
The dynamics and spatial distribution of ecosystem services at national and regional scales	• Defra Action Plan on Embedding the EsA • Natural Environment White Paper: Natural Choice; Securing the Value of Nature (July 2011) • England Biodiversity Strategy 2020 & England National Planning Policy Framework • Living Wales the Scotland, 2012 Land Use Strategy	• Multi-functionality and trade-offs between ecosystem services will be investigated, including the relationship between biodiversity and ecosystem services.	ES1: CS combined with other data provides the basis for mapping spatial and temporal changes in ecosystem service output.(2,3) ES2: The CS2007 integrated assessment established the potential for CS data to be used for ecosystem service assessment that informed the subsequent analysis in the UKNEA. (1)

Note: The numbers after the hypotheses refer to the different types of expectation described in Section 1.3.2

Table 2.2: Evaluation matrix, cont.

Topic area	Potentially relevant policy area	Potential application of CS2007	Hypothesis
Landscape			
The nature of landscape/seascape character, condition, change and management objectives	European Landscape Convention	Inform landscape quality objectives in the protection, management and planning of National Character Areas	L1: Trend data from the Field Survey on the condition of selected habitats can inform assessments of landscape change.(2)
	National Character Areas and Local Landscape Character Assessments	Inform at a local level landscape character, condition and change which will influence the direction of management objectives	L2: LCM2007 can be used to relate broad patterns of land cover with other aspects of landscape character, including at character area level. (2)
	Marine Protection Areas	Description and monitoring of seascape character	Not relevant
	Marine Conservation Zones		Not relevant
Extent of noise and light pollution, and extent of tranquillity	National Planning Policy Framework, 2011, in England	Support the identification of areas with noise and light pollution and tranquil areas.	L2: LCM2007 can be used to relate broad patterns of land cover with other aspects of landscape character, including at character area level. (2)
Sustainable Agriculture			
Estimates of the changing extent and condition of farmland habitats and landscape features	EU Common Agricultural Policy and national Rural Development Programmes	Monitoring of farmland land use including major crop types and conversion between agricultural uses	SA1: CS Field Survey data on the condition of farmland habitats, the diversity of plants in fields and field margins and landscape features has been used as evidence on the impact of agriculture on the environment. (1) SA2: Field Survey data on the stock and condition of linear features should be able to be used to estimate proportion of stock covered by agri-environment schemes (2) and (3) SA3: LCM2007 is a source of evidence for monitoring the changing distribution of farmed habitats and their relationship with other indicators of environmental quality. (2)
	Local Biodiversity Action Plans	CS is main tool for assessing progress towards the BAP target for ancient and species-rich hedgerows, arable field margins, ponds, and blanket bog	
The influence of agri-environment schemes and the regulation of farmland habitats and species	National Rural Development Programmes	LCM will contribute to assessments of landscape character and targeting of agri-environment schemes (especially ES in England).	
		Use as indicator in the Agriculture Change and Environment Observatory.	
	· Environment Impact Regulations (Forestry, 1999 and Agriculture, 2006), England and Wales and equivalent in Scotland · Hedgerow Regulations 1997 (England and Wales)	Evaluation of effectiveness to the Environmental Impact and Hedgerow Regulations and quantification of spread and impact of pernicious weeds (e.g. Ragwort). There are similar applications in Scotland and Wales.	
Water resources			
Contextual and baseline information on water bodies and aquatic habitats	EU Water Framework Directive	Contribution to WFD surveillance (CS2007 focus on headwater streams and ponds, complementing EA monitoring of larger water courses and water bodies).	W1: The results of the CS2007 Freshwaters work package provide information on the ecological condition of headwater streams and ponds that has complemented other Water Framework Directive surveillance programmes.(1) W2: Data on the condition of terrestrial habitats from the CS2007 field survey and on land cover from LCM2007 can be used to characterise trends in water quality and aquatic diversity. (1)
Long term trends in biological water quality, aquatic biodiversity at national and regional scales.	EU Water Framework Directive	Investigate factors contributing to long term trends in biological water quality, biodiversity and habitat structure of headwater streams and ponds, including land use of upstream catchments and diffuse pollution, at national and regional scales. Contribution to WFD surveillance monitoring network of larger water courses and water bodies.	
	Water Resources Strategy for England and Wales – Water for People and the Environment	Inform an understanding of how the water environment and ecology interact	
		Inform the improvement of environmental resilience	
		Identify the impact of climate change on biodiversity	
	Planning Policy Statement 23 Planning and Pollution Control, replaced by the National Planning Policy Framework 2012	Contribute to the quality of land, air and water and potential impacts arising from development	
Water resource and flood models, where local-scale land cover and vegetation data may be important.	The Flood and Water Management Act; Flood Risk Management (Scotland) Act, 2009, together with relevant planning guidance. In relation to:	LCM data will be useful as an input to water resource and flood models, where local-scale land cover and vegetation data may be important.	W3: LCM2007 provides broad contextual data on land cover to improve understanding of flood propagation and generation through processes such as surface run-off and flood water storage.(2) W4: LCM2007 provides contextual land cover data that has improved understanding of aquifer recharge to assist in water resource planning.(1) and (2)
	Catchment flood management plans, Flood risk management plans, Local flood risks management plans, Surface water management plans		

Note: The numbers after the hypotheses refer to the different types of expectation described in Section 1.3.2

Table 2.2: Evaluation matrix, cont.

Topic area	Potentially relevant policy area	Potential application of CS2007	Hypothesis
Soil			
Soil quality monitoring and evaluation	Safeguarding our Soils: A Strategy for England,2009 and subsequnetly the Natural Environment White Paper ; Country-	Inform protection of soils from erosion, compaction and organic matter decline	S1: Data from the CS2007 Soils Work Package on the acidification and eutrophication of soils, deposition of heavy metals, soil carbon and soil biodiversity has directly informed devolved country policies for soil management and protection. S2: In combination, CS data on soil character and biodiversity, and LCM data on patterns of land cover can play a significant role in the modelling the impact of land cover change on soil quality and function. (2)
	Draft National Planning Policy Framework, England, 2011	Supports identification of areas of poor soil quality	
	Safeguarding our Soils: A Strategy for England,2009 and subsequnetly the Natural Environment White Paper ; Country-level programmes (Soil Strategies) for Wales and Scotland	Quantify and investigate long term change in physical, chemical and biological soil quality at national and regional scales and identify the major drivers of change. Specifically, to quantify trends in acidification and eutrophication of soils, deposition of heavy metals, soil carbon and soil biodiversity.	
Carbon flux in soils	Safeguarding our Soils: A Strategy for England,2009; For Scotland, the Land Use Strategy	Support the prediction of carbon fluxes from changes in land use and land management	
Coastal erosion	National Flood and Coastal Erosion Risk Management Strategy	Support proposals to identify areas at risk from flooding and coastal erosion	Not relevant
	Shoreline Management Plans (Integrated Coastal Zone Management Plans)	Use of LCM/field survey to monitor change	
Wind and rain erosion	Safeguarding our Soils: A Strategy for England, 2009, the Scottish Soils Framework, 2009 and the Welsh Soils Action Plan.	Inform protection of soils from erosion, compaction and organic matter decline	See soil quality, above
Sustainable Forestry			
The extent and character of trees, woodland and forestry	National Inventory of Woodland and Trees, succeeded by The Forest Inventory	Additional information on trends in plant diversity within woodlands, habitat conversion to and from woodland and soil quality within woodlands. CS also provides information on trees outside of woodlands.	F1: Data from the CS2007 Field Survey on the extent and condition of trees outside woodlands, on trends in plant diversity, condition and soils within woodland, and on the land cover change to and from woodland complements and adds value to the data provided by the Forestry Commission's National Inventory of Woodland and Trees and its successor the National Forest Inventory. (1) F2: LCM2007 data provides contextual data to the Forestry Commission' National Inventory of Woodland and Trees and National Forest Inventory, allowing the context of woodlands within the broader matrix of land cover to be mapped and analysed. (1) and (2)
	A Strategy for England's Trees, Woods and Forests	Inform the sustainable management of forests and woodlands – ecological character and condition of vegetation, soils and water bodies in woodlands and forests.	
	Scottish Forest Strategy, 2006		
	Woodlands for Wales: the Welsh Assembly Government's strategy for woodland and trees, 2009		
Monitor resilience to climate change	A Strategy for England's Trees, Woods and Forests, 2007	Inform Government's vision and priorities for England's trees and woodland resource including resilience to climate change	
Carbon storage in woody biomass	A Strategy for England's Trees, Woods and Forests, 2007	Monitor area and volume of woody biomass	
	Woodlands for Wales: the Welsh Assembly Government's strategy for woodland and trees, 2009		
	See also Climate Change.		
Urban Development			

Note: The numbers after the hypotheses refer to the different types of expectation described in Section 1.3.2

Table 2.2: Evaluation matrix, cont.

Topic area	Potentially relevant policy area	Potential application of CS2007	Hypothesis
Urban Development			
Land lost to urban development	National Planning Policy Framework, England 2012, National Planning Policy Framework, Scotland, 2009 and Scottish Planning Policy, 2010, Planning Policy Wales and the Wales Spatial Plan	Note CS is not optimised for assessment of built-up areas or impacts of urbanisation. However, CS will provide national estimates of habitat types lost to urban development.	U1: CS2007 provides national estimates of the area and trend in habitats converted to urban development which can contribute to monitoring of policy on brownfield/greenfield development and protection of the greenbelt. (2) U2: LCM2007 provides evidence for the development of locally planning policy on the extent of green space within and on the edge of urban areas. (2) and (3)
Development in greenbelt	In England, PPG2: Green belts replaced by the National Planning Policy Framework, England, 2012 National Planning Policy Framework, Scotland, 2009 and Scottish Planning Policy, 2010 Planning Policy Wales and the Wales Spatial Plan	Inform opportunities to enhance biodiversity within the green belt and control development opportunities	
Development in floodplain and along the coast	PPS25: Development and Flood Risk Draft National Planning Policy Framework National Planning Policy Framework, Scotland, 2009 and Scottish Planning Policy, 2010	Land use within high risk areas for development within the floodplain and along the coast	See water
Urban green space	Local-level green infrastructure strategies	LCM will identify green space within urban areas	U1: CS2007 provides national estimates of the area and trend in habitats converted to urban development which can contribute to monitoring of policy on brownfield/greenfield development and protection of the greenbelt.
Provision for new or expanded open space including sports and recreational facilities	In England, PPS17 Open Spaces, Sport and Recreation, 2002, replaced by the National Planning Policy Framework, England, 2012 National Planning Policy Framework, Scotland, 2009 and Scottish Planning Policy, 2010 Planning Policy Wales and the Wales Spatial Plan	Supports the identification of local green space including its tranquillity and importance for wildlife	
Sustainable drainage systems	National Flood and Coastal Erosion Risk Management Strategy	LCM will provide limited discrimination of urban soil sealing. (i.e. continuous/discontinuous urban cover)	
Protection of best and most versatile agricultural land	PPS7 Sustainable Development in Rural Areas, 2004, replaced by the: National Planning Policy Framework, England 2012	Identification of the extent and grade of agricultural land	
Land contamination	Planning Policy Statement 23 Planning and Pollution Control replaced by the: National Planning Policy Framework, England 2012	Support the identification of contaminated land and potentially polluting areas	
Protection against local development proposals where there are environmental constraints	In England, Neighbourhood Plans and the Localism Act 2011	Inform the development of constraints maps for neighbourhood plans Inform the preparation of SA/EIAs/HRAs where development proposals identified within Neighbourhood Plans are likely to have an impact on the environment	
Improvements to the local environment	In England, Community Infrastructure Levy National Planning Policy Framework, England, 2012	Support the identification of environmental improvement opportunities which could be funded through CIL	

Note: The numbers after the hypotheses refer to the different types of expectation described in Section 1.3.2

Table 2.2: Evaluation matrix, cont.

Topic area	Potentially relevant policy area	Potential application of CS2007	Hypothesis
Air quality			
Impacts of air pollution	UK Air Quality Standards Regulations (2010)	CS will provide assessments of impacts of air pollution (acid and nitrogen deposition, and heavy metals) on condition/quality of terrestrial habitats, soils and headwater streams and an evaluation of long term change.	AQ1: The reporting of CS2007 data on the chemical status of soils and waters and habitat condition can has contributed to air quality policy by enhancing policy makers' the understanding of how nitrogen and heavy metal deposition affect ecosystems. (1) and (2) AQ2: Countryside Survey provides evidence for predictive modelling of future air quality scenarios and for the development of indicators of change of air quality impacts and critical loads. (2)
		Data will be used subsequently in other work to further develop modelling of ecosystem responses to air pollution, contributing to UK commitments to deliver model outputs on target loads for acidity and nutrient nitrogen.	
Improvements in air quality with new standards and objectives	Air Quality Strategy for England, Scotland , Wales and Northern Ireland	Inform the development of air quality objectives and development of policy options	
		Inform historic trends and projections of for air quality emissions and measurements	
	Planning Policy in England, Wales and Scotland (as previously referenced for other topic areas)	Contribute to air quality and potential impacts arising from development	Not relevant
		Inform the location of development which may give rise to pollution directly or indirectly	
Climate Change			
Land use change and GHG emissions	National Inventory of Greenhouse Gases	CS is the main source of information for the land cover/land use change component of the National Inventory of Greenhouse Gases. CS provides national estimates of land cover change from which carbon emissions are currently calculated, leading to:	CC1: CS is a key source of information for the land cover/land use change component of the National Inventory of Greenhouse Gases. (1)
		improved basis for estimating emissions, and attributing these to policy interventions	
	Climate Change Act, 2008	information relevant to long term impacts of climate change and adaptation/mitigation strategies affecting land use, biodiversity, water resources and soils	CC2: CS data can be used to examine whether climate is a significant variable that has affected changes in land use, soil quality and water resources in recent decades. (2)
		framework for scaling up results of more local, detailed studies (for example ECN) to national levels	
Environmental adaptation to CC and resilience planning and mitigation actions	In England, Supplement to PPS1 Planning and Climate Change, replaced by National Planning Policy Framework 2012, and equivalent planning guidance in Wales and Scotland.	LCM will provide underpinning data for development of adaptation and mitigation strategies and modelling studies	CC3: CS provides underpinning data for development of adaptation and mitigation strategies and modelling studies (2) and (3)
	National Planning Policy Framework, England, 2012 and equivalent guidance in Wales and Scotland	Track changes in vegetation (including key species and composition of habitats), landscape features, soils and water bodies arising from climate change.	See CC1
	Climate Change (Scotland) Act, 2009		
	EC Directive regarding renewable energy, 2009.	Area of biomass crops	CC4: LCM2007 has been used to model and map land capability for the production purpose grown biomass crops. (3)
	The Energy Act, 2008, 2010 and 2011		
	UK renewable energy targets		
Access to Nature			
Public rights of access to the countryside	In England and Wales: Countryside and Rights of Way Act (2000) In Scotland: Land Reform Act (2003)	LCM can monitor classes of land cover to which the public has rights of open access	AN1: LCM2007 can provide contextual information on land cover at both national and local scales that can be compared with data on publicly accessible green space and on public health inequalities to address policies on outdoor recreation and public health. (2) and (3)
Urban green space	National Planning Policy on green infrastructure Accessible Natural Greenspace Standards (ANGSt) Local-level green infrastructure strategies	LCM will identify green space within urban areas	

Note: The numbers after the hypotheses refer to the different types of expectation described in Section 1.3.2

When reviewing the structure of Table 2.2 it should be noted that the topic areas are probably not as distinct as the arrangement suggests, and that some themes could justifiably be combined or repositioned. The issues covered in 'sustainable agriculture' and 'sustainable forestry', for example, might just as easily be dealt with in an expanded 'ecosystem services' grouping, or indeed the latter could be distributed across a number of other topics. The rationale for the design of Table 2.2 was simply to preserve as much of the structure contained in the specification for CS2007 as possible. There has been no attempt to assign the specific policy drivers to the policy topics on a one-to-one basis, because they too may be cross-cutting in nature and relevant in more than one thematic area; Table 2.2 therefore nests the policy drivers under the different sub-topics to indicate the possible links, and the drivers may therefore appear in more than one place.

2.3.1 Biodiversity

Of all the policy topics considered in Table 2.2, biodiversity is the broadest. This is an important area of public policy, defined by a range of long standing international obligations. At the highest level these include the Ramsar Convention on Wetlands (1971), the Bern Convention on the Conservation of European Wildlife and Natural Habitats and the Bonn Convention on the Conservation of Migratory Species of Wild Animals (both 1979) and, most significantly the UN Convention on Biological Diversity (1992). The parties to this Convention have continued to meet and in October 2010 adopted the 'Aichi' targets in Nagoya, Japan[7]. Also significant are the international conventions adopted at a European Union level through Directives such as the Habitats Directive (92/43/EEC) and the Birds Directive (2009/147/EC). The EU Biodiversity Strategy (2011) aims to halt the loss of biodiversity in the EU by 2020. While these policy initiatives are probably best regarded as key future policy drivers, we include them here because they are already shaping people's expectations.

The international and European Union policies are enacted through a set of national strategies and programmes which form the 'UK Post-2010 Biodiversity Framework' (July 2012). In England, the country strategy is set out in *Biodiversity 2020* (published July 2011), for which a Delivery Plan is expected in 2012, and the *Natural Environment White Paper for England*. The Natural Environment Framework in Wales (also referred to as Living Wales, published September 2010) which deals with a number of issues, including biodiversity, is under review by the Welsh Government. The Scottish Biodiversity Strategy (2004) is being reviewed by the Scottish Government.

This policy area was split into three sub-topics: Broad and Priority Habitats, Ecological Networks, and the impact of Invasive Non-Native Species.

[7] See Box 5.1 later in this report for a summary of the targets.

Broad and Priority Habitats

Policy in the UK towards the conservation of biodiversity has a history dating back many decades[8]. The UK Biodiversity Action Plan (UK BAP) was published in 1994 as the Government's response to the 1992 Convention on Biological Diversity (CBD). The UK BAP established a framework of priority habitats that were identified as priorities for conservation action. A review of Priority Habitats was undertaken in 2007, producing an updated list of 65 habitats covering a wide range of terrestrial, aquatic and marine semi-natural habitat types[9]. A classification of Broad Habitat types was developed in conjunction with the development of the Priority Habitats list, in order to understand how the suite of Priority Habitats are set within the context of the whole of the UK. Each Priority Habitat is included within (at least) one Broad Habitat. The original classification of Broad Habitats was subsequently revised[10] in 1997, resulting in a list of 27 Broad Habitats. The UK BAP process was designed to support a range of international and national policy commitments. Some of these, such as the EU Habitats Directive, specifically require monitoring of the condition of Priority Habitats to determine their Favourable Conservation Status. As the material in Table 2.2 suggested these international and national concerns are then reflected at local scales through Local Biodiversity Action Plans, the targeting of habitat restoration and creation measures, and the integration of biodiversity into regional programmes and strategies.

The last two Countryside Surveys (2000 and 2007) were designed to provide information on progress against the UK Biodiversity Action Plan (1994-2010), in the form of contextual data on the majority of terrestrial Broad Habitats found in the UK and also specific reporting on a smaller number of the Priority Habitats that occur regularly in CS survey squares. Twenty-one of the Broad Habitats were recorded by the CS2007 Field Survey; these include all of the terrestrial and freshwater habitats as well as four shoreline marine habitats (littoral sediment, littoral rock, supra-littoral sediment and supra-littoral rock). LCM2007 recorded 23 land cover classes, which could be combined to map 17 of the terrestrial Broad Habitats. Eleven of the BAP Priority Habitats were reported on for the first time in CS2007. These so-called 'widespread Priority Habitats' included three (hedges, ponds and arable field margins) for which the CS2007 Field Survey is regarded as the primary source of evidence, upon which progress towards meeting the habitat action plans is measured, and eight for which the results of CS2007 were regarded as important in that they supplemented other sources. The requirement to report on Broad Habitats was fundamental to the design of CS2000 and the methods were carried over, with some enhancement, to CS2007. This system of habitat recording in the field has backwards

[8] For instance the network of protected sites emerged as a result of the National Parks and Access to the Countryside Act 1949.

[9] Action Plans for each of the Priority Habitats were prepared between 1995 and 1999 and published in Tranche 2 of the UK Biodiversity Action Plan: Action Plans.

[10] The Broad Habitats are described in Volumes 2: Terrestrial and Freshwater Habitats and Maritime Species and Habitats, of Tranche 2 of the UK Steering Group Report, published in 1998 and 1999.

compatibility to 1990 for most Broad Habitats, and for some there is backwards compatibility to 1984, so that stock and change estimates can be made. Although CS2000 covered habitats that were classified as Priority Habitats (such as blanket bog and ancient species-rich hedges) there was no attempt to report on them as such in CS2000. CS2007 was therefore the first of the Countryside Surveys to seek to report systematically on the Priority Habitats that are found sufficiently frequently in its survey squares. This included retrospective analysis of CS2000 to identify some Priority Habitats such as ponds and hedges. In the case of LCM2007, there is no backward compatibility with the earlier remote sensing products, and so it fundamentally only maps current stock.

In the context of the Broad Habitats, therefore, one may reasonably expect CS2007 to have made a significant contribution to policy. For the smaller number of Priority Habitats, which were systematically analysed for the first time in CS2007, one might expect more limited contributions. As noted above, these expectations have been expressed in Table 2.2 as a set of hypotheses (e.g. 'B1' through 'B4') that could be tested further by looking at the evidence for current use. In simple terms these hypotheses are restatements of the material in the column labelled 'potential applications of CS2007'; the strategy for developing them was to combine, as far as possible, the different specific uses into a smaller number of statements that could be handled more easily in the subsequent analysis. The deliberative process that shaped the development of these hypotheses is described further in section 2.4, below. At present it is sufficient to note the structure of the section of Table 2.2 for biodiversity, and the way the expectations on the right hand side relate to the policy requirements on the left, because this structure is used for all the policy topics considered.

Ecological networks and landscape permeability

In addition to monitoring the stock and condition of habitats, the importance of maintaining and recreating functional ecological networks has increasingly been emphasised as part of conservation policy. Article 10 of the EU Habitats Directive, for example, encourages Member States to promote the management of landscape features which are of major importance to wild fauna and flora, such as those features that are essential for migration, dispersal, and genetic exchange of wild species. In the national context, the importance of networks has been emphasised most recently by the Lawton Report in 2010, *Making Space for Nature*[11], and in England *Biodiversity Strategy 2020*. The Lawton Report concluded that current land use patterns do not represent a coherent and resilient ecological network capable of responding to the challenges of climate change and other pressures.

The importance of reporting on ecological networks was noted in the tender for the CS2007. The structure of the Field Survey programme, with its stratified set of sample

[11] http://archive.defra.gov.uk/environment/biodiversity/documents/201009space-for-nature.pdf

squares clearly presents a challenge for this kind of analysis, although it may be anticipated that some condition measures might be developed to address this issue. On the other hand, the mapping produced by LCM2007 is likely to be especially valuable in describing the structure of habitat networks, even though their functionality might be difficult to determine directly. These possibilities have been reflected in hypotheses B5-B7 in Table 2.2.

Species monitoring including spread of invasive non-native species

There is no obvious policy requirement for the monitoring of common species in the countryside, although populations of certain species are used as indicators of broader environmental characteristics (such farmland and woodland birds, used by Defra as a measure of biodiversity in the countryside). The UK Biodiversity Action Plan (1994-2010) identified a total of 1,150 species as being a priority for conservation action[12]. Of these, there were 212 vascular plants, 112 non-vascular plants and 214 fungi (including lichens). Species action plans were prepared for many of these and some high profile species are the subject of national species recovery programmes.

Along with the mapping of habitat and other landscape features, an important component of successive Countryside Surveys has been the recording of the vegetation within the sample squares at species level. By establishing different kinds of permanent recording plots within the sample squares, changes in composition over time can be monitored, and importantly shifts in composition can be interpreted against a number of different environmental drivers of change. The sampling strategy used for the monitoring of freshwater habitats also enables shifts in species composition potentially to be detected. CS2007 data was identified as a source of data on vascular plants for a Defra research paper on the development of an indicator for invasive non-native species as part of the suite of JNCC 'Biodiversity in Your Pocket' (BIYP) indicators[13].

The UK Government has entered into several international commitments concerning action to tackle the threats posed by Invasive Non-Native Species (INNS). These include the Bern Convention on the Conservation of European Wildlife and Natural Habitats which calls on Contracting Parties to strictly control the introduction of non-native species; and the Convention on Biological Diversity (which came into effect in 1993) under which Contracting Parties undertake to prevent the introduction, control or eradication of those alien species which threaten ecosystems, habitats or species. The EU has been working towards the development of a Strategy on Invasive Alien (Non-Native) Species since 2008. A review of the EU Plant Health Regime is also ongoing, and includes obligations for surveillance of some plant pests and diseases. Responding to these obligations, Defra along with the Welsh and Scottish Governments prepared the Invasive

[12] This was the number in a revised list published in August 2007.

[13] Hill, M.O. et al. 2009 Developing an indicator of the abundance, extent and impact of invasive non-native species. Final Report. Defra, 49pp. (WC0718)

Non-Native Species Framework Strategy for Great Britain in 2008. Actions to deliver the Strategy are being co-ordinated by the GB Non-Native Species Secretariat which maintains a database of non-native species projects in GB, including monitoring and surveillance projects.

The CS2007 country and headline messages reports analysed changes in several non-native species. This work has been used to generate an appropriate hypothesis (B8) in Table 2.2.

2.3.2 Ecosystem Services

Although the significance of ecosystem services and adopting an Ecosystems Approach[14] was recognised in the specification for CS2007, the importance of this topic for policy has grown since that time. Stimulated, in part, by the Global Millennium Ecosystem Assessment[15], and subsequent initiatives such as *The Economics of Ecosystems and Biodiversity (TEEB)*[16] and the revision of the System of Integrated Economic and Environmental Accounts (SEEA)[17], ecosystem services and an Ecosystems Approach are now an important feature of current UK and country-level policies, and the research activities that underpin them. The 2011 UK National Ecosystems Assessment (UK NEA), for example, helped shape recent policy across all the devolved administrations, most notably expressed in England, through the *Natural Environment White Paper* (2011), the *Biodiversity Strategy* 2020 (2011), and the *National Planning Policy Framework* (2012). In Wales, the National Environment Framework, *A Living Wales*, adopts an Ecosystems Approach as the primary framework for environmental policy. In Scotland, the country's first *Land Use Strategy* (2011) makes explicit reference of the Ecosystems Approach and the need to understand ecosystem functions as a core principle, as does the current review of the 2004 Scottish Biodiversity Strategy.

The need to explore the multi-functionality of ecosystems and the trade-offs between different ecosystem services was acknowledged in the design of CS2007, especially in the 'Integrated Assessment' work package, which aimed to make an analysis of the drivers and pressures of change, their effects on 'the UK countryside and their implications for ecosystem goods and services'. To reflect this aim, two hypotheses (ES1 & ES2) have been

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[14] It should be noted that the literature contains a number of variations in terminology designed to emphasise different aspects of the idea. Reference is often made to an 'ecosystem-based approach', a term used mainly to promote holistic thinking in the design of specific management strategies for natural resource systems. More commonly the term 'Ecosystem Approach' is employed. The latter originates from the Convention on Biological Diversity (CBD) and emphasises the higher-level or more strategic issues surrounding decision making. Defra, in a recent publications (e.g. Defra, 2007, updated Action Plan 2010), refer to **an** 'Ecosystem**s** Approach', using the plural to emphasise that no prescriptive methodology is implied. In this report we employ the terminology used by Defra – but see no substantive difference in the way the two ideas are conceptualised. In this report we also avoid abbreviating the term 'Ecosystems Approach' as 'EA' because it can be confused with the abbreviation for the Environment Agency; the IUCN CEM suggests using EsA as an alternative (written communication, 2007).

[15] MA (2005): Millennium Ecosystem Assessment Island Press, Washington, D.C., http://www.maweb.org/

[16] http://www.teebweb.org/

[17] EC 691/2011 European Environmental Economic Accounts.

formulated in this section of Table 2.2; the first is general in character while the second reflects more expectations built on the potential significance of the Integrated Assessment Work Package of CS2007.

2.3.3 Landscape

The national policy agenda for landscape planning and management is shaped by the European Landscape Convention (ELC)[18], which came into effect in the UK in 2007. The Convention recognises that all landscapes matter, be they ordinary, degraded or outstanding. It puts emphasis on the whole landscape and all its values and is forward looking, recognising the dynamic and changing character of landscape. Specific measures promoted by the Convention include:

- The identification and assessment of landscape, and analysis of landscape change, with the active participation of stakeholders;
- Setting objectives for landscape quality, with the involvement of the public; and,
- Improved consideration of landscape in existing and future sectoral and spatial policy and regulation.

One of the key policy tools for guiding landscape planning and management is the well-established process of Landscape Character Assessment (and the emerging method of Seascape Character Assessment for areas along the coastal zone and offshore) which is supported by guidance from the relevant country agencies. This tool is implemented at a range of levels – from national (e.g. the National Character Areas of England; Regional Character Areas of Wales), to assessments at the individual local authority level, where it is used to support planning policy in line with national planning guidance issued by the devolved administrations.

In Table 2.2, we suggest that there are no relevant expectations appropriate for the coastal zone, but that for the terrestrial environment, two can be postulated, both relating to the use of CS data in the characterisation process. The first (L1) relates to the use of CS Field Survey data to report on the condition of specific landscape features, while the second (L2) relates more to the use of LCM to characterise the broader patterns of landscape structure and context.

2.3.4 Sustainable agriculture and agri-environment schemes

Alongside technology, the EU Common Agricultural Policy (CAP) has been a key driver of land use and management in the farmed landscape of the UK. A substantial reform of the CAP took place from 2004 that replaced sectoral payments with the Single Payment Scheme that was 'decoupled' from ongoing production levels. Subsequently, a 'Health Check' of the CAP was made by the European Commission in 2008, which led to minor

[18] http://www.coe.int/t/dg4/cultureheritage/heritage/landscape/default_en.asp

adjustments to the operation of the policy, prior to what is expected to be a more significant reform to take effect sometime after 2013. In the context of CAP, therefore, there has been a significant and broad policy requirement to design schemes, to provide guidance and monitor outcomes. Over the last decade there have also been growing concerns about long term global food security, triggered by rising demand for food from higher and more affluent populations and the impact of climate change on the stability of food production. The 2011 Foresight *Future of Food and Farming* Report[19], for example concludes that given global trends in population and nutrition, the same amount of land will be required to grow substantially greater amounts of food through, what has become known as, 'sustainable intensification'. The review of the Environmental Audit Committee[20] emphasise that for the UK, the challenge is to define what this term means in practice, and note that it must be more than simply increasing yields; policy, they suggest, must take account of social and environmental impacts of the food system. The impact of agricultural change is therefore likely to continue to be a significant policy concern into the future.

Agricultural policy and practice are a major influence on many of the other topics considered here, including biodiversity, water quality and soils. There is therefore a close read-across between this and these other sections.

Estimates of the changing extent and condition of farmland habitats and landscape features

The stratified sampling strategy used by the Field Survey makes it particularly suitable for monitoring the stock and condition of the more common land cover types. The extensive nature of farmed landscapes in the UK makes the Survey a particularly important source of information on the changing extent and condition of farmland habitats and landscape features. The results of the 1990 Survey were particularly influential in the formulation of the Hedgerow Regulations in England and Wales in 1997, for example, and subsequent Surveys have allowed their policy effectiveness to be monitored. Reporting on the other widespread Priority Habitats associated with the farmed landscape (see Biodiversity, section 2.3.1) is also an area where CS2007 can make a potential contribution. These possibilities form the basis of hypothesis SA1 in Table 2.2.

The influence of agri-environment schemes

The design and monitoring of agri-environment schemes to deliver specific environmental outputs has been a significant feature of the CAP since the 1980s. These schemes have been delivered in England, Scotland and Wales through a separate but evolving set of Rural Development Programmes, initially between 2001 and 2006, then for the period from 2007 through to 2017. Thus in England the Environmental Stewardship with its Entry Level and targeted Higher Level arrangements has now replaced the Environmentally

[19] http://www.bis.gov.uk/assets/foresight/docs/food-and-farming/11-546-future-of-food-and-farming-report.pdf
[20] http://www.publications.parliament.uk/pa/cm201012/cmselect/cmenvaud/879/87908.htm

Sensitive Area and Countryside Stewardship Schemes. In Wales, from 2012 Glastir has replaced Tir Gofal and Tir Cynnalen, while in Scotland Rural Development Contracts have replaced the Rural Stewardship Scheme. Under such schemes key monitoring requirements include:

- Conserving natural wildlife;
- Protecting natural resources;
- Adapting farming methods around features on farmed land, to enhance biodiversity and resource protection;
- Maintaining and enhancing landscape quality and character;
- Promoting sustainable forest management;
- Avoiding marginalisation; and,
- Contributing to climate change mitigation.

Although the EU provides guidance, the question of how to monitor the effectiveness of all such schemes operationally represents a major challenge at the country level, especially given the cross-cutting nature of the requirements. In England, for example, a systematic programme of environmental monitoring of the Environmentally Sensitive Area and Countryside Stewardship Schemes[21] was carried out, but since then there has been less detailed surveillance of outcomes because of the difficulty of detecting the impact of un-targeted schemes across wide geographical areas. The Scottish Government is currently funding a project (2011-14) to develop a methodology for monitoring the outcomes of selected agri-environment measures. As the tender for CS2007 suggests, the Survey was seen as making a potential contribution to this topic area, with LCM helping with the assessment of landscape character and hence the targeting of agri-environment schemes (see section 3.2.3), and the Field Survey data helping assess Environmental Stewardship and generate indicators of change in the agricultural landscape via the, then, Agriculture Change and Environment Observatory. Both these kinds of application are therefore reflected in hypotheses SA2 and SA3 in Table 2.2.

2.3.5 Water Resources

In Table 2.2 this policy area is split into three sub-topics, of which the first two are best considered together.

Contextual and baseline information on water bodies and aquatic habitats and factors influencing water quality and aquatic biodiversity

Policies in the UK for this sub-topic are largely shaped by the EU Water Framework Directive (WFD - 2000/60/EC), which requires member states to protect and enhance the quality and quantity of water bodies. Protection should be delivered through the River Basin Management Plan, which member states must produce for each of its river basin districts. In England, the Environment Agency is responsible for producing the River Basin

[21] For instance the ADAS vegetation and landscape monitoring reports of the ESAs.

Management Plans for the 10 districts in England and Wales, while in Scotland the same responsibility falls to the Scottish Environment Protection Agency. Such plans involve monitoring the status of water bodies against the objectives set within the WFD, which seek to:

- Prevent deterioration in status for water bodies;
- Achieve good ecological and good surface water chemical status in water bodies by 2015;
- For water bodies that are designated as artificial or heavily modified, aim to achieve good ecological potential by 2015;
- Comply with objectives and standards for protected areas where relevant; and,
- Reduce pollution from priority substances and cease discharges, emissions and losses of priority hazardous substances.

Successive Countryside Surveys have reported on trends in biological and chemical water quality, the biodiversity and habitat structure of headwater streams and ponds, using methods that are consistent with the national environment agencies, and so these expectations have been used to generate hypotheses W1 and W2 in Table 2.2.

Water resource and flood models

This policy topic area is divided between water resources (providing sufficient water for the needs of people, the environment and business) and flood risk management (dealing with excess water). The Water Resources Strategy for England and Wales, *Water for People and the Environment* was published in March 2009 by the Environment Agency, replacing the earlier 2001 framework. The Scottish Government have recently consulted on proposals for a Water Resources Bill, based on the 2011 document *Building a Hydro Nation*. In England, the Flood and Water Management Act 2010 requires the Environment Agency to develop, maintain, apply and monitor a strategy for flood and coastal erosion risk management. The *National Flood and Coastal Erosion Risk Management Strategy for England* was published in 2011, and this requires the higher tier local authorities in England to prepare Local Flood Risk Management Strategies. In Wales the National Strategy for Flood and Coastal Erosion Risk Management was published in 2011, and in Scotland the Flood Risk Management (Scotland) Act 2009 was enacted in June 2009. The development of policies for both areas depends, in part, on a basic understanding of land use and land cover patterns, and so to reflect this, two further hypotheses for water have been developed around LCM in Table 2.2 (W3 and W4).

2.3.6 Soil

Although the EU Thematic Strategy for Soil Protection[22] was published in September 2006, proposals on the Soil Directive (COM(2006)232) are still being discussed. In the UK, current strategies are separated across the three countries and represented by the

[22] http://ec.europa.eu/environment/soil/three_en.htm

Natural Environment White Paper in England (which has replace the *England Soils Strategy* 2009 adopted by the previous administration), the *Scottish Soils Framework* (2009) and the *Welsh Soils Action Plan* (2008), which was a consultation document. In each case important policy requirements involve understanding term changes in physical, chemical and biological soil quality at national and regional scales, and the identification and management of the drivers of change. Since soils information has, at various times, been collected as part of Countryside Survey, these data can potentially contribute in these areas of concern. The CS2007 tender document specifically notes that the Survey could contribute to the national programmes for soil quality monitoring and evaluation, by quantifying trends in acidification and eutrophication of shallow soils, deposition of heavy metals, soil carbon and soil biodiversity. In Table 2.2, these expectations are captured in hypotheses S1 and S2, although clearly given the cross-cutting role of soil other contributions might be identified through the outputs of CS for biodiversity, ecosystem service, sustainable agriculture and forestry, water and air quality.

2.3.7 Sustainable Forestry

Forestry policy in the UK is set out in the Forestry Commission's Corporate Plan for England (2012-13), the *Scottish Forestry Strategy* (2006) and *Woodlands for Wales* (2009). Although monitoring data have been, and continue to be, provided by the Forestry Commission (FC), through the National Inventory of Woodland and Trees (NIWT) (1995-1999) and the ongoing National Forest Inventory (NFI), Countryside Survey has also been an important source of information about woodlands since 1978. It has provided information on trends in plant diversity within woodlands, habitat conversion to and from woodland (providing information on the development of new woodland sites which the FC surveys do not do) and soil quality (especially soil carbon) within woodlands. CS also provides information small woodland areas (below the 2ha limit of the NIWT and the 0.5ha limit of the NFI) and on individual trees outside of woodlands, especially those associated with linear features. Given the design of LCM, it is anticipated that these data can provide additional contextual information on woodlands relating to ecological networks that may assist in the development and implementation of woodland policy by targeting woodland grant schemes. These possibilities have been captured in two hypotheses (F1 & F2) in Table 2.2, both of which stress the linkage to the National Forest Inventory.

2.3.8 Urban Development and Infrastructure

The field component of Countryside Survey was designed to provide information about rural landscapes, and the sampling strategy specifically excluded dense urbanised areas. Nevertheless, the Survey can provide some information on the impact of development, in that the stock and change in the Built-up and Garden Broad Habitat is mapped. In addition, some of the vegetation plots recorded in the Field Survey are located on road-side verges, so that the biodiversity associated with elements of the transport

infrastructure can be determined. Thus historically the Field Survey has therefore been able to provide national estimates of habitat types lost to urban development in the rural domain, and for the future the development of LCM offers the prospect that urban areas can be investigated in more detail to determine the extent of green space and possibly the changes in the extent of artificial surfaces (surface sealing).

Thus there are reasonable expectations that CS can contribute in terms of better understanding the extent of land conversion to urban development, for example, supporting the recently adopted *National Planning Policy Framework* in England. This policy framework encourages the sustainable use of land by protecting Green Belts and by promoting brownfield developments; similar policies are set out in the *Scottish Planning Policy* and *Planning Policy Wales*.

It is also to be anticipated that CS can contribute to the development of policies on green infrastructure more generally. The European Commission is currently developing evidence to support a Green Infrastructure Strategy. In England Planning Policy Guidance 17, which sets out expectations on the identification of green space in settlements, was replaced in 2012 by the National Planning Policy Framework which emphasises the importance of positive planning for the creation, protection, enhancement and management of networks of biodiversity and multi-functional green infrastructure. Such policies reinforce the idea of Accessible Natural Greenspace Standards (ANGSt) that have been prepared by Natural England and CCW to guide local authorities and others on the extent of green space that should be available to communities.

Both sets of expectations, on monitoring development and Green Infrastructure, are reflected in the two hypotheses for Urban, shown in Table 2.2 (U1 & U2).

2.3.9 Air Quality

International policy on air quality is established by the Convention on Long-Range Transboundary Air Pollution and the protocols that have been developed from it, such as the Gothenburg Protocol. The *Air Quality Strategy for England, Scotland, Wales and Northern Ireland* (2007) has identified gaps in the understanding of how air pollution affects ecosystems, and as the tender for CS2007 notes, it is anticipated that the Survey can provide information on the condition and quality of terrestrial habitats, soils and headwater streams in relation to the impact of acid and nitrogen deposition, ozone, radionuclides and heavy metals. Data from earlier Countryside Surveys has contributed to modelling of ecosystem responses to air pollution, thereby contributing to UK commitments to deliver model outputs on target loads for acidity and nutrient nitrogen, via the critical loads framework. In the light of such work two hypotheses have been identified in Table 2.2, relating to monitoring the impact of changes in air quality on soils and vegetation via the Field Survey programme (AQ1), and providing input to critical loads modelling based on both the Field Survey and LCM components (AQ2). However, it

is important to note that the assessment in this topic area needs to be looked at in the context of judgements made in relation to soils and water.

2.3.10 Climate Change

Climate Change is a major area of policy concern, with requirements in the areas of land use change and emissions monitoring, the development of adaptation strategies and the monitoring and targeting of mitigation measures.

Land use change and GHG emissions

In December 2008, EU leaders and the European Parliament agreed a unilateral commitment to reducing greenhouse gas (GHG) emissions by 20% by 2020. The EU has made a commitment to increase this target to 30% for the period beyond 2012 if there are comparable targets from other developed countries and adequate action by developing countries. The Climate Change Act 2008 introduced a binding reduction target requiring the UK to reduce its emissions by at least 80% by 2050 against 1990 levels. It also introduced a long-term framework for managing emissions through a system of national carbon budgets and caps on the total quantity of greenhouse gases permitted in the UK over a specified time. The UK Climate Change Plan (2010) sets out measures for climate change mitigation to meet the Climate Change Act target, as well as measures for adaptation to climate change. Scotland has a similar legislative driver, through the Climate Change (Scotland) Act 2009; Wales is bound by domestic and external legal targets.

Land cover data from the field component of previous Countryside Surveys have been the main source of information in the land cover and land use change component of the National Inventory of Greenhouse Gases. The inventory is calculated on the basis of the net changes in emissions resulting from land cover change. In drawing up the specification for CS2007 it was anticipated that it would continue to provide the *de facto* national estimates of land cover change from which carbon emissions would continue to be calculated. It was also suggested that analyses of the data for land cover change, vegetation and soil carbon generated by the Field Survey would be an important supplement to other data, and provide estimates of emissions that could be attributed to policy interventions. These expectations are therefore represented in hypotheses CC1 and CC2 shown in Table 2.2.

Environmental adaptation and mitigation

Policy for climate adaptation is currently being led by Defra, and will build on the work of the UK Climate Impacts Programme (UKCIP) and independent advice from the Advisory Committee on Climate Change. In England, the Environment Agency has taken on a new role as the Government's delivery body to help organisations adapt to climate change, and the recent *National Planning Policy Framework* now requires local planning authorities to adopt proactive strategies to adapt to climate change, taking account of

flood risk, coastal change and water supply. The Welsh Government's Climate Change Strategy, was published in 2010, and outlines its approach to reducing emissions, and sets out its adaptation framework and delivery plan that is designed to make Wales more resilient to the impacts of climate change. Scotland's Climate Change Adaptation Framework, which was published in 2009, has been assessed by the Adaptation Sub-Committee for the Advisory Committee on Climate Change in 2011.

The development of renewable energy sources is particularly important in the area of mitigation planning. In this sector the policy agenda is being shaped by the EC Renewable Energy Directive 2009/28/EC, implemented in the UK through the Energy Act (2011). The renewable energy target for the UK is 15% by 2020 across all electricity, heat and transport sectors. To assist, UK Government and the Devolved Administrations have published a 2020 Route Map for Renewable Energy.

For the development and assessment of adaptation and mitigation policy, a good understanding of land cover and the way it is changing is essential. Thus it may be anticipated that LCM will provide some of the underpinning data in these areas (see hypotheses CC3 and CC4, Table 2.2) by providing empirical information on the stock and distribution of land cover elements and the baseline information needed for modelling studies.

2.3.11 Access to nature

Access to the Countryside and the Development of Green Infrastructure

Access to nature is not one of the policy topics where CS2007 can be expected to make a contribution, given the original tender documents, but it has grown in importance as an issue. Although it overlaps to some extent with topics already discussed, such as the analysis of some of the cultural aspects of ecosystem services, it is also worth separating out the topic to ensure that it is fully covered. In England, the Natural Environment White Paper aims to improve access to nature in local neighbourhoods. One of its proposals is to create a Green Infrastructure Partnership to strengthen ecological networks and improve communities' health and quality of life. An important input to such thinking was the results of the Marmot Review which made a strategic analysis of health inequalities in England. A key finding was the importance of access to nature and open spaces for physical and mental health and well-being. In Wales, this view is supported in policy through *A Living Wales*. In Scotland the importance of public access to the countryside is emphasised in the *Scottish Planning Policy*[23] document published in 2010, and supported by the work of Scottish National Heritage[24]. It is anticipated (see hypothesis AN1, Table 2.2) that LCM2007 will be an important resource that will help take such polices forward, by providing contextual information on land cover that can potentially be used in

[23] http://www.scotland.gov.uk/Publications/2010/02/03132605/0
[24] http://www.snh.gov.uk/land-and-sea/managing-recreation-and-access/access-and-recreation-policy/

conjunction with data on publicly accessible green space and on public health inequalities to address policies on outdoor recreation and public health.

Public understanding of biodiversity

The importance of general public awareness of the value of biodiversity and what they can do to maintain and restore it was emphasised in the UN Convention on Biological Diversity. Most recently the issue has been re-affirmed in the Aichi Targets for biodiversity, which commits signatories to ensure that *by 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably.*[25] In the UK such thinking is reflected in each of the country level biodiversity strategies. Thus although it was not flagged up explicitly in the CS2007 Tender, the subtopic has been included in this analysis to ensure that this important policy dimension is considered. In line with NERC policy, CEH do recognise the need to make information understandable and available to the public, and in monitoring key aspects of changes in the wider countryside, could potentially play a significant role and so we have included hypothesis AN2 in the evaluation matrix.

2.4 Testing the Evaluation Framework

Given the important role that the hypotheses on potential uses of CS play in the evaluation process, the finalised versions presented above were formulated through a deliberative process, involving consultation with a number of experts. As noted in Section 1.3.2 this was done in a workshop to which a number of policy advisors familiar with CS and scientists from CEH were invited. Seventeen people attended the workshop; the invitations were made to ensure that there was at least one person present with expertise in each of the broader policy topic areas used to construct the evaluation matrix (see Appendix 2 for agenda and participants).

The meeting had two main purposes. First to ensure that the hypotheses (see Table 2.2.) represented a set of expectations that could fairly be used to examine the applications of CS2007 via the evidence available. Second to reflect upon current applications and consider how policy needs might be different in the future. The material generated on future needs will be discussed in Part 5 of this Report. At this stage it is most appropriate to focus on the methods used for the assessment of current outputs from CS.

After a presentation was made on the analytical approach being used for this Study, delegates were asked to work in groups to review the coverage of policy topic areas and the hypotheses that relate to them, and to suggest any changes in content or scope. Delegates were encouraged to reject any of the draft hypotheses that they thought were unfair or untestable, and suggest alternatives that might improve the effectiveness of the

[25] http://www.decadeonbiodiversity.net/aichi-targets

evaluation framework. They were also asked to consider the character of the hypothesis, in terms of the three-fold typology described in section 1.3.1, namely:

- concerning whether they could be expected *a priori* given the design of CS2007 (Type 1);
- whether they arose from a more general opportunity to exploit CS2007 outputs given the wider policy needs that existed at the time of the Survey (Type 2); or,
- whether they represented new and unforeseen opportunities to use the evidence from CS, prompted by new policy requirements that had developed since the inception and publication of CS (Type 3).

Despite the difficulty of distinguishing between hypotheses of types 2 & 3 in some situations, delegates were asked to try to retain them, because evidence in relation to the latter could be used to test claims about the flexibility of the CS data resource to address unexpected issues in novel ways.

Although the workshop attempted to cover all policy topic areas, it was felt that two areas (Landscape and Access to Nature) were potentially under-represented. Thus the workshop materials outputs from the discussions were explored via a telephone interview with a policy advisor with expertise in these areas. Altogether the workshop and interview process considered 32 draft hypotheses. Five were accepted in their original format, and two were recommended for deletion as being inappropriate as a basis for making an evaluation. Textual changes were suggested for most of the other hypotheses and three additional propositions were put forward. As a result the 33 finalised hypotheses presented in Table 2.2 were developed as the basis of the evaluation matrix. These discussions also confirmed the suitability of the division of policy topics and sub-topics used as the framework for the evaluation.

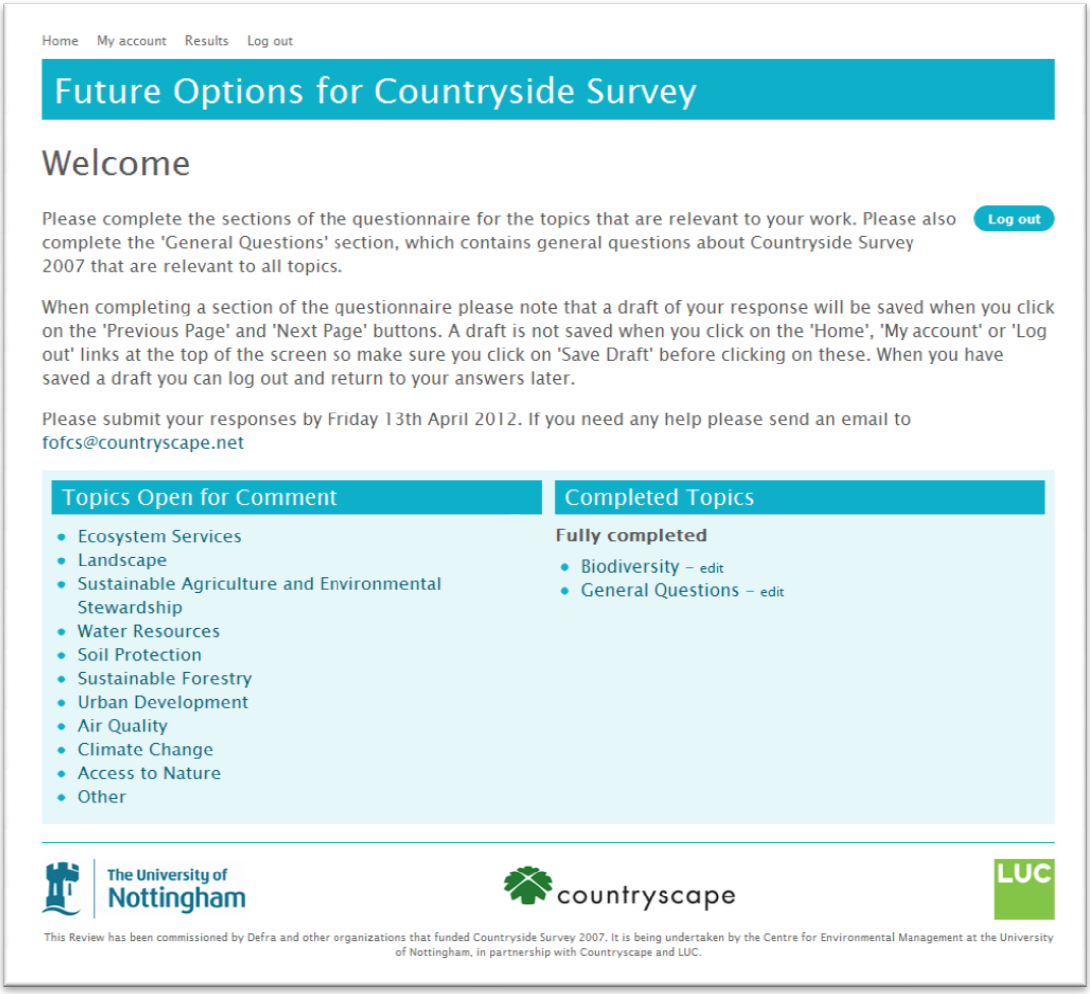
2.5 Creating the Evidence Base

Two major sources of evidence have been used to test the hypotheses discussed above: the results of an on-line questionnaire survey, principally with members of the core-funding organisations; and, analysis of the aims and objectives of policy relevant project work that has been undertaken using CS2007 data.

2.5.1 The On-line Questionnaire Survey

The structure of the on-line questionnaire mirrored that of the evaluation matrix. Given that the objective was to assess evidence of policy use, it was felt more appropriate to structure the questionnaire around a set of recognisable policy topics rather than the specific outputs from CS2007. It was also felt that it was important that respondents should not be hampered by a lack of any detailed understanding of the design of CS and the data it produces, because some policy applications may be several steps removed from the analysis of the data.

Figure 2.1: Welcome Page for the on-line Questionnaire Survey of Policy Requirements and CS



Note: Page shows how users were able to keep track of which parts of the questionnaire had been completed – in this case the biodiversity and general questions had been started but not submitted.

The questionnaire was therefore divided up by the 11 policy topic areas and their sub-topics described above (Figure 2.1); different questions were asked in each policy area depending on whether people said they were users of CS or not. An additional set of general questions about CS was included which could be completed if the respondent wished. Copies of all the questionnaire material are provided in Appendix 3. In general terms, each of the policy related sections followed the same layout, which was designed to explore the following key issues from the information provided by respondents about current needs:

- Does the pattern of use of CS2007 data and reporting outputs revealed from the questionnaire correspond to the anticipated policy use (i.e. the policy use envisaged when CS2007 was commissioned)?
- What new areas of policy use have emerged since the design and publication of CS2007?

- Given the importance of the different policy topics suggested from the questionnaire survey, how was CS2007 rated in terms of fulfilling user needs? What kinds of limitation were identified in terms of using CS data?
- How was CS2007 used, for further primary analysis of raw data or via reports?
- How was CS2007 used in conjunction with other data? Was it seen as a primary source or did it fulfil an ancillary or complementary role?
- How effective were the data curation and reporting activities associated with CS2007?

In order that the respondents were only approached once for information, the opportunity of the questionnaire was also used to elicit their views on future needs[26]. Thus at the end of each policy related section people were asked to indicate:

- What new policy topics or policy issues were likely to shape their work?
- What limitations to any future CS might be foreseen?
- What modifications to CS outputs are needed to address these emerging needs?
- How CS might link or relate to other data sources that are likely to be important in the future, and was there scope for combining existing or new CS outputs with other evidence sources?

The questionnaire contained both closed and open questions; the structure allowed people to rate CS effectiveness in relation to different issues and provide free text comments to explain their thinking. As the welcome screen shown in Figure 2.1 illustrates, respondents could select the topic areas that were relevant to their work, and save and edit their responses before they were finally submitted. The questionnaire survey was opened on 19th March, 2012, and closed on 13th April, 2012. Participation was encouraged largely by invitation. The members of the Steering Group for this Project were asked to identify people from within their organisations who should be approached; as a result 156 people from the core organisations were invited to participate by e-mail. An invitation to participate was also sent out by CEH to a wider circle of 550 who had registered as a data user on the CS2007 website. Altogether, 86 individuals came forward from the core-funding organisations who provided 147 responses across all the policy topic areas. Twenty three individuals from other types of organisations also took part; they provided 43 responses. There were more responses than respondents because some people provided information for more than one topic area.

2.5.2 The analysis of policy relevant project work supported by CS2007

To ensure that as wide a range of evidence was considered as possible, the questionnaire survey was supported by an analysis of potentially relevant projects that had exploited the data generated by CS2007. Nineteen projects were identified as potentially relevant

[26] The analysis of this will be reported in the final draft Report

by CEH, who are the custodians for the CS data, in that even if the work involves other organisations it is generally done in partnership with them. A simple template (Table 2.3) was developed to collect information from the principal investigators for each project; in cases where an e-mail response was not forthcoming, a telephone interview was arranged.

Table 2.3: Template used to collect project information

	Project name and contact:
1	Relevant project report/link
2	Approximate start and end date
3	Project aims & objectives
4	Policy customer(s) (Sponsors)
5	Policy requirement(s)
6	Are CS 2007 data used in project (and type of analysis)?
7	Is CS the main source of data for this project? Please indicate of results of earlier surveys are also being used. What other sources of evidence are being used?
8	Key findings (if available)
9	Would a future CS be needed to continue the support for this policy area?
10	In what ways might future CS be modified to improve the utility of the data needed to support the science in this policy area?

Part 3 CS2007: Meeting Current Policy Needs

3.1 Introduction

This Part of the Report presents the analysis of the extent to which Countryside Survey (CS) meets current policy needs using the results of the questionnaire survey and the review of current project work. Before the evidence is considered in detail, however, it is necessary to think about the nature of the material collected more closely so that the kinds of judgement that can be made using it are seen in context.

The first key limitation to consider is while a substantial number of questionnaire returns were generated, there was no intention to collect a statistically representative sample. A similar point can be made about the investigation of the projects using CS2007. Rather, given the way the invitations were made and the kinds of people targeted, it is more appropriate to regard the material they provided as the views of a set of 'key informants'. That is, people (at least from the core-funding organisations) who can be regarded as having significant insights into the policy issues being considered, who have an understanding of the different sources of evidence that are available (including CS), and an appreciation of how evidence is used in the policy process. Normally the views of key informants are gained through 'softer' techniques such as interviews or participant observation, and so in that respect this Study differs from what might be expected in qualitative research. Nevertheless, the material can be used to investigate the uses of CS in a systematic and deliberative way that will ensure that evidence-based judgements can be made transparently. The questionnaire approach was used because the number of key individuals that needed to be contacted was potentially large and the time available to collect their views was limited. The combination of open and closed queries in the questionnaire, and in the survey of projects, meant that there was an opportunity for these individuals to fully document their views. An initial open question on their work responsibilities was used to check the position of the respondent and confirm their 'key informant' status.

A second, and related issue affecting the kinds of judgement we can make given the nature of the material available, is that although the responses were supplied by an individual, in some cases the participant indicated that a set of collective views was being presented that represented the opinions of their group or organisation. The inclusion of returns of this type in the analysis of the questionnaire survey reinforces this notion of the evidence collected coming from people with a special insight and understanding, who are able to provide a rich picture of the situations we need to investigate.

The fact that the evidence collected represents the views of a set of key informants has implications for the way we have analysed the material and drawn conclusions from it. This is the third key issue that we need to consider before the results are discussed in detail. When constructing the evaluation matrix described in Part 2, the notions of a

hypothesis setting out a reasonable expectation for CS2007 was used deliberately, to emphasise the need to make an evidence-based judgement of some kind. However, conclusions about the contribution of CS2007 cannot sensibly be based on any statistical test of uptake, because the people consulted have different requirements. Given the aim of this study, the discovery of only one significant use of the data would be sufficient to establish its utility in a particular area of policy. Thus, in what follows, we present a qualitative analysis of the hypothesis about potential use of CS2007. It involves scrutinising the survey materials to identify any evidence that would allow us to reject the null proposition of 'limited or no impact', in favour of the alternative expressed in the set of hypotheses that form the basis of the evaluation matrix.

Given the qualitative nature of the analysis, it is not appropriate to simply 'accept' or 'reject' the hypotheses used to make the evaluation, but to make a more nuanced kind of judgement. Thus, for the questionnaire results and the review of project work, the responses were read one by one, and the evidence provided was judged as providing different strengths of support for the hypotheses using the following terminology:

- **Strong:** where the respondent documented a clear policy-based evidence requirement for which CS2007 data was an essential, pivotal or critical source;
- **Partial:** where the respondent indicated a general evidence need that was supported by CS2007 alongside other sources of information. To be rated as partial the evidence needed to suggest that the standing of the CS2007 data was at least as important as the other sources;
- **Weak:** where the respondent indicated a general evidence need and cited the usefulness of CS2007, but that the information was used alongside other data to merely inform or check views; and,
- **None:** all responses were initially coded as providing no evidence in support of the relevant hypotheses, and this judgement was retained in the absence of evidence to the contrary; and
- **Equivocal:** where the evidence provided was ambiguous or conflicting, or where it did not clearly relate to the hypotheses being tested in that policy area.

Where there were several sub-topics that needed to be considered for a given policy area all of the answers and comments provided by an individual were looked at, and the responses coded using the strongest category of support identified across the sub-topics. This meant that there was no 'dilution effect', and that any evidence of strong support would be preserved in the final more aggregated analysis.

While coding the responses at the individual or project level, an attempt was made to assess where in the policy cycle any particular use of CS2007 data seemed to lie. Given the limited amount of information that some respondents provided this was not always straightforward, and so the stages used were necessarily highly simplified. Thus the strongest evidence about the contribution responses was coded as:

- **Influencing others:** where evidence from CS2007 was used primarily to describe an issue or situation;
- **Framing the issue:** where evidence from CS2007 was being used in an analytical way and the research used to develop an understanding of a problem or situation;
- **Testing the options:** where evidence from CS2007 was being used to compare the policy alternatives or to test guidelines;
- **Judging policy success:** where evidence from CS2007 was clearly being used to assess the effectiveness of policy implementation; and,
- **Reporting:** where evidence from CS2007 was being used to provide feed back and report progress towards defined policy targets.

Two further categories were used to code responses, namely **'Indeterminate**' and '**Unspecified**'. The latter was taken as the default position, and retained if no evidence was provided in the response. The coding 'Indeterminate' denoted those responses where no clear assignment to a policy cycle stage could be made.

All of the questionnaire responses and project reviews, and the coding attached to them, are available as Excel spreadsheets. The analysis of evidence that follows is structured around the results of the questionnaire survey because this is the more substantive source. However, reference will be made to the outcomes of the project review where appropriate. For reference, these are summarised in Appendix 4.

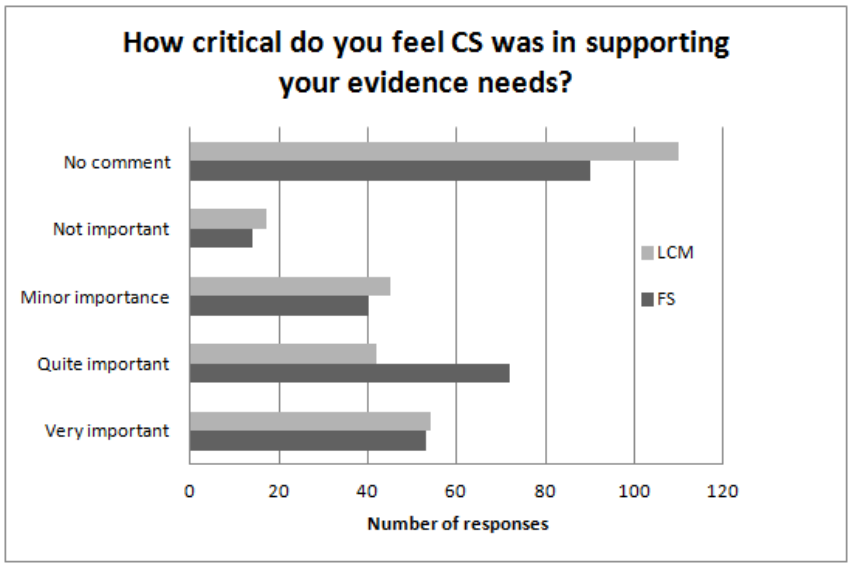
3.2 Headline Results from the Questionnaire Survey

Given that CS2007 has a wide scope, and has many potential uses, it is appropriate to begin the analysis with an overview of the results by taking the questionnaire responses as a whole. For each of the policy topics and subtopics, views were invited about the 2007 Field Survey (FS) and Land Cover Map 2007 (LCM) separately, and so it is possible to disaggregate these results from the outset.

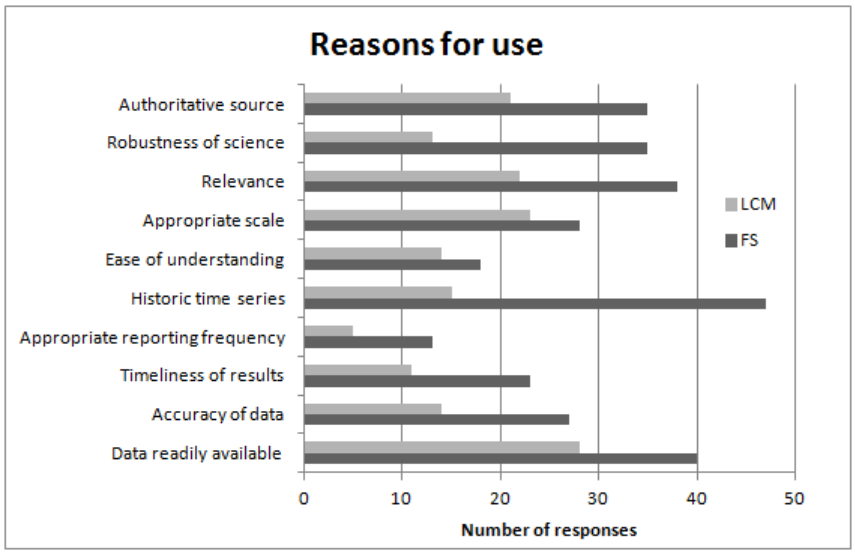
Figure 3.1a shows the collective view of those who had used CS in some form, when asked how critical FS and LCM were in meeting their evidence needs. Setting aside the people who chose not to make a comment, most key informants felt that the Field Survey was quite important for their work. In contrast, a larger proportion found Land Cover Map to be 'very important'. The reasons for using the data are summarised in Figure 3.1b. For the FS the historic time series that it represented was the most frequently cited characteristic, followed by its easy availability, relevance, robustness and the authoritative nature of the source. For Land Cover Map, availability was the most often cited characteristic relating to use, followed by reasons of scale, robustness and authority.

Figure 3.1: Summary of questionnaire responses across all policy topics and subtopics

a.



b.



C.

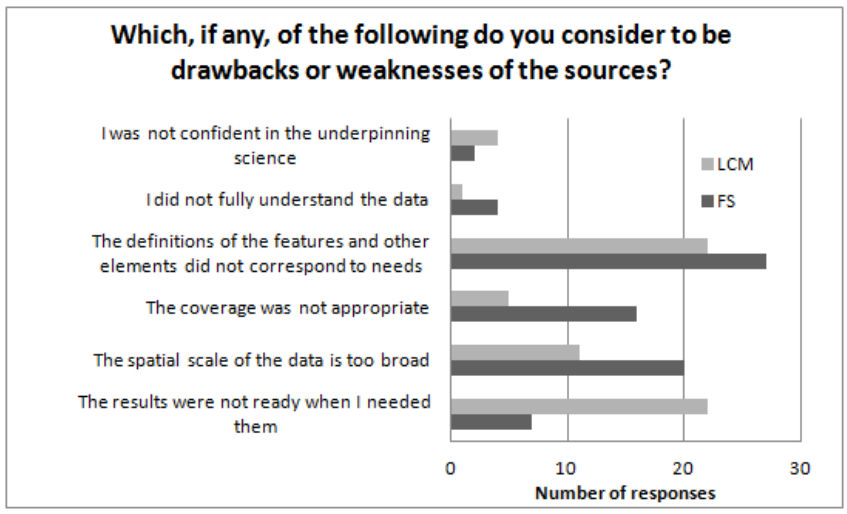
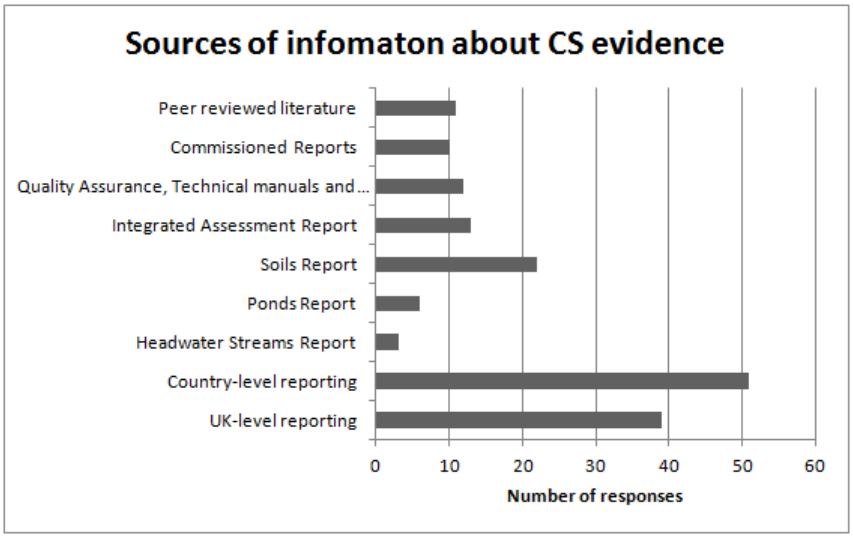
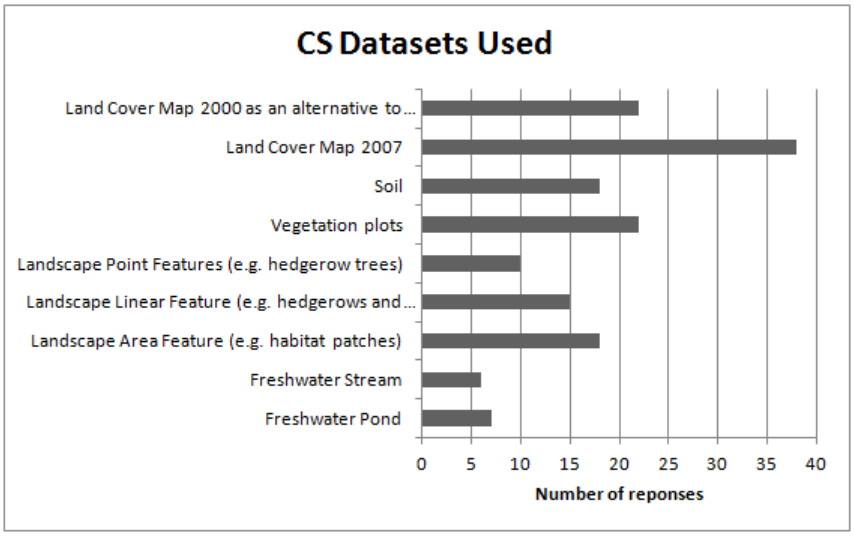


Figure 3.1, cont: Summary of questionnaire responses across all policy topics and subtopics.

d.



e.



When asked about what the drawbacks of each sources were (Figure 3.1c), the majority of respondents suggested that it was the way the definitions of features and other elements matched their needs that was the major shortcoming of both the FS and LCM. There was an important difference between the two sources for the next most significant factor. In the case of the FS, people felt that its spatial scale limited its usefulness. For LCM it was that the results were not ready when required. Both results are important, in that it is widely acknowledged that the sample-based characteristic of the FS means that it is not appropriate for issues that require analysis at local or fine spatial scales. These results seem to confirm this conclusion, although a deeper look at the analysis is required to identify for which policy areas this limitation is most significant. The finding that the release timing of LCM was a limitation for many users is perhaps to be expected, because

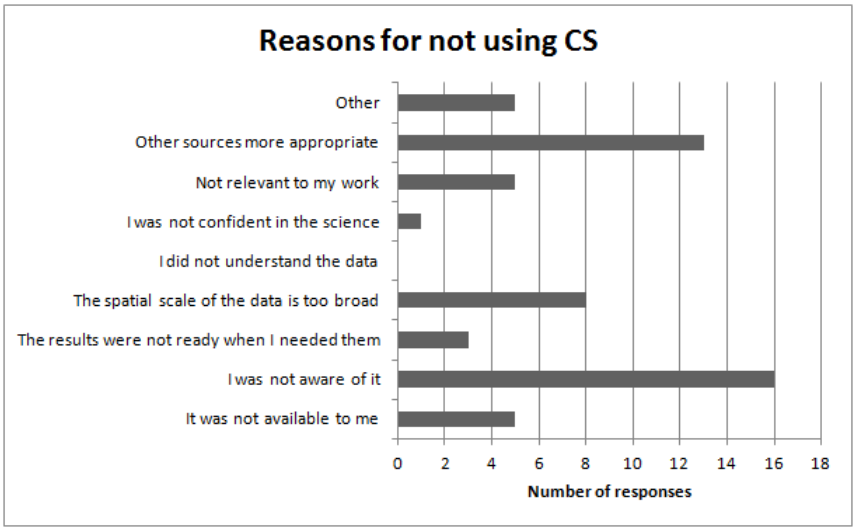
there was a significant delay in making it widely available. Also the fact that it was only made public six months before the start of the review has meant that usage has probably been limited; the extent to which future use will be hindered by this is difficult to assess.

Figure 3.1d also suggests that the country-level reporting of CS2007 (which dealt entirely with the results of the Field Survey) was the most frequently used source of evidence, followed by the UK report and the soils report. However, in terms of which dataset from within the CS portfolio was the most frequently used source, LCM2007 was cited nearly twice as often as the next most often used sources, namely 'LCM2000 as an alternative to LCM2007 and the vegetation plot data (Figure 3.1e).

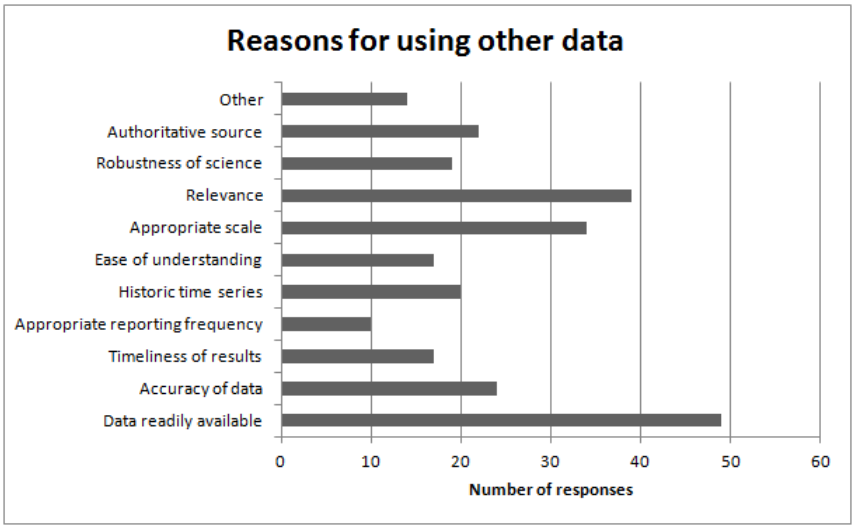
A summary of the responses of the reasons why people did not use CS data for their work is shown in Figure 3.2a.

Figure 3.2: Overview of responses from key informants not using CS or using other datasets

a.



b.



While fewer people who took part in the survey had no experience of CS, it is interesting to note that their main reason for not using it was 'lack of awareness'. The next most frequently cited reason for not using CS data was simply that other data sets were more appropriate for their work. This is confirmed in Figure 3.2b, which shows the responses of all those using other data instead of, or alongside CS data. Here the reasons for using other sources were mainly that they were readily available, relevant and at an appropriate scale.

These summary data provide a backdrop against which the more detailed analysis of responses topic by topic can now be made. Although we will consider any differences from these general patterns, the main focus will be on the qualitative analysis of responses and its implications for the hypotheses that define the evaluation matrix.

Table 3.1: Evaluation of the hypotheses for the biodiversity policy subtopics

			Assessment		
Policy topic	Sub-topic	Hypotheses	FS	LCM2007	Rationale
Biodiversity	Distribution and condition of Priority Habitats (PH)	B1: For four Priority Habitats (hedges, arable field margins, ponds, and blanket bog) CS FS data are the primary source of evidence on which targets in the UK Habitat Action Plans were monitored.(1)			Limited number of PHs covered by FS, but for linear features the contribution is important. The extent of future contribution of FS depends on potential modifications to survey methods. Thematic and spatial resolution of LCM2007 probably too coarse for monitoring of PHs.
	Distribution and condition of Priority Habitats (PH) and Broad Habitats (BH)	B2: Data on both Broad and selected Priority Habitats contributed to assessment of achievement of the 2010 biodiversity target through updating of indicators on plant diversity, extent of habitat features and habitat fragmentation at UK and country levels.(2) B4: By reporting on the extent and condition of habitats, CS2007 has provided evidence of progress against a range of international and national biodiversity policies. (2) and (3)			No policy need for monitoring BH and so contribution of FS rated as weak to partial; there is a contribution but not as significant or clear as for Priority Habitats. Need for information about BHs in future is uncertain and depends on the way policy requirements evolve; important contribution to UK National Ecosystem Assessment suggess potential importance of dataset to future ecosystem assessment exercises.
	Distribution and condition of Broad Habitats (BH)	B3: Mapping of Broad Habitats by LCM2007 has supported the targeted delivery of biodiversity programmes. (2) and (3)	NR	P	Potential of LCM is possibly unrealised due to its recent release and therefore classified as negligible, but with potental. It has provided, example, the UK contribution to the EU-wide CORINE mapping of land cover.
	Ecological networks and landscape permeability	B5: Data on the spatial distribution of Broad Habitats across the UK obtained from LCM has enabled improved understanding of the spatial pattern of ecological networks. (2) and (3)	NR	P	Limited use of LCM in this area - but several core users stress its potential.
		B6: Data on the changing condition of Broad Habitats from FS has enabled improved understanding of the resilience of ecological networks. (2) and (3)		NR	The Integrated Assessment from CS make limited reference to funcitonal ecological networks in its analysis.
		B7: CS has been used in conjunction with other datasets to understand ecological networks.(2) and (3)	P	P	FS data have been used as basis of national connectivity indicator, and some use of LCM for network analysis has been found in survey respondents; but interpretation is difficult Future contribution of both depends on further development of methods; the potential contribution of LCM appears more significant in this area.
	Species monitoring including spread of invasive non-native species	B8: Data collected from the FS vegetation plots and boundary plots has allowed monitoring of general species change, and in particular the prevalence of non-native species in the countryside.(2)	P		Some reference to general species monitoring in questionnaire survey, but some partial evidence of use of CS data in monitoring invasive species. Future potential role.

negligible weak partial strong equivocal

P = potential identified but unrealised NR= not relevant

Note: The numbers after the hypotheses refer to the different types of expectation described in Section 1.3.2

3.3 Qualitative Analysis by Policy Topic

3.3.1 Biodiversity

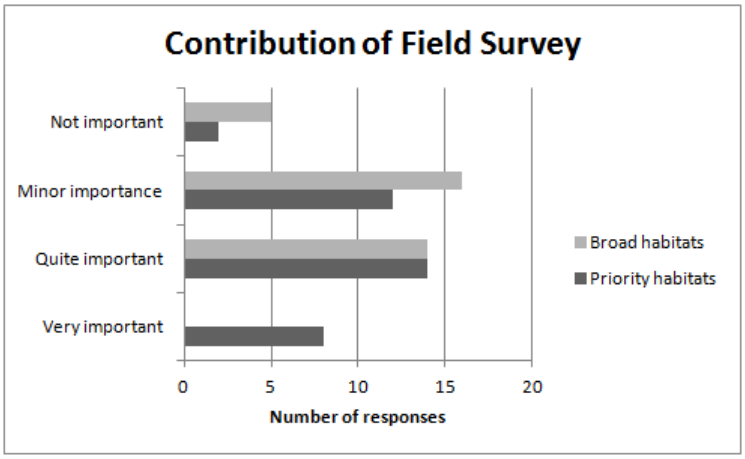
As might be expected, the largest number of responses was made for the biodiversity topic. Altogether 64 people provided information; 45 were from core-funding organisations or CEH. Four sub-topics were considered: Broad Habitats, Priority Habitats, Ecological Networks and Species Monitoring. Table 3.1 sets out the hypotheses, against which the contribution of CS2007 was judged, the conclusions and the rationale that led to them. The evidence that informed these judgements is presented below.

Broad and Priority Habitats

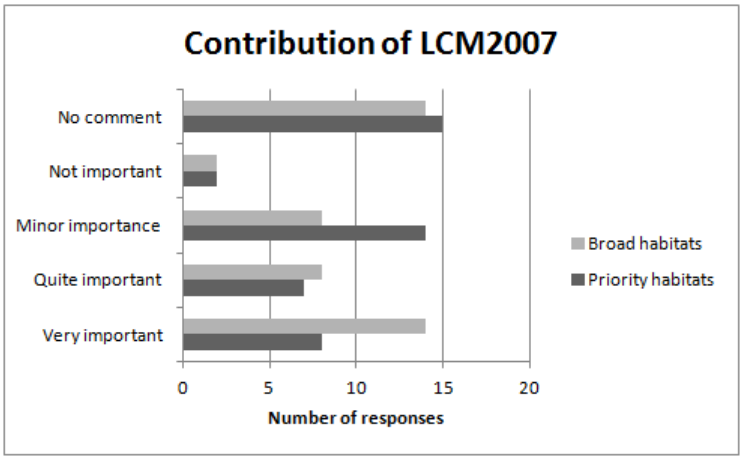
The provision of information on the Broad and more common Priority Habitats that are found in the wider countryside is a core feature of Countryside Survey. Figure 3.3a suggests marked contrast in the significance that people attach to the CS Field Survey in relation to these subtopics, in that more people rated the FS as 'very' or 'quite' important for their work on Priority Habitats than they did for the Broad Habitats (which may reflect

Figure 3.3: Summary of results for the biodiversity policy sub-topics

a.



b.



the value that respondents put on these topic areas, as well as the impact that FS has had on them). By contrast, more felt LCM had greater use for Broad than Priority Habitats (Figure 3.3b).

The responses on biodiversity dominated the questionnaire results numerically, and so the reasons for using CS and the drawbacks that were found with them follow closely the summary shown in Figure 3.1. The historic time series was a particular strength of the FS results, while the way specific landscape features and land use types were defined was seen as a limitation. The appropriateness of scale and relevance were cited as significant important features of LCM, although the delay in making the data available was seen as a problem. Setting aside the people who made no comment, more than three quarters (78%) of respondents scored the two sources as 'partially relevant to their work'; about 15% (that is eight out of 55) said that it completely fulfilled their needs. Clearly people base such ratings on a range of subjective criteria, and from these data alone we cannot fully gauge the contribution of the different components of CS. Analysis of the open questions, however, enables the hypotheses set out in Table 3.1 to be evaluated.

Using the evaluation criteria described in section 3.1, only three of the responses received for the biodiversity topic were rated as providing strong evidence to support any of the hypotheses relating to Broad and Priority Habitats (B1-B4). A respondent from Welsh Government (ID139)[27], for example, regarded the information on the Priority Habitats as *'core evidence base'*, while a member of CCW, stated that:

> *'CS2007 was very important source for input into projects that were examining distribution of PHs although it wasn't used in relation to condition.' (ID127)*

One non-core organisation also provided strong evidence supporting the contribution that CS2007 had made, and made reference to the issue of Priority Habitats. Thus the NGO Hedgelink observed that they:

> *'Have relied on the boundary chapter heavily to report on HAP targets and steer relevant policy areas - i.e. agri-environment options and delivery. The data source has also allowed Hedgelink to identify priorities for work and influence, and also further research needs.' (ID84)*

They went on to identify specific uses of the data in relation to hedgerow trees and the restoration of herbaceous flora, and the assessment of management prescriptions. Turning to Broad Habitats, a representative from Scottish Government argued that the Field Survey data was:

[27] All responses to the online questionnaire are anonymised and referred to by their ID number. The anonymised materials can be made available in a spreadsheet format to the members of the Steering Group.

'Very helpful source of information when considering trends in the extent of semi-natural grasslands in Scotland (to help inform our consideration of the need to provide additional protection for these habitats)'. (ID133)

In general, however, the questionnaire results provide little support for any of the four hypotheses relating to Broad and Priority Habitats; respondents highlighted what they saw as limitations of both sources of data. A typical response is illustrated by a policy advisor from Defra, who justified their rating as the contribution to work on Priority Habitats as being 'minor' as follows:

'Data on priority habitats too restricted, except in limited cases.' (ID36)

The same issue was identified by the respondent from JNCC who observed that in addition to the problems of timing of CS2007 in relation to their Article 17 and Annex I reporting needs, the CS2000 outputs that were actually used were only:

'Of minor importance in reporting on 6 habitats' confined to those 'few habitats that are sufficiently extensive for the Field Survey to sample'. (ID11)

The project review found that FS data had contributed to work funded by CS core funders on two of the Priority Habitats covered by CS and work on a third is ongoing. These were ponds (where the CS data was used as evidence for the Pond Habitats Action Plan prepared by Pond Conservation) and ancient species-rich hedgerows (where Defra funded projects on hedgerow trees and ground flora used CS data, contributing to the Habitat Action Plan). It is understood that CS data is being used by SNH in relation to Blanket Bogs in Scotland. No evidence was found relating to use of CS data in relation to arable field margins.

Thus the support for hypothesis B1 that relates specifically to Priority Habitats is judged to be strong but this judgement must be qualified because the Survey deals with a only a limited number of Priority Habitats considered by some to have less conservation interest; where data are available, however, they are generally regarded as being of suitable quality (Table 3.1).

In relation to the Broad Habitats a number of respondents suggested that the FS was helpful, but more as background than for meeting specific policy needs. Thus:

'There are no policy commitments on Broad Habitats, but the data have been used to identify and advise on drivers of change in the Countryside' (ID136); and, *'Topic [Broad Habitats] only considered within overarching reports on UK biodiversity - CS2007 of minor importance in reporting on this aspect within 4th National Report to CBD'. (ID11)*

An informant from CCW provided a similar perspective. Even though they had rated the source as 'quite important' they added:

> *'Broad habitats are of limited use - especially for those habitats where some types (grasslands, wetlands) are BAP priority habitats. CS can't help to audit losses and gains of the habitats types of highest value (and therefore important in terms of developing / monitoring policies.' (ID53)*

Looking at the types of application described by respondents for their work with Broad and Priority Habitats, most appeared to correspond to the 'framing the issue' stage of the policy cycle, in that it seemed that the data were used to help policy advisors to understand or take stock of a situation rather than to test the effectiveness of a policy intervention or to report policy outcomes. This is supported by the widespread use of the UK and country-level reports published from CS. A representative from CCW, for example, observed in relation to the Broad Habitat data that it was:

> *'Used as one of several sources of data to illustrate current state of Welsh environment to aid forward planning of work. Also used to provide context to results from more local studies (e.g. Snowdon ECN).' (ID76)*

There was some evidence from SNH, however, that supported hypotheses B2 and B4, which are probably best taken together because of their similar scope. It was reported (ID87), for example, that the Field Survey data were important in the 2010 Biodiversity Report for Scotland. The user from Welsh Government (ID139) also recorded that the FS Habitat data had been used for State of the Environment and Article 17 Reporting, albeit alongside other information. In England the CS FS Habitat data also contributed to *Biodiversity 2020* indicators (ID11), in Scotland the same was the case for the Biodiversity State Indicators and in the UK more generally the data were used in the publication of *Biodiversity Indicators in Your Pocket*.

Given the mixed responses about the utility of the Field Survey on Broad Habitats for policy applications, support for hypotheses B2 and B4 are also judged to be partial. **However, given that the data were used to construct a number of indicators used by the policy community the judgement should not suggest that the data made showed a strong contribution, albeit in some specific areas.**

Turning to the use of LCM, the few respondents who rated it as 'very important' for their work on Priority Habitats did not give an explanation of what kind of contribution it made. Other people who rated it as less significant for this sub-topic referred to its lack of thematic resolution at the Priority Habitat level. However, there was stronger support for the use of LCM for work on Broad Habitats, and despite the problem of its limited availability, several people stressed its potential in the longer term. For example a policy advisor from SNH suggested that:

'It's the main dataset we use for assessing broad habitats at a Scotland-wide level.' (ID137)

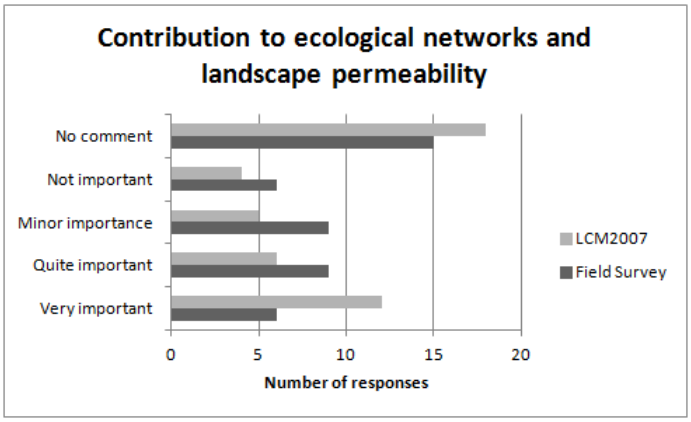
Nevertheless, few tangible policy applications were described in any of the returns for LCM. Apart from the delay in its release the major limitation on its utility that was cited was the fact that it did not map change. **In the absence of evidence on significant current policy use it was concluded that the contribution of LCM as 'negligible' for the hypotheses relating to Priority Habitats (B1) and for reporting more generally (B2); the hypothesis relating directly to the mapping aspects of LCM (B3) has been assessed as 'negligible' at present but with potential.**

Ecological networks

A summary of the responses to the question of whether CS data was important for people's work on ecological networks and landscape permeability is shown in Figure 3.4. These data suggest that most people felt that LCM was more significant than the Field Survey data, but the picture was less certain once the qualitative answers were considered.

Figure 3.4: Summary of results for the biodiversity policy sub-topics – ecological networks

a.



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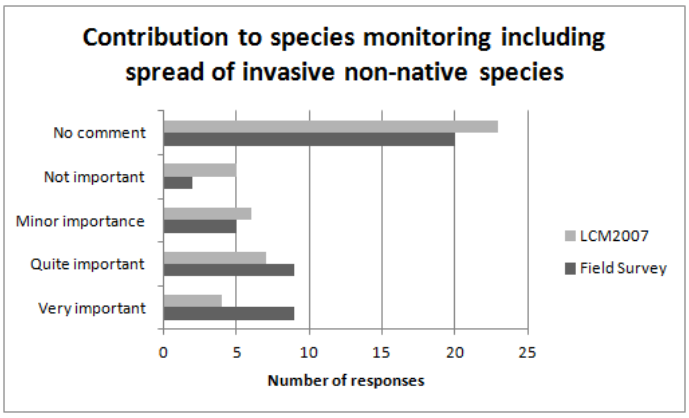


Thus there is some evidence that CS data have been used to report changes in the structure of ecological networks; one respondent cites, for example, the development of an indicator of habitat connectivity reported in Defra's *Strategy for England's Wildlife and Ecosystem Services*[28], based on the analysis of FS data. However, opinion on the success of this work is mixed. For example, that same informant adds:

> *'Has been used to develop metrics for connectivity but the data are hard to interpret, because it has not been possible to look at rate of turnover between habitat types.' (ID36)*

A number of other respondents who provided information for this sub-topic made a similar point about the difficulty of using this data source. A representative from Natural England, for instance, observed that:

> *'This topic is extremely key to future direction-not that clear on exactly how CS2007 is doing this.' (ID30)*

A response from a policy advisor at SNH was not hopeful:

> *'Networks analysis requires contiguous spatial data - although CS2007 survey squares were analysed for the UK biodiversity indicator, the result has to be heavily caveated and is of no operational use.' (ID87)*

Given this remark, it is surprising that the contribution of LCM also appeared to be limited in this policy sub-topic, although more people saw that it might have future potential. For example, an informant from SNH stated that:

> *'LCM2007 will be the definitive map for network analysis (because it's the only one we have) but we are only starting to develop applications and it is still under test.' (ID87)*

However, others (CCW) noted some difficulties ahead, feeling that:

> *'Lack of accuracy and level of resolution limit its use. In Wales we have comprehensive Phase 1 survey information which we have used for this type of analysis. A replacement for Phase 1 survey would be highly desirable as the information is getting older, however remotely sensed information is still a long way off being as accurate.' (ID75)*

Even though they rated LCM as valuable for their work on ecological networks, a respondent from Natural England balanced their enthusiasm as follows:

[28] http://www.defra.gov.uk/statistics/files/England-Biodiversity-indicators-2012-FINALv1.pdf

'Sure it is very important on a national scale, [but] concerned how it works at smaller scales where the minimum areas/feature size may prevent accurate mapping of the 'matrix'?' (ID93).

Such concerns might be looked at in the context of remarks from a user of LCM2007 in SNH who reported their experience as follows:

'We have built network tools based on LCM2007. Generally it is not detailed enough for local level use hence in central Scotland we use a land cover dataset produced by Forest Research. Elsewhere we may use LCM but we have been asked to integrate more detailed data sources (NVC/Phase 1/ Native woodland survey for Scotland) where possible.'

Overall, there seems some support for all three hypotheses (B5, B6 and B7), but given the work is exploratory with mixed views about its success, the contribution has been rated as weak for the Field Survey and LCM, with the both showing potential.

Species monitoring including spread of invasive non-native species (INNS)

As Figure 3.4b suggests, the Field Survey data was generally regarded as more important than LCM for species monitoring, mostly for purposes that corresponded to the 'framing issues' stage of the policy cycle. For example, a representative from Welsh Government felt the FS data was:

'Essential UK wide evidence base for movement and extent.' (ID139)

They did not comment on LCM. Similarly, a member of SNH found that the data on:

'Trends in plant species richness (including bird/butterfly food species) very helpful in order to illustrate/understand the need for additional measures to enhance biodiversity in the farmed landscape.' (ID133)

While another user from CCW suggested that the field data were:

'Not so important for monitoring of individual species, but analysis of species assemblages is one of the useful features of CS enabling links to be hypothesised about drivers of observed change.' (ID76)

It should be noted, however, that none of the respondents referred to the use of the Field Survey data for the indicator on *Change in plant species richness in the wider countryside, 1990 to 2007,* published in *UK Biodiversity Indicators in Your Pocket 2012*[29], which used the CS vegetation plot data for arable land, woodland and grassland and boundary habitats.

[29] http://jncc.defra.gov.uk/page-4237

In the context of monitoring INNS, views were more mixed as to the utility for the Field Survey data. While a representative from Defra felt that the species data from CS2007 were: '*Interesting because it shows low prevalence of NNS in wider countryside.'* (ID36), a colleague felt that:

> *'The survey does not target likely areas where invasive may be gaining a foothold..... .' (ID107)*

They went on to explain that the stratified nature of the sampling programme meant that it does not target or detect changes in *'specific abiotic conditions that would be conducive to their proliferation'.* Thus at best it seems such data provide a partial strategic view that falls short of what will be required in terms of policy evaluation and reporting. A contributor from JNCC expressed the situation as follows:

> *'Most outputs are from JNCC-sponsored surveillance schemes, and these have not utilised CS2007 data. Article 17 reporting for species included 20 species for which CS2000 provided a minor component of data.' (ID11)*

However, other developments in this area may be possible. Our review of on-going projects found, for example, that Defra have commissioned further work in this important policy area, with two projects entitled: *Analysis of Change in Frequency and Abundance of Injurious Weed and Selected Invasive Non Native Species in England* (to be completed in 2012); and, *Developing an indicator of the abundance, extent and impact of invasive non-native species* (completed 2009). Both have used CS vegetation data from the Field Survey as a key evidence source alongside other data, and have looked at changes between 1978, 1990, 2000 and 2007; habitat area data have been used where relevant to identify some of the key explanatory variables for the changes observed.

In terms of the utility of CS data to delivering current policy, it should be noted that the primary focus of the Invasive Non-Native Species Strategy is on the early detection, risk assessment and prevention or swift eradication of invasive non-native species. By its nature as a periodic sample-based survey, the CS Field Survey is not well placed for detecting the early low-level incidence of species. To do this, more frequent surveys of sites judged to be at risk of colonisation are required.

An additional new area of potential application in relation to general species monitoring was identified (ID56) in the questionnaire survey related to changes in the context of GM legislation. Although some empirical work using CS data has been undertaken in this area[30], these types of application are probably best dealt with in the context of future developments.

[30] Wilkinson, M. J., L. J. Elliott, et al. (2003). "Hybridization Between Brassica napus and B. rapa on a National Scale in the United Kingdom." Science **302**(5644): 457-459.

On the basis of the work reviewed the contribution of CS2007 Field Survey data in this area has been rated as partial for hypothesis B8 in Table 3.1; however, there does seem scope for a potentially stronger use in the future. By contrast the evidence from the questionnaire suggested that the contribution of LCM in this policy area was negligible.

Table 3.2: Evaluation of the hypotheses for ecosystem services

		Assessment		
Sub-topic	Hypotheses	FS	LCM2007	Rationale
The dynamics and spatial distribution of ecosystem services at national and regional scales	ES1: CS combined with other data provides the basis for mapping spatial and temporal changes in ecosystem service output.	P	P	Use of FS results was central to UK NEA, but contribution of LCM was unrealised due to timing of release. Contribution of both to future policy likely to be strong.
	ES2: The CS2007 integrated assessment established the potential for CS data to be used for ecosystem service assessment that informed the subsequent analysis in the UKNEA. (1)	P	P	Integrated assessments provide some evidence of potential role but results not exploited by policy beyond fulfilling research a need. LCM was not exploited in Integrated Assessment and so contribtion has been set as none

negligible weak partial strong equivocal

P = potential identified but unrealised NR= not relevant

Note: The numbers after the hypotheses refer to the different types of expectation described in Section 1.3.2

3.3.2 Ecosystem Services

In spite of the widespread current policy interest in ecosystem services, the questionnaire responses provided little evidence of specific policy applications of CS results in this area, other than those linked to the National Ecosystem Assessment (UK NEA)[31]. Altogether 17 responses were provided via the on-line questionnaire; most felt that both FS and LCM were 'quite important' for their work. It must be noted, however, that policy interest in this topic was not so marked as at present, in the run-up to CS2007, and it is an area where any contributions have mainly depended on the availability or flexibility of the CS data resource, rather than any feature specifically built in at the design stage. The Integrated Assessment component of the CS2007 work programme was recognised as being mainly exploratory. The situation is summarised, for example, by the response from JNCC:

> *'The work area has been at a 'definitional' stage, work with datasets will become a priority in future. The Integrated Assessment report was not at an appropriate*

[31] http://uknea.unep-wcmc.org/

'level' for use within our outputs so far: it had a scientific focus which did not match the more policy-focussed work undertaken within the last 4 years.' (ID11)

In relation to the stages of the policy cycle the responses overwhelmingly suggested that where the data had been used it was mainly to help people frame issues. The Broad Habitat structure of the Field Survey provided a framework for the UK NEA, and the results on stock and change of area features were an essential component of the evidence base on which the work drew, albeit in association with other data. The potential of CS in this area is also evident from recent research by CEH on quantifying cultural ecosystem services using Field Survey data[32].

Thus the contribution of the Field Survey has been rated as partial for hypothesis ES1, because much of the work is at a preliminary stage; however, the potential contribution of the data in this area is noted. (Table 3.2).

A respondent from Natural England, for example, reported that in the area of carbon storage the FS completely met their needs for work on the 'Mountains, moors and heaths' chapter of the NEA, because they could *'use comparable data for different habitats from one source.'* (ID92)

Overall, however, as the JNCC observation about the work being at a 'definitial stage' suggests, the overall outputs of the CS Integrated Assessment appeared to have played a limited role in the NEA or elsewhere.

Thus contribution of the Field Survey has been rated as 'negligible' for hypothesis ES2, but its potential noted.

Nevertheless there is clearly potential in this area, and there is evidence from the questionnaire returns that people are beginning to use the results to support their work, or see that it might. A respondent from Forest Research (ID74) provided evidence to suggest that CS had made a strong contribution in this area; they were interested in using the data for the valuation of ecosystem services from forestry and developing mechanisms to support work on payments for ecosystem services. They used CS to support their reporting activities. Another respondent from Defra suggested that:

'The NEA follow-on will be producing a database of useful data sets over the next twelve months... .' (ID122)

and concluded that it will provide a:

[32] See Norton, LR, Inwood, I, Crow, A and Baker, A (2012) Trialling a method to quantify the 'cultural services' of the English landscape using Countryside Survey data. Land Use Policy, 29(2) 449–455.

'Good base data, but will need linking to new data sets to reveal ecosystem service trends.' (ID122)

A representative from Scottish Government also reported that the Field Survey data would be used:

'Potentially in support of a range of indicators for ES and biodiversity.' (ID143)

and that they are:

'Developing [a] strategic research programme to provide other data/ evidence for SG.' (ID143)

The desk review of published work conducted during the study noted that LCM2007 data had been used in the three of the four case study projects of operational ecosystem approaches assessed in JNCC research contract 469[33]. These are recent projects and may give an indication that LCM2007 will be regarded as a valuable source of data in future in this area of work (in many respects replacing the role that LCM2000 played in the UKNEA). A comment from one of the core funding bodies received at the draft reporting stage of this study suggested that LCM's contribution to policy on ecosystem services may be in providing spatial data on the biophysical structures and processes that lead to ecosystem function rather than the service itself.

The questionnaire responses provided very little evidence for the use of LCM in this area; its support has therefore been judged as 'negligible' in relation to hypothesis ES1. Unfortunately its release was too late to support the NEA. Nor did it have any significant role in the Integrated Assessment; hence the support for hypothesis ES2 has also been judged as 'negligible', but the potential has been flagged.

Presently people are using other sources for mapping of ecosystem services. In Wales, for example, it was reported by a respondent from CCW that:

'For our mapping work we needed a high level of detail and we therefore used the new Phase 1 Habitat map for this.' (ID17)

For the future they need better sources of information on the condition of habitats. Also in Wales, a representative of the Forestry Commission observed that they:

'Tend to use Forestry Statistics, National Inventory of Woodlands and trees and more recently National Forest Inventory which will provide information on carbon and biomass.' (ID131)

[33] Medcalf, K., Small, N., Finch, C. & Parker, J. 2012. Spatial framework for assessing evidence needs for operational ecosystem approaches. JNCC Research Contract No. 469, Peterborough 2012

but that in the longer term they were looking towards using CS to complement other data sources, especially in relation to linear features.

3.3.3 Landscape

Landscape is a broad topic area potentially overlapping with ecosystem services and sustainable agriculture, where agri-environmental schemes target interventions on particular types of landscape feature. In order to minimise the potential for 'double counting' we focus here on the support that CS data provide for work on landscape character assessment.

Table 3.3 provides an overview of the assessment for this topic area on the basis of the fifteen responses were received.

Support for the use of the Field Survey data was found to be limited and so its contribution has been rated as negligible for hypothesis L1.

For example, a person from SNH:

> *'The study was of minor importance to me in that we would usually base our landscape character discussions on our national suite of landscape character assessments produced by SNH 1998 – 2000... .' (ID106)*

A respondent from Natural England explained their position as follows:

> *'The scale and stratification of the Field Survey means that it is difficult to relate to landscape needs at the national i.e. England scale.' (ID10)*

They went on to suggest that alternative stratifications of the data, using say the Agricultural Landscape Types, may improve the usefulness of the data for landscape assessment needs, but this is still to be resolved.

By contrast, two of the questionnaire responses provide evidence for a significant contribution of LCM in this topic area, both were from Natural England. Thus one person (ID108) reported that LCM2007 had been used to compare change against historical sources of land use/cover data, such as that on woodlands. Another (ID10) identified a series of projects that the organisation was involved in where LCM was playing a significant role, these included: the work undertaken on the 'Character and Quality of the English Landscape' (CQuEL); the monitoring of landscape outcomes from the Higher Level schemes of Environmental Stewardship (ES); and the development of methods for monitoring the impact of ES on landscape character and quality. While they stressed the importance of such work, they added:

'However this analysis is not yet complete but its seems likely that the importance of LCM2007 will only increase' (ID10)

Thus the contribution of LCM has been judged as partial, but with potential, in relation to hypothesis L2 (Table 3.3).

Since landscape was one of the topic areas that was not fully covered in the workshop designed to refine and confirm the set of evaluation hypotheses, we undertook some wider consultation with landscape specialists. Although they confirmed the two hypotheses identified above they also suggested that contribution in the area of tranquillity mapping might be considered. Although no specific hypothesis was developed in this area, we looked at the returns to see if there was any evidence of their application for this subtopic (Table 3.3). The returns did mention tranquillity mapping but only in relation to future needs. While LCM2000 had been used for the national tranquillity mapping study led by CPRE, there has been no attempt to apply LCM2007 in a similar way, or to use it to update the earlier work. In the Integrated Assessment there was some discussion of tranquillity as an issue related to cultural ecosystem services, but no substantive analysis was made. **Thus the contribution of both FS and LCM in this additional area has been rated as negligible.**

Table 3.3: Evaluation of the hypotheses for landscape

Sub-topic	Hypotheses	Assessment: FS	Assessment: LCM2007	Rationale
Landscape character, condition and management objectives	L1: Trend data from the Field Survey on the condition of selected features can inform assessments of landscape change.(2)	P	NR	Contribution of FS to work on landscape character has been weak to negligible, although previous survey data were used to inform analysis of landscape character by Natural England in the CQC Project.
	L2: LCM2007 can be used to relate broad patterns of land cover with other aspects of landscape character, including at character area level. (2)	NR	P	Current contribution of LCM is unrealised - but likely to be strong in future based on results of current research.
Extent of noise and light pollution, and extent of tranquillity	Other			LCM2000 used for tranquillity mapping, but LCM2007 not been used for update or revison etc.; some reference to tranqullity assessment based on FS data in Integrated Assessment.

negligible weak partial strong equivocal

P = potential identified but unrealised NR= not relevant

Note: The numbers after the hypotheses refer to the different types of expectation described in Section 1.3.2

3.3.4 Sustainable Agriculture

Twelve people provided responses on the topic of sustainable agriculture, ten of whom were from core-funding organisations. Although they mostly rated the two components of CS as quite important for their work, their use of reporting sources and datasets differed from the general patterns shown in Figure 3.1, in that their interest was spread more evenly across the categories. Given that this topic has potential of overlap with landscape and ecosystem services and indeed biodiversity, the focus here has been a mainly on judging the effectiveness of agri-environmental schemes to avoid any duplication. However, the analysis must be looked at in connection with the biodiversity information that CS provides on the Priority Habitats associated with the farmed landscape, principally arable field margins, hedgerows and other boundaries, and ponds (see Section 2.3.1).

This topic area provides some of the strongest evidence for the contribution of the FS component of CS to policy. Three respondents identified significant uses at different stages of the policy cycle ranging from framing options to testing policy outcomes and reporting. Thus a respondent from Natural England observed in relation to the Field Survey data that:

> *'CS2007 is particularly important for providing a wider countryside 'context' to agri-environment delivery. No other monitoring scheme provides national data on the extent and condition of widespread features such as hedgerows, ditches, field edges etc. Given detailed knowledge of the location of the sampling points, a range of comparative analyses can be undertaken.' (ID58)*

In relation to the issue of the condition of landscape features potentially affected by agri-environmental interventions they added:

> *'The Field Survey gives a context of trends in the wider countryside that is not available anywhere else. This is vital as a surveillance dataset.' (ID58)*

It concluded thus:

> *'My view is that from a sustainable agriculture perspective (rather than ES necessarily) CS provides a unique framework for understanding gross change in the wider farmed environment. Despite high levels of overall uptake, ES currently provides direct management of a modest proportion of the farmed area. To understand change in the farmed environment as a whole and the implications for environmental systems and sustainability we need to understand change and the reasons for change in the whole landscape and not just areas targeted for different degrees of conservation management.' (ID58)*

Similar views were expressed by respondents from Wales. Thus a representative of Welsh Government (ID58) reported that the FS data were very important because they provided

a *'partial counter factual to agreement holdings against which to compare impacts'.* Another from the same organisation rated the Field Survey data as very important and suggested that:

> *'All this data feeds directly and indirectly into the development of agri-environment/sustainable land management policy in Wales and is also used to provide reliable data in response to ad-hoc requests. Data showing changes over time, particularly showing the impact of policy/schemes is extremely useful as is data monitoring areas/issues that are not currently key for policy.' (ID142)*

In Scotland the CS Field Survey data for changes in landscape features were found to provide a:

> *'Helpful indication of the decline in the extent/condition of managed hedges in Scotland. This is relevant when considering priorities for agri-environment support.' (ID133)*

On the basis of the evidence provided the contribution of Field Survey for both hypothesis SA1 and SA2 (Table 3.4) has been rated as strong.

The data do appear to play an important role in the design and assessment of agri-environmental schemes and in understanding the significance of changes in the stock and

Table 3.4: Evaluation of the hypotheses for sustainable agriculture

Sub-topic	Hypotheses	Assessment: FS	Assessment: LCM2007	Rationale
Estimates of the changing extent and condition of farmland habitats and landscape features	SA1: CS Field Survey data on the condition of farmland habitats, the diversity of plants in fields and field margins and landscape features has been used as evidence on the impact of agriculture on the environment. (1)		NR	Contribution of FS to understanding change in aspects of farmed landscape partial to strong because survey data are most reliable for widespread habitats such as farmland. Role for FS likely to be more important in future. Contribution of LCM is presently weak.
The influence of agri-environment schemes and the regulation of farmland habitats and species	SA2: Field Survey data on the stock and condition of linear features should be able to be used to estimate proportion of stock covered by agri-environment schemes (2) and (3)		NR	Coarse spatial resolution of FS means that Survey difficult to use for agri-environmental monitoring, but may provide context or base-line data; future role is equivocal, depending on technical innovation. Role of LCM currently weak and equivocal in the future.
	SA3: LCM2007 is a source of evidence for monitoring the changing distribution of farmed habitats and their relationship with other indicators of environmental quality. (2)	NR	P	Applications are being developed to understand patterns of uptake using these data - evidence suggests potential in this area.

negligible weak partial strong equivocal

P = potential identified but unrealised NR= not relevant

change of particular features associated with the farmed landscape. The conclusion is supported by our review of relevant project work, which identified the on-going work entitled *Correlative Analysis* as making a significant contribution to understanding how ES scheme options deliver their specific stated objectives and environmental outcomes and how they might be monitored in the future. Other supportive work includes that concerning the links between agriculture and land use change to pollinator populations, which also make use of the CS vegetation plot data.

The responses for LCM suggest that it too is a significant source of data in this topic area, although perhaps less markedly than for FS. For example, one of the respondents from Natural England who provided strong support for the FS data also found that:

> *'Land Cover Map is proving a very useful tool for understanding patterns of uptake of features targeted by ES. We have used LCM data to explore scheme coverage in relation to specific National Character Areas, looking at distribution of habitat types against environmental potential in relation to those features that are most characteristic of the area.' (ID58)*

Similarly one of the representatives from Welsh Government (ID139) felt that LCM was a 'core spatial data set'. Other representatives of Welsh Government (ID142) found the data source to be 'very important' but did not explain the basis of their view.

The Scottish Government is currently funding a project (2011-14) to develop a methodology for monitoring the outcomes of selected agri-environment measures on a random sample of farms. LCM2007 is being used at catchment level for initial classification of agricultural land, before carrying out further analysis with remote sensing data.

Given that fewer applications of LCM were identified, compared to the Field Survey, the support of LCM has been judged as 'partial' rather than strong for hypothesis SA3.

3.3.5 Water resources

Water was an area that was poorly covered by the responses gained though the questionnaire survey. Only two people provided information, both of whom were not active users of CS data. One was from a core organisation, Scottish Government; their work mainly concerned natural flood management, although they were also involved in commissioning research in relation to water more generally. For example, a key requirement was evidence to understand the effectiveness of existing policy measures to mitigate rural diffuse pollution, and to change polluting behaviours. Although they did not comment on current use of CS data specifically, in their comments on any future need for CS they reported that:

'CS headwater stream data complements that collected by SEPA. Understanding of water quality across the whole catchment is important to develop integrated catchment management, and to understand the whole system.' (ID90)

Scottish Environmental Protection Agency (SEPA) monitors headwater streams only where pollution thresholds downstream are exceeded, and so the wider CS sampling of headwaters potentially increases the range of information available. In England and Wales, the data on the biological and chemical quality of headwater streams also complements the water quality data collected by the Environment Agency. Only in the later stages of this study was it possible to obtain information from the Environment Agency on the significance of the CS data. The Environment Agency[34] stated that

'CS focuses on headwaters, a part of the river network which is not covered well by the National Agencies' monitoring programmes. In addition, the co-location of multiple freshwater survey components (chemistry, macroinvertebrates, macrophytes, habitats), is not common in the Agencies programmes, nor did the Agencies have coherent macrophyte monitoring programmes in 1990 or 1998. The consistent species-level taxonomic resolution of the CS macroinvertebrate data cannot be matched by the Agencies' data and is important for the assessment of change in freshwater biodiversity. The fact that the freshwater surveys are quality assured by repeat surveys of a subset of the squares, laboratory taxonomy is also checked similarly, is a further unique characteristic of CS. Finally, the CS network is largely consistent going back to 1990 and changes little from survey to survey (with the exception of the additional squares in Scotland in 2007). This contrasts greatly with the Agencies' networks which aim to quantify change, but which have themselves changed considerably over this time period.'

Despite such information, the policy application of these data appears limited, except in terms of helping users understand the general state of the environment.

Our study also reviewed on-going projects using CS data, and at least two were found to be relevant. A project entitled *Ecosystem Interactions,* is at the start-up stage and will be completed in April 2013. It is sponsored by Defra. The primary research questions that will be the focus for the work are:

- What are the key interactions between farmed land and water ecosystems which need to be taken into account when making policy and decisions?
- What data are missing and are there suitable proxies?
- What is the importance of scale in understanding these interactions?
- How do interactions vary nationally or locally and what is the significance of any variation?

[34] M.Dunbar, pers comm., October 2012.

To answer them it will seek to combine the water quality and land cover data from the 2007 Field Survey with LCM. A second project relevant to this topic area is REFORM, an FP7 Project funded by the EU. This work aims to improve the success of hydromorphological restoration measures to reach, in a cost-effective manner, target ecological status or potential of rivers, given the requirements of the Water Framework Directive. Although CS will be one of many data sources used, the work intends to build on the 2007 Integrated Assessment and use the freshwater data from all three surveys (1990, 1998, and 2007) to understand better how the freshwater biota respond to multiple interacting anthropogenic stressors.

It has been reported[35] that until CS2007 Integrated Assessment, little or no freshwater work was supported by the core organisations outside of the surveys and reporting for in CS1990 and CS2000. As a result the freshwater work undertaken by CEH was

Table 3.5: Evaluation of the hypotheses for water

Sub-topic	Hypotheses	Assessment: FS	Assessment: LCM2007	Rationale
Contextual and baseline information on water bodies and aquatic habitats	W1: The results of the CS2007 Freshwaters work package provide information on the ecological condition of headwater streams and ponds that has complemented other Water Framework Directive surveillance programmes.(1) W2: Data on the condition of terrestrial habitats from the CS2007 field survey and on land cover from LCM2007 can be used to characterise trends in water quality and aquatic diversity. (1)		P	FS contributes to monitoring status of Pond BH; uncertain what is the use of monitoring data of headwaters from FS. Role of LCM is unrealised and will depend on technical innovation in the future.
Factors influencing water quality and aquatic biodiversity	W3: LCM2007 provides broad contextual data on land cover to improve understanding of flood propagation and generation through processes such as surface run-off and flood water storage.(2)			No evidence found - interpretation equivocal.
Water resource and flood models	W4: LCM2007 provides contextual land cover data that has improved understanding of aquifer recharge to assist in water resource planning.(1) and (2)			No evidence found - interpretation equivocal.

negligible | weak | partial | strong | equivocal

P = potential identified but unrealised NR= not relevant

Note: The numbers after the hypotheses refer to the different types of expectation described in Section 1.3.2

[35] M.Dunbar, pers comm., October 2012.

concentrated on building up the dataset, and was in some sense waiting for the 2007 data before doing any substantial analysis. This contrasts with the long history of the terrestrial survey from 1978 onwards, and the investment made in its interpretation. The lack of funding for use of the freshwaters data may in part explain its limited policy impact.

Given the limited evidence available, any judgment about the contribution in this area must be a qualified one (Table3.5). Pending further investigation the work in the area of Field Survey water quality has been judged to be partial, while the role of LCM is presently negligible. The hypotheses suggested in the area of flooding and water resources have both been assessed as equivocal or indeterminate.

3.3.6 Soil

Eleven respondents provided information on soils; ten were from the core-funding partners of CS2007. More than half of whom provided partial to strong evidence supporting the contribution of the soils data arising from the CS FS for their work, which ranged from framing the issue through to reporting. The CS soils report was identified by them as a particularly important source of information.

A representative from Forest Research, for example, found the data CS provided on soil carbon especially significant:

> *'I have compared our Forest Research results with CS2007 as this was the only spatial survey which measured continuously soil bulk density in order to produce soil carbon stock under forest. Changes in soil carbon reported by CS2007 survey under forestry compares well with FR results but not with NSRI.' (ID105)*

Their response also confirmed the authoritative nature of the information:

> *'We referred to CS2007 soil results as we believe they are more accurate compared to NSRI soil results on soil C change under forestry.' (ID105).*

Overall they felt that the soils data from CS completely met their needs in so far as they agreed with and confirmed the results of their own long-term experiments, monitoring and chronosequence work. Similarly, a representative from Welsh Government (ID139) felt that the soils data were an *'essential data set which includes a range of parameters'* and described how they supported their reporting needs for internal and external reporting, such as State of the Environment Reporting, as well as the design of intervention measure for example agri-environmental schemes and policy programmes such as *A Living Wales* and the *National Environment Framework.*

However, a number of other users felt that soils data from FS partially met their needs, which were served from a number of sources including the information from the National

Soils Resource Institute (NSRI). For example a user from Scottish Government who felt the data to be quite important and partially meeting their needs reported they have:

> *'...linked it to studies of the question of whether soil carbon content in Scotland is declining over time. This is in conjunction with the National Soil Inventory for Scotland re-sampling (NSIS 2), which is more detailed on this subject.' (ID97)*

Other respondents who gave more qualified support for the Field Survey information went on to highlight some of the shortcomings of the data series. In the context of soil carbon, for example one user (ID97) highlighted the fact that CS only sampled the top 15cm and that no record was made of management at the sampling point. A similar view was expressed by Natural England:

> *'Would like data to record land management/farm type so that soil nutrient status can be assessed on that basis not just by broad habitat type[36] [...]. This is important for monitoring whether agricultural production can increase without damage to the environment.' (ID51)*

The statistical methods used in the soils work allowed for the analysis of change in the soil properties measures by different land cover types (i.e. with implied land uses or management regimes); this was reported as part of the final outputs from the soils work package. The limited sampling depth used in CS is accepted weaknesses explained by the

Table 3.6: Evaluation of the hypotheses for soil

Sub-topic	Hypotheses	Assessment: FS	Assessment: LCM2007	Rationale
Soil quality monitoring and evaluation	S1: Data from the CS2007 Soils Work Package on the acidification and eutrophication of soils, deposition of heavy metals, soil carbon and soil biodiversity has directly informed devolved country policies for soil management and protection. (1)			Time series for changes in soil characteristics sampled by FS were important in understanding changes in soil carbon and nutrient status of soils. Contribution likely to continue in the future. Role of LCM currently weak, but would possibly benefit by additonal research
	S2: In combination, CS data on soil character and biodiversity, and LCM data on patterns of land cover can play a significant role in the modelling the impact of land cover change on soil quality and function. (2)	P		The statistical approach used in the soils analysis allows for analysis of change due to land management and was reported for all soil meaurements; evidence of policy impact limited.

negligible weak partial strong equivocal

P = potential identified but unrealised NR= not relevant

[36] In their comments on this report, CEH challenged this response, saying that data on vegetation was recorded for all soil samples and that this was included in the soils reporting.

requirement of the CS Soils Topic Group to repeat the 0-15cm sampling carried out in 1978 and 1998[37]; a change in methodology in CS2007 would also have required a significant increase in resources needed to go to additional depths. Since the top-most soil horizons are the ones most immediately sensitive to changes in land management, the data collected are potentially valuable. However, the implication is that in any future survey greater resourcing will be necessary.

Given the interest in the results of the analysis of soil carbon over time, the contribution of the Field Survey to hypotheses S1 & S2 (Table 3.6) is judged as partial to strong.

In the context of LCM, evidence for the strength of its contribution was more limited. The user from Natural England, for example found that they:

> *'Have found LCM2007 not accurate enough for scales of 1:50,000 or more detailed. Not allied to data on land management or farm type.'(ID51)*

and that as a consequence the data were of general interest only. A representative from Defra felt that in it had only minor importance but suggested:

> *'...had it been released earlier it would have had greater importance as we have had to continue to use LCM2000.' (ID56)*

As with the Field Survey data, no evidence was forthcoming on the use of LCM for modelling and so on the basis of these results the support for hypotheses S1 and S2 (Table 3.6) have been rated as weak and negligible respectively.

3.3.7 Sustainable Forestry

Ten respondents provided information on this policy topic, eight of whom were from the core-funding organisations. None rated the data as being of more than 'minor importance' and many turned to other data sources to satisfy their needs. At best the data were used for background only. A user from Forestry Commission summarised the situation as follows:

> *'Useful for comparing with summary results from national forest inventories and for considering changes in woodland in context with other land cover changes.' (ID47)*

A similar position was put by a representative of the Forestry Commission in Wales:

> *'Linear features and possibly information on wood pasture would be very useful - as would information on veteran trees. We tend to use FC generated woodland*

[37] B.Emmett, pers comm., September 2012

information via Forestry Statistics and National Forest Inventory - but complementary Countryside Survey information would be very useful .' (ID131)

The respondents to the questionnaire did not suggest any application of LCM in the area of sustainable forestry.

From the review of projects, two were identified as being relevant to understanding the use of CS data in this general area. The first had been funded by Defra and ended in 2009. It aimed to produce a population model for isolated hedgerow trees so as to help review, and if necessary, amend the 2006 HAP targets. The study exploited the time series provided by CS from 1984 and sought to identify trees that had died or had been removed from hedgerows, and so estimate recruitment. Although there were some problems in re-locating the trees originally surveyed, the results showed that current recruitment rates were probably insufficient to maintain the existing population of hedgerow trees. Moreover, the mortality of older trees was found to be increasing in some parts of the country. It was concluded that dominance of ash and oak in hedgerow tree populations may compromise future recruitment and survival trends, because these species appear to show evidence of increasing decline in relation to climate change.

The second project concerned the restoration of hedgerow flora. This was also funded by Defra, but led by ADAS[38]. Once again it used vegetation data from successive Countryside Surveys since 1990, and used them to develop a condition measure for hedgerow ground flora that could be used as a UK Biodiversity Indicator for achieving European and UN targets, given that the Hedgerow HAP includes a target to halt further decline in

Table 3.7: Evaluation of the hypotheses for sustainable forestry

Sub-topic	Hypotheses	Assessment: FS	Assessment: LCM2007	Rationale
The extent and character of trees, woodland and forestry	F1: Data from the CS2007 Field Survey on the extent and condition of trees outside woodlands, on trends in plant diversity, condition and soils within woodland, and on the land cover change to and from woodland complements and adds value to the data provided by the Forestry Commission's National Inventory of Woodland and Trees and its successor the National Forest Inventory. (1)			FS has provided stock and condition data, but differences with FC estimates limit utility for national reporting purposes. However, it is noted that FS provides some data on woodlands not captured by NFI.
	F2: LCM2007 data provides contextual data to the Forestry Commission' National Inventory of Woodland and Trees and National Forest Inventory, allowing the context of woodlands within the broader matrix of land cover to be mapped and analysed. (1) and (2)	NR		No evidence found

negligible weak partial strong equivocal

P = potential identified but unrealised NR= not relevant

Note: The numbers after the hypotheses refer to the different types of expectation described in Section 1.3.2

herbaceous hedgerow flora by 2010 and reverse the trend by 2015. The results suggested the need for further research, especially in relation to the soil conditions at the base of hedgerows. The study argued for the identification of a more comprehensive suite of attributes and targets to determine favourable condition of hedgerow herbaceous flora, which may well inform the design of future CS.

On the basis of the questionnaire results and the analysis of projects therefore the contribution of the Field Survey has been judged as partial (hypothesis F1), but that of LCM negligible (hypotheses F1 and F2) at present (Table 3.7).

3.3.8 Urban Development and Infrastructure

Given that the CS Field Survey does not specifically address urban issues, it is perhaps unsurprising that this topic area attracted a small number of respondents. Only two provided information. Both were from Forestry Commission, which is one of the core organisations, but neither had used CS data directly. One user was concerned with the impact of urbanisation on tree cover, and the other was interested in urban tree canopy cover. They used other data sources for their work, principally aerial photography.

Our review of relevant project work also provided no evidence for either the Field Survey or LCM being used to look at urban issues related to land conversion, or green infrastructure, although CEH do report that the number of licences taken up by Local Authorities for LCM is increasing.

In the absence of any more detailed evidence about its use, however, the support for both hypotheses shown in table 3.8 have been assessed as negligible.

Table 3.8: Evaluation of the hypotheses for urban development

		Assessment		
Sub-topic	Hypotheses	FS	LCM2007	Rationale
Land conversion to urban development	U1: CS2007 provides national estimates of the area and trend in habitats converted to urban development which can contribute to monitoring of policy on brownfield/greenfield development and protection of the greenbelt. (2)			No evidence identified
Urban green infrastructure and inter-linkages with the countryside	U2: LCM2007 provides evidence for the development of locally planning policy on the extent of green space within and on the edge of urban areas. (2) and (3)		P	No evidence identified

negligible weak partial strong equivocal

3.3.9: Air Quality

Although this topic area only recorded four responses in the questionnaire survey, three were from core organisations that were active users of CS. The evidence provided significant support for the hypotheses relating to this topic, especially in relation to using the data for reporting the impacts of nitrogen and heavy metals on ecosystems. The support provided by the respondent from Defra was especially strong. Although they noted *that 'not all the required parameters are collected to make a detailed investigation'*, they added:

> *'Data from Countryside Survey 2007 clearly showed an increase in plant-available nitrogen (N) in extensively managed habitats with increasing N deposition, which was more marked in organic soils.' (ID104)*

They recorded that the results have been published in the peer reviewed literature[39] and will be used to further develop models that predict changes in plant species composition as a result of reactive N pollution. The work is significance for the UK in the context of the Convention on Long Range Transboundary Air Pollution (CLRTAP).

The same respondent from Defra also noted that CS contributed an updated time-series analysis of partial N deposition effects to a Defra-funded Report on Trans-boundary Air Pollution (RoTAP) Project[40]. The aim of this work, which was completed in June 2012, reviewed the current state of rural air pollution issues in the UK, evaluated the extensive measurements of atmospheric pollutants and their effects, and produced a synthesis of current understandings used to determine air quality policies. To assist the work, the CS2007 vegetation and soils data from the Field Survey were analysed alongside the CS2000 data to quantify change in state variables and to attribute change to modelled estimates of atmospheric pollution having accounted for other plausible driving variables. Analyses were also carried out using all previous survey datasets back to 1978.

Although other users gave more measured support to the role of CS in work on air pollution, it is apparent that the data are a significant source for policy advisors. The respondent from JNCC, for example, who only ranked the data as 'quite important', felt that the CS2007 needed to take its place alongside other datasets because:

> *'Countryside Survey data have been effective in showing the spatial impact of N deposition, but less effective in temporal aspects, therefore the 2007 repeat provided relatively little extra information compared to CS2000.' (ID11)*

They added that:

> *'The direct outputs from CS are often quite difficult to use within project work. Problems include inconsistencies in headline messages between the UK report and*

[39] Rowe et al., 2012: http://dx.doi.org/10.1016/j.scitotenv.2011.12.027
[40] www.rotap.ceh.ac.uk

country reports and summaries for habitats that include a wide range of impact sensitivity. Therefore, work on air pollution impacts has always required additional analyses to be undertaken of the data, in order to understand the complexities that underlie the headline messages.' (ID11)

The problem was that:

'These additional analyses are generally not funded as a core component of CS, and hence add delay and uncertainty into the system for using the outputs. Although CS2007 is effective in attributing change to N deposition, other datasets have to be utilised in order to understand the different scales of impacts and the reasons why some surveillance schemes do not detect impacts.' (ID11)

It has, however, been noted[41] that new evidence of impacts on soil of air pollution was provided by a measure of plant-available N that was only introduced in CS2007, which limited the potential for revealing temporal change.

In relation to LCM, the respondent from Defra (ID104) noted that LCM2000 has been used to provide the basis of the habitat distribution and area maps for applying critical load methods to UK habitats sensitive to acidification and/or eutrophication. This work has been used to develop indicators for biodiversity[42], and sustainable development[43], and provided support for the development of the Air Quality Strategy in 2007[44]. They note that under the EU Habitats Directive the focus is not just on protecting designated sites, but also on the entire distribution of the habitats listed in Annex I of the Directive; critical load and critical load exceedance data provide information on the risks from pollution on sensitive Broad Habitats (but not all Annex I sites). They conclude that there is:

'...currently a task comparing LCM2000 and LCM2007 to look at the implications of using the updated land cover map for future critical loads work. Results to date show improvements in the distributions for some habitats, including calcareous grassland and bog.' (ID104)

Our review of relevant project work also provides evidence in favour of a significant contribution of CS in this topic area. In addition to the RoTAP work, other projects include: the JNCC funded work on detecting and attributing air pollution impacts during SSSI condition assessment, in which vegetation soils data from the Field Survey fixed plots were used to investigate the suitability of new indicator variables for detecting pollution; and, the Defra funded research on UK Eutrophication and Acidification of Terrestrial Ecosystems (UKREATE)[45]. The aim of UKREATE is to collect evidence on the impact of

41 Row, E, Pers Comm. September 2012
42 http://jncc.defra.gov.uk/page-4229
43 http://archive.defra.gov.uk/sustainable/government/progress/index.htm
44 www.defra.gov.uk/environment/quality/air/air-quality/approach/
45 http://ukreate.defra.gov.uk/

Table 3.9: Evaluation of the hypotheses for impacts of air quality

Sub-topic	Hypotheses	Assessment: FS	Assessment: LCM2007	Rationale
Impacts of air pollution	AQ1: The reporting of CS2007 data on the chemical status of soils and waters and habitat condition can has contributed to air quality policy by enhancing policy makers' the understanding of how nitrogen and heavy metal deposition affect ecosystems. (1) and (2)		P	The strong contribution of the FS data is based on the extensive use of these data to support reporting activities at the national and internations levels.
	AQ2: Countryside Survey provides evidence for predictive modelling of future air quality scenarios and for the development of indicators of change of air quality impacts and critical loads. (2)		P	The strong contribution of the FS data is based on the extensive use of these data to support reporting activities at the national and internations levels. Alongside other data, the sources also enable the impact of policies to be tested.

negligible | weak | partial | strong | equivocal

P = potential identified but unrealised NR= not relevant

Note: The numbers after the hypotheses refer to the different types of expectation described in Section 1.3.2

policies to reduce emissions of N and S in mitigating eutrophication and acidification effects in terrestrial ecosystems. Once again the work draws upon CS vegetation and soils data from 1978 through to 2007.

On the basis of the questionnaire results and the review of project work the contribution of the Field Survey data has been rated as strong (hypotheses AQ1 and AQ2, Table 3.9). The results suggest that the future role of LCM is also likely to be strong, but its current usage has been limited due to the short time that it has been available. Its contribution has therefore been ranked as 'negligible' but with potential.

3.3.10: Climate Change

Seven respondents provided information on climate change; all of them were from the core-funding organisations. They provided information on both the use of CS data for GHG emissions calculations and the development of mitigation strategies.

Along with information from the Forestry Commission, the land cover and land use change data provided by Countryside Survey have been a critical input for the preparation of the UK Green House Gas Emissions Inventory[46,47]. The time series between 1978 and

[46] http://www.decc.gov.uk/assets/decc/statistics/climate_change/1222-ghg-inventory-summary-factsheet-lulucf.PDF

2007 provided by the CS Field Survey have been used to model the pattern of land use change between different categories of land use in the inventory calculation (i.e. grassland, cropland, forest land, settlements and other land). Using these matrices the transitions between the major types are estimated and the resulting changes in soil carbon density calculated from soil survey data, so that annual gains and losses of soil carbon associated with the land use transitions can be reported. The importance of the work was emphasised in the questionnaire by a representative of Scottish Government, who felt that some improvement was necessary given the critical nature of the information:

> *'Outputs need much greater compatibility with IPCC requirements, survey must become less insensitive to rotational practices in LUC and greater level of sample effort in Scotland required. Time taken for the data to become available was a major difficulty- CS operators need to recognise the importance of this dataset for meeting national legal requirements (UK and Scottish CC Acts for example) as well as international agreements.' (ID65)*

Table 3.10: Evaluation of the hypotheses for climate change

Sub-topic	Hypotheses	Assessment: FS	Assessment: LCM2007	Rationale
Land use change and GHG emissions	CC1: CS is a key source of information for the land cover/land use change component of the National Inventory of Greenhouse Gases. (1)	partial	equivocal	The historic time series on land cover land use change from the field survey plays a critical role in the preparation of the UK GHG inventory to IPCC standards. The role of LCM in this work is unclear and has been rated as equivocal.
	CC2: CS data can be used to examine whether climate is a significant variable that has affected changes in land use, soil quality and water resources in recent decades. (2)	negligible	weak	Limited use of CS data to look at the impact of CC on ecosystems, other than the analysis covered in in the UK report.
Environmental adaptation to CC and resilience planning and mitigation actions	CC3: CS provides underpinning data for development of adaptation and mitigation strategies and modelling studies	weak	negligible	Some project work is using eelier FS data to help understand how species respond to changing climate space.
	CC4: LCM2007 has been used to model and map land capability for the production purpose grown biomass crops. (3)	NR	negligible	No evidence identified to support this hypothesis.

negligible | weak | partial | strong | equivocal

P = potential identified but unrealised NR= not relevant

Note: The numbers after the hypotheses refer to the different types of expectation described in Section 1.3.2

[47] See also: Inventory and Projections of UK Emissions by Sources and Removals by Sinks Due to Land Use, Land Use Change and Forestry, Annual Report, July 2009, http://ecosystemghg.ceh.ac.uk/docs/2009/Defra_Report_2009.pdf

They also suggested that LCM was very important in the same context, but no evidence was provided as to the way it had been used. However, the contribution from JNCC did note that it had been:

> *'Considered within the GHG emissions report as having potential for identifying peatland management states in any future work'. (ID11)*

On the basis of the evidence provided, the contribution of the CS Field Survey to hypothesis CC1 (Table 3.3.10) has been judged as strong, whereas that of LCM has been assessed as partial, but with potential.

A respondent from Natural England (ID128) did, however, identify one area in which LCM was making a current contribution, largely at the stage in the policy cycle concerned with framing issues. Their work involved the development of a national (England) biodiversity climate change vulnerability GIS model, and in this context LCM was used to map habitats that store carbon. As a result they rated the contribution of LCM as 'very important'. **However, overall the support provided for hypothesis CC2, on using CS data to help understand the impact of climate change on ecosystems is weak at best for LCM and negligible for FS.** The review of projects using CS data found only one that was dealing with vulnerability issues, namely those affecting lowland raised bogs in Scotland. However, although CS Field Survey data were being used as an input for this work, it was limited to the use of CS2000 vegetation and soils information that was being employed to build empirical niche models of ombrotrophic Sphagnum species and other bog and heath indicator species. The project review suggested that where climate change is being considered it is often as a backdrop for other issues, such as the future impacts of air pollution, and that CS data were not critical in these contexts.

The evidence from the questionnaire returns on the contribution of CS to work on adaptation and mitigation issues in general (i.e. hypothesis CC3) is also weak. The respondent from Forestry Commission, for example reported CS data were not important and:

> *'We have tended to use our own mapping and evidence base for adaptation.' (ID131)*

The strongest support in this area was from a respondent of Scottish Government who used the FS data to:

> *'Develop indications about vegetation change and change in soil carbon' (ID120)*

But even so they only rated the contribution of CS as 'quite important' and felt that overall CS only partially met their needs.

No evidence was identified during the evidence gathering phase of the study to support a contribution of LCM in the analysis of land capability and the planning for biomass crops

(hypothesis CC4). However, at the final reporting stage, CEH reported that the Energyscapes project used CS data (specifically the distribution of Broad Habitats) to examine the potential deployment of renewable energy and associated infrastructure into real landscapes[48]. Since the report of this work is currently in press, the role of CS in this area has been rated as negligible (Table 3.10).

3.3.11: Access to Nature

Five respondents provided information on this policy area, four of whom were from core funding organisations. Their work concerned issues such as improving access and recreational opportunities (especially to woodlands), funding of Rights of Way Improvement Plans, undertaking CROW Open Access Review. None, however, had used CS data. Lack of use partially reflected lack of awareness of CS, but also that other data sources were more relevant especially at local scales. The contribution of CS has therefore been rated as negligible for both FS and LCM (Table 3.11).

Table 3.11: Evaluation of the hypotheses for access to nature

Sub-topic	Hypotheses	Assessment: FS	Assessment: LCM2007	Rationale
Health and well-being through access to nature	AN1: CS can provide contextual information on land cover at both national and local scales that can be compared with data on publicly accessible green space and on public health inequalities to address policies on outdoor recreation and public health. (2) and (3)			No evidence found to support any contributioni this area

negligible | weak | partial | strong | equivocal

P = potential identified but unrealised NR= not relevant

Note: The numbers after the hypotheses refer to the different types of expectation described in Section 1.3.2

3.4 Conclusions on Significance of Current Contribution of CS

The challenge of evaluating CS is that it is a wide ranging programme with many potential uses, only some of which may be critical to policy. As a consequence, it is not straightforward to make judgements about the strength of its contribution. The analysis of the questionnaire survey and review of projects has focused on the needs of the core funding organisations. While this has narrowed the scope of the evaluation, it does ensure that any judgements we make about the significance of CS outputs are focused on

[48] Howard, D.C et al, in press. Energyscapes – a new perspective on energy in landscapes. Biomass and Bioenergy. and Burgess, P.J et al, 2012. A framework for reviewing the trade-offs between, renewable energy, food, feed and wood production at a local level. Renewable & Sustainable Energy Reviews 16, 129-142.

the concerns to the people who have supported it. In this way they will be better placed to assess the value of the investment that they have made.

A number of features stand out from the analysis of evidence presented:

a. That the criteria used to create the evaluation matrix were successful in covering the range of applications identified by the users. Although the questionnaire gave people the opportunity to identify other uses besides those captured in the policy sub-topics, the majority of responses fitted into the pre-defined framework and could be set against the expectations that had been identified before the analysis.

b. That evidence collected suggests the strength of the contribution from the Field Survey to policy is greater than that of LCM. While this may partly reflect the more limited time that LCM has been available, there was little suggestion from any of the users that stressed its potential value was critical to any particular policy application. The 2007 Field Survey has clearly made a significant contribution to work related to:
    - Sustainable agriculture (specifically in the design and evaluation of agri-environmental schemes);
    - Soils (especially in relation to long term trends in soil carbon);
    - Air pollution (especially the eutrophication of soils and critical loads modelling); and
    - Climate change (calculation of GHG inventories).

c. The strongest contributions of LCM were in those areas where an area-wide perspective was needed, such as landscape and sustainable agriculture, where it provided useful contextual information. Even so, exploitation of these data is presently limited even in these topic areas, and the contribution identified for LCM is mainly based on the potential of these data that was highlighted by users, rather than on evidence describing concrete applications.

d. An implication of the finding about the Field Survey providing the stronger support for policy uses compared to LCM is that there is little to suggest that the linkage between the Field Survey and LCM components of CS is essential. Only in the area of critical loads mapping is close association and joint exploitation of the two data streams apparent, but criticality in terms of the timing of the two survey components is unclear. As a result, when we look at the future technical options for CS, one possibility might be to explore whether continued linkage between these two elements is necessary or beneficial in terms of timing and funding; the need to integrate data would, however, remain essential (see below).

e. A further implication of the findings about the policy topics where the Field Survey is making its strongest contribution concerns what this means for the use of these data for biodiversity, a subject area where it has traditionally been seen as most relevant. The contribution of Field Survey was rated as only partial for the work

based on Broad and Priority Habitats, and weak for ecological networks and species monitoring (although the latter was seen as having greater potential). However, this cannot be taken to mean that the collection of evidence for biodiversity is less important than that needed to support work in sustainable agriculture, soils, monitoring the impacts of air pollution and climate change. All of the areas where the strongest applications have been identified use essentially the same data from the mapping of area and linear features and the monitoring of vegetation plots and soils. Thus while the range of Priority Habitats covered by the Field Survey is necessarily restricted by the characteristics of the sampled survey sites, and while there is no formal policy requirement to report at the Broad Habitat level, the kinds of information that the Field Survey provides about the wider countryside is valuable across a number of other policy areas. The time series data is particularly valuable and may become increasingly so in future. **This conclusion is an important one, because as we look to the future technical options for CS, it suggests that attention may need to focus more on the ways the results can be better tailored or customised to meet user needs as well as on how fundamentally new types of data are collected.** While some modification to the approach used for the Field Survey may be necessary, given that many users said that overall the results 'only partially met their needs', the findings do not suggest a fundamental shift in methodology, all other things being equal; the quality of the habitat data is generally regarded to be good.

f. Although it is difficult to assign the applications to the different phases of the policy cycle with any certainty given the limited information provided by respondents, it does seem that overwhelmingly applications involve policy advisors exploring issues and 'framing options'. As the summary in Table 3.12 shows, about 40% of the responses from the core funding organisations were assigned to this category, while only 15% recorded as involving reporting of some kind (Table 3.12a). This conclusion seems to apply across all the policy topic areas (see table 3.12b), apart from air pollution impacts where the requirements of most users seemed to involve using the data to make some formal statement. In their qualitative statements, many respondents stressed the importance of CS as strategic or background information, often used with other data to better understand an issue[49]. When asked about the significance of CS over half of the 35 respondents answered the general questions at the end of the questionnaire said that they regarded it as *'a good source for describing change'.*

[49]Note: these findings corroborate those reported in the review of Defra's Biodiversity Research Programme 1995-2008, see: http://archive.defra.gov.uk/environment/biodiversity/documents/research-review.pdf

Table 3.12: Summary of applications by topic and stage in the policy cycle

a.

Type of user	Influencing others	Framing the issue	Testing the options	Judging policy success	Reporting	Unspecified	Indeterminate	Grand Total
Core	2	43	10	7	17	22	7	108
Originator		5				1	1	7
Non-core	4	17				13		34
Grand Total	**6**	**65**	**10**	**7**	**17**	**36**	**8**	**149**

b.

	Influencing others	Framing the issue	Testing the options	Judging policy success	Reporting	Unspecified	Indeterminate	Grand Total
Biodiversity		16	4	3	8	7	2	40
Ecosystem Services	2	6	2			2	3	15
Landscape		4	2	1	1	1		9
Sustainable agriculture		4	2	1	1	1	1	10
Water						1		1
Soil		6			2		1	9
Sustainable forestry		4		1	1	2		8
Urban						2		2
Air quality					3			3
Climate change		3		1	1	2		7
Access to nature						4		4
Grand Total	**2**	**43**	**10**	**7**	**17**	**22**	**7**	**108**

Note: Totals vary between tables a. and b. because of differing numbers of respondents

g. This finding about the stages in the policy cycle that CS data tend to support also has important implications when we look to the future of CS and the technical innovations that might be considered in its design. Namely, that if it is seen as part of a wider evidence base that forms a platform on which a range of different policy advisors develop a shared understanding of the state of the wider countryside, then anything that will promote a better read-across between different sources of evidence will be important. This may, for example, involve looking at how definitions and methods of data collection can be standardised; or it may also involve better synchronisation of monitoring efforts across different programmes. **The finding suggests that if those concerned with the future design of CS want to add significant value to the Survey, then the ability to integrate**

with other evidence sources and emerging monitoring programmes will be strengthened.

h. A final feature that is apparent from the evidence collected on the contribution of CS2007 is that, given that it mainly involves exploratory work designed to help users 'frame issues', exploitation of the evidence base depends fundamentally on the investment made by the core organisations in the further analysis of these data. In developing the hypotheses about expected kinds of use we emphasised that a number of these could not really be foreseen at the design stage for CS2007. The fact that many of them were supported argues for the versatility of the CS database and the different kinds of science that can be built around it. The review of projects also confirms that CS data can be used to deepen and extend understandings of issues for policy customers. Further work is needed to examine this point more closely, but it does seem at this stage that the level of investment made in using the data from CS is small in comparison to that needed to collect the data. The analysis of the costs and benefits of existing approaches will consider the kind of bottle neck that this represents. However, at this stage it should be borne in mind that any limited uptake and exploitation of the results by policy customers may reflect the funding model for CS rather than limitations of the data themselves. **In terms of future design it may well be that some needs can be foreseen or built in at the processing stage, so that the turnaround time between collection and use of data by policy customers is reduced.** The extent to which more of the potential science applications can be used to structure the Field Survey programme at the outset will also be considered in the later sections of this Report.

Part 4 Cost Savings of the Innovations in CS2007

4.1 Introduction and analytical approach

This review of CS2007 is based on three strands of evidence. In Parts 2 & 3 of this Report we have looked at two of them, namely the present and potential future contributions of data from CS to policy. In Part 4 we look at the third area, namely the costs and benefits of the innovations introduced into CS2007 and the implications these might have if the Survey were to be continued. As the brief for this study noted, part of its rationale was to give the core funders a sense of which packages provided the best value for money, so that they could identify the added-value and/or cost savings generated by CS2007.

Although it is important to consider all components of the CS programme, in line with the brief for this study we have also looked closely at the key innovations introduced in CS2007. These were: the Informatics work package (WP8); the use of mobile tablets to record data in the Field Survey (WP7); and the Communications work package (WP10). The assessment of these features, like that for all the work packages, has involved an examination of quantitative information, such as the resources expended, the timeliness of reporting and the numbers of users of CS results, as well an analysis of qualitative data, such as the nature of the outputs produced, their relevance to policy needs and the awareness raised amongst key audiences. An important source of evidence has been material from the on-line questionnaire, which also contained sections on the more general aspects of CS2007 and especially the effectiveness of its reporting and communications strategy.

Information for the analysis of costs and resource management issues surrounding CS2007 was gained from two formal interviews with staff at CEH in April and August 2012. These interviews followed a template of questions prepared by the Project Team and agreed by the Project Steering Group. The purpose of the first meeting was to identify and agree what kinds of information could be provided by CEH; the second interview reviewed this material in detail, which was then taken away to be scrutinised.

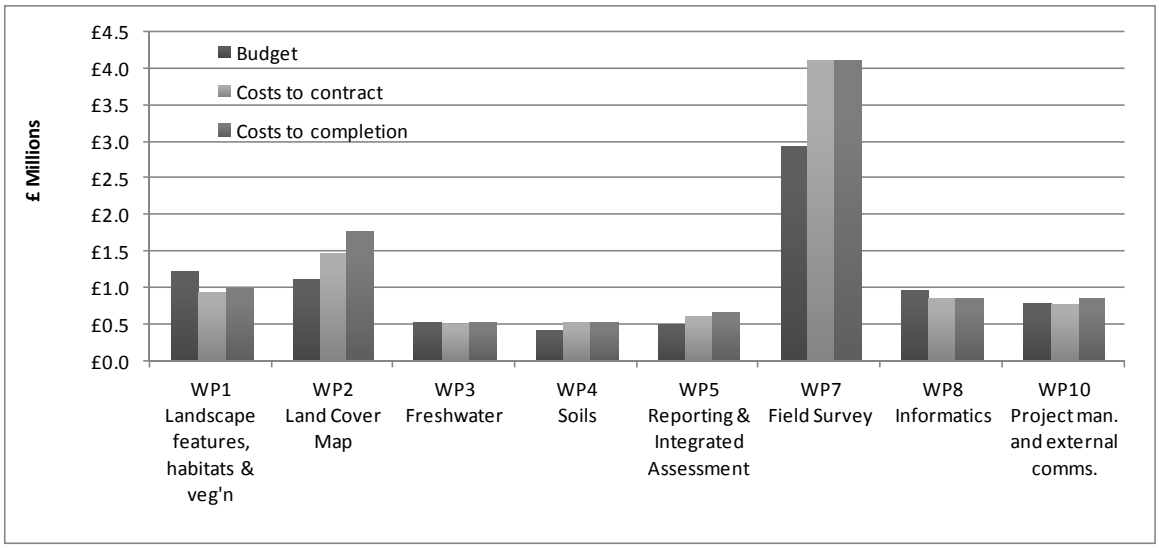
Although the costs of a project like CS2007 are relatively easy to estimate, the benefits are more difficult to judge. The evidence presented in Part 3 suggests that the CS2007 Field Survey especially has made a number of significant contributions to policy, in the sense that key questions or reporting requirements would not have been addressed if these data had not been available, but it is difficult to make a financial estimate of what such applications are worth to policy customers. A formal cost-benefit analysis of CS2007 was not required by the brief for this study. Instead, we have adopted a more deliberative approach in which we will consider the scale and nature of the investments made in CS2007 so that they can be looked at in the context of the ways the data resources have been used up to present, or might be exploited further in the future.

4.2 The cost-benefit profile of CS2007

The estimates of the costs of CS2007 that were provided by CEH are summarised in Figure 4.1; a more detailed tabular breakdown is given in Appendix 5. Both sets of data show the initial budget for each of the CS2007 work packages, and the costs of each of them to contract (February 2007) and completion (March 2010). This allows a comparison to be made of the budget costs at the time the contract was awarded, the effects of the amendment to the budget that were agreed with funders to take account of the anticipated costs of Land Cover Map in 2008 and the actual expenditure at the end of the contract period in July 2011.

In reviewing the data in Figure 4.1, it should be noted that in providing this breakdown CEH stated that the final costs to them are probably an underestimate, because they do not fully take account of senior staff input and some of the unforeseen costs arising from the licensing issues associated with LCM2007. In addition, the overall cost estimates provided by CEH do not cover the involvement of the funders in project management and overseeing the outputs, particularly for the preparation of the UK, country and integrated assessment reports. For example, the preparation of the England Report involved

Figure 4.1: CS2007 Budget and cost breakdown by work package (Source, CEH)



£000s	WP1 Landscape features, habitats & veg'n	WP2 Land Cover Map	WP3 Freshwater	WP4 Soils	WP5 Reporting & Integrated Assessment	WP7 Field Survey	WP8 Infomatics	WP10 Project man. and external comms.
Budget	£1,221	£1,117	£529	£415	£505	£2,941	£957	£794
Costs to contract	£950	£1,460	£510	£520	£610	£4,130	£850	£760
Costs to completion	£990	£1,780	£529	£520	£650	£4,130	£850	£860
Variation of costs	-£231	£663	£0	£105	£145	£1,189	-£107	£66
Percentage variation	-19%	59%	0%	25%	29%	40%	-11%	8%

£000s	WP1 Landscape features, habitats & veg'n	WP2 Land Cover Map	WP3 Freshwater	WP4 Soils	WP5 Reporting & Integrated Assessment	WP7 Field Survey	WP8 Infomatics	WP10 Project man. and external comms.
Budget	£1,221	£1,117	£529	£415	£505	£2,941	£957	£794
Costs to contract	£950	£1,460	£510	£520	£610	£4,130	£850	£760

significant time inputs of members of the CS Funders Steering Group. However, in the absence of verifiable data, neither of these additional sources' costs have been included in our analysis.

The budget for CS2007 that was agreed with funders in 2007 was £8.479M; this figure does not include the sum of £1.944M spent by the core funding organisations during the preparation phase in 2006-7. By July 2011, the actual costs of the main survey were estimated to be £10.309M, or about 22% more than originally planned. As Figure 4.1 shows the largest cost increases were for LCM2007 (WP2) (59%) and the Field Survey (WP7) (40%); by contrast, the major savings were for the analysis of landscape features, habitats and vegetation (WP1) (-19%) and Informatics (WP8) (-11%). The experience from CS2007 suggests that estimating the cost of the Field Survey is relatively difficult, there being a high dependence on external factors and a significant risk of unforeseen additional costs. By contrast, the costs of data analysis and reporting are more predictable and therefore manageable.

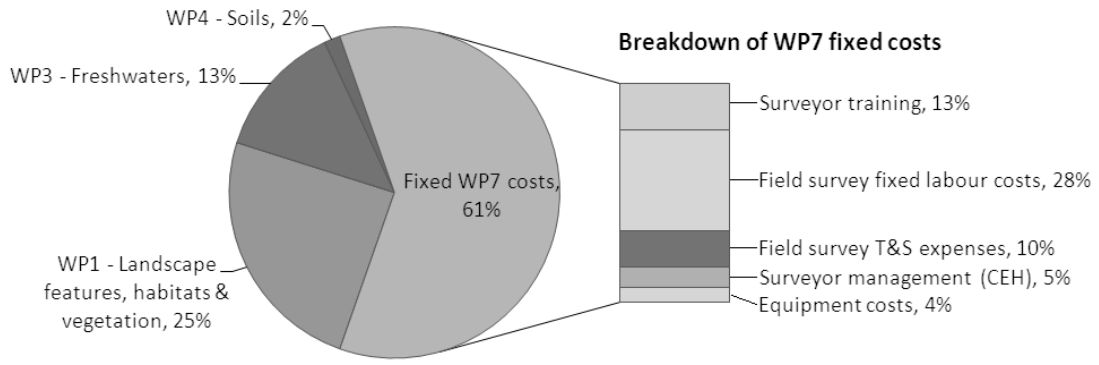
4.2.1 The Field Survey

The Field Survey (WP7) was the largest work package in CS2007, accounting for 35% of budgeted costs. It involved the recruitment, training and deployment of 20 teams of four surveyors who visited the 591 survey squares. Teams took, on average, four days to complete the survey of each square. In reviewing the costs of WP7 it must be noted that it is distinct from those of WP1, WP3 & WP4 which represents the analysis of the samples and data collected respectively, on: landscape features, habitats and vegetation; freshwaters; and soils.

CEH report that the survey time in the field was higher than expected, partly because of the new survey requirements that had been added since CS2000. These related to the collection of data on soils and freshwaters, which proved more time consuming than anticipated. There were also external factors such as poor weather and the foot and mouth disease outbreak which imposed delays. As a result, actual expenditure on the Field Survey was considerably higher than expected and the shortfall was met partly from additional funding agreed as a contract variation with the Steering Group, and partly by moving money from other work packages (for instance from the project management and communications work package). No contingency had been built into the overall budget for CS2007.

Although the Field Survey (WP7) delivered no direct data outputs, but supported the analysis of the other work packages, it is possible to make an estimate of the amount of Field Survey time that was spent providing the data for these other CS components (Figure 4.2). In the breakdown shown, a distinction has been made between the 'fixed costs' of running the Field Survey (such as the time spend by surveyors travelling to survey areas, finding accommodation, contacting landowners and training and the costs of equipment) and the survey costs that can be easily attributed to individual topic

Figure 4.2: Attribution of Field Survey effort to major data CS Field Survey outputs (Source CEH)



Element		£000s
Contribution to WP1 - Landscape features, habitats & vegetation		£1,012
Contribution to WP3 - Freshwaters		£544
Contribution to WP4 - Soils		£65
Fixed costs	Surveyor training	£540
	Field survey fixed labour costs	£1,154
	Field survey T&S expenses	£420
	Surveyor management (CEH)	£224
	Equipment costs	£170

outputs that make a direct contributions to other work packages. These direct contributions are based on the time in the field, estimated by CEH, spent collecting data for the other work packages (for instance 30 hours per survey square on the vegetation plots, 16.5 hours recording habitat data and 16 hours on the headwater streams data).

Using this method, it is estimated that 25% of the costs of undertaking the Field Survey (WP7) were directly involved in providing data on landscape features, habitats and vegetation (WP1), 13% on freshwaters (WP3) and 2% on soils (WP4).

A similar approach can be taken to allocating the costs of work packages 5 (reporting) and 8 (informatics) to the three Field Survey topic areas. CEH estimate that 80% of the cost of WP5 can be attributed to the reporting of landscape features, habitats and vegetation, 10% to reporting of freshwaters and 10% to the reporting of soils. Similarly, 40% of the costs of handling data in the Informatics Package (WP8) related to landscape features, habitats and vegetation, 5% to freshwaters and 5% to soils. Using these data we can now look at the aggregated costs of each major analytical component that were supported by the Field Survey.

Work Package 1 – Landscape features, habitats and vegetation

WP 1 involved the analysis and reporting on the results of the Field Survey in relation to landscape features, habitats and vegetation, and as such, represented one of the major analytical components of CS2007. In detail it made an analysis of change in the extent (stock) and condition of Broad and selected Priority Habitats, linear and point features, and monitored changes in vegetation character. It also explored patterns of change and drivers of change in relation to data from other work packages and external data.

Altogether WP1 accounted for around 14% of the overall anticipated costs of CS2007. In the event, the work package was completed with lower than anticipated expenditure (19% below budget). Combining the data shown in Figure 4.1 and 4.2, and attributing to WP1 that proportion of the field effort needed to generated its underlying data, the total resource needed to complete this work package was around 25% of the overall budget for CS, or roughly £2.6M[50].

The aggregated cost of WP1 clearly needs to be weighed against the policy impacts of this work package that were assessed in Part 3 of this Report. The analysis found that WP1 was responsible for making a strong contribution to policy in sustainable agriculture, air quality and climate change, a partial contribution in relation to ecosystem services and weaker contributions on aspects of biodiversity, landscape and sustainable forestry. In line with the greatest level of expenditure it clearly had the most significant policy impact to date of all the CS elements. For most of these contributions the value of CS was derived from the contextual nature of the data on habitat condition and species diversity or the extent and condition of landscape features.

Work package 3 – Freshwaters

WP 3 provided evidence and analysis on changes in the components of biological diversity and condition, and in the physical condition, of small streams and ponds. The management and reporting of the pond biological survey was sub-contracted to Pond Conservation, although the surveying was integrated with, and took place alongside, the other aspects of the Field Survey. This work package accounted for 6% of budgeted costs and came in on-budget. As with Work Package 1, it is possible to estimate the resources accounted for under other work packages (Field Survey, reporting and informatics) that directly contributed to the outputs of this work package. If these are included, the freshwater results of CS2007 represented an expenditure of £1.4M or 14% of the overall cost.

The cost of this work package must be looked at in the context of the policy impacts identified in Part 3. The evidence is equivocal because of the low response rate to the questionnaire on the water resources policy area and the lack of engagement from the key organisations who are potential policy users. Although far from conclusive, this lack of

[50] Note this estimate does not include the fixed costs – but only those other costs attributable to the analysis undertaken in WP1.

response and engagement might lead to the conclusion that this work package represents poorer value for money than some of the other CS work packages.

Work package 4 - Soils

WP 4 assessed and sought to explain the status and changes in key soil properties, identifying linkages between soil properties and with vegetation and water properties. It was the smallest work package, that accounting for around 5% of overall costs. Although the final costs were about 25% higher than anticipated, it clearly has contributed strongly to policy on soils and air quality. This suggests that it represents better value for money in comparison to the other work packages.

4.2.2 Land Cover Map 2007

The Land Cover Map (LCM) was delivered through WP2, which operated as a relatively free standing element within CS2007. Despite its inclusion in CS, the analytical connections made with Field Survey data have been limited, and so the case for treating the Field Survey and LCM as a single funding package does not seem to be a strong one. LCM was delivered two and a half years later than originally intended. The fact that the delay in publication of LCM did not significantly hinder the reporting or use of the Field Survey results only serves to underline the weakness of the connections that existed between them.

In addition to the delay in publication, the funding of the work was also problematic. WP2 experienced the largest over-run in costs of any of the work packages in CS2007. In the tender submitted in February 2007, the budgeted cost of LCM was put at £789,000, but it was recognised that there were significant outstanding issues that needed to be resolved, relating primarily to Ordnance Survey (OS) royalties payable by end users, and the use of LCM for the European CORINE Land Cover project. The budget was subsequently increased to £1.12M or 13% of the total CS2007 budget. However, expenditure to the end of the contract in March 2010 had increased to £1.46M, and by July 2011 when LCM2007 was finally launched, its cost had risen to £1.78M. The cost over-run was about 59% of the original budget, much of which was met by CEH. The total expenditure on LCM was around 17% of the final cost of CS2007.

In general terms, the increased costs arose because the data processing was more complex and took more time than anticipated. Organisational restructuring with CEH over the period also contributed to the delay which was exacerbated by the negotiations with OS over data licensing. However, it is not appropriate here to make a detailed review of the reasons for the difficulties faced in the production of LCM, but rather to examine the question of whether the money actually spent represented good value given the contribution that this WP has made in the policy arena.

As noted in Part 2, the policy impact of LCM is difficult to assess because of the short time since the product was launched in July 2011. In Part 3 the evidence collected from the core funding organisations suggested that LCM had unrealised potential, especially in

relation to the assessment of landscape character, the understanding patterns of agricultural land use and the structure of ecological networks. Looked at in these terms it would appear that LCM has some way to go before it can be seen to justify its costs. However, in making a rounded assessment of the investment made in LCM, it is important to also note that as a data product it is being handled in a different way to the other data outputs generated by CS2007. For all products, except the 1km resolution summary products (which are free), users pay an annual licence fee[51] that is set according to the size of the area of interest. The LCM website[52] states that:

> *'UK LCM 2007 pricing has been developed to provide a reasonable return on NERC's investment in creating the LCM 2007 information products and is in line with the NERC Policy on Licensing and Charging for Environmental Data and Information Products.'*

It goes on to note that the prices are in part based on comparison with previous Land Cover Map and 'the improvements made to the products themselves'. The pricing is therefore set at a rate of reasonable return, based on what could be assumed to be market rates, with reductions for non-commercial uses. The licence for a block of the LCM2007 vector data for an area roughly the size of an English county (3000km^2) will cost around £1700 per year for commercial use (excluding VAT). This compares to roughly the same charge for similar block of LCM2000 vector data, charged as a one-off licence fee.

In our discussions with CEH we have sought to clarify the assumptions on which the pricing policy has been based, and it has been confirmed[53] that the level of charge will not enable anything like full cost recovery to be achieved. In the last decade LCM2000 has generated around of £600K in licensing revenue, out of which administration costs need to be taken. It is expected that LCM2007 will generate a similar amount over its lifetime, and due to third party costs, the income could be less; in the example cost given above the OS fee accounts for around 50% of the cost. Nevertheless, it is clear that the cost-benefit ratio for LCM2007 is likely to change significantly over time. CEH report, for example, that they are now (July 2012) getting sales of LCM to local authorities. The download statistics from the CEH website (see below) also suggest that there has been nearly four times as many downloads of LCM2007 products[54] than for the 2000 equivalent. **Thus while it is probably premature to suggest that LCM currently represents good value for money, in the longer term it may well do so, providing it is accepted that a financial return on the investment is an appropriate objective for the core funders.** It is difficult to see how all charges could be waived, however, to promote wider uptake, given the need to cover OS royalties.

[51] This includes licensing fees other than those payable to the OS

[52] http://www.ceh.ac.uk/LandCoverMap2007Pricing.html#Charges

[53] Stephen Keightley – CEH licensing lead, personal communication

[54] Note this include some LCM products for which no fee is payable – such as the 1km resolution data. See the LCM website for further details.

4.2.3 Informatics

A new data platform for CS

A legacy of previous Countryside Surveys was a proliferation of the formats used to store and analyse the spatial and other data from the Field Surveys, resulting in poor integration and compatibility between these datasets. The Review of Countryside Survey 2000[55] recognised the issue and recommended that if future surveys were undertaken then better systems for handling the data resources would be needed. In scoping CS2007, the Funders therefore agreed that a key element of the preparatory phase for CS2007 was the informatics work package (WP8) that developed an integrated geodatabase into which data from previous Field Surveys was transferred. The database would then be ready to receive data from the 2007 Field Survey directly from mobile tablets used in the field, thereby speeding up processing times.

The cost of the geodatabase development, which was contracted out to ESRI, was £510,000. This sum accounted for about 26% of expenditure during the second stage of the preparatory work for CS2007. The software package was a development of ESRI's existing 'Forester' data recording software, prepared under contract to the Forestry Commission, which we understand to have cost several million pounds. The cost of transferring data from previous Field Surveys by CEH staff was a further £320,000 or 16% of preparatory work. **All these costs can be regarded as a significant and justifiable 'one-off' investments that have secured the value of data from previous Field Surveys and have enabled the more timely and accurate reporting of trends up to, and including, the 2007 Survey**. It also allowed the direct entry of data into the geodatabase in the field which, in turn led to significant costs savings, enhanced accuracy and faster reporting of the most recent Field Survey. Although any future surveys will require software and IT investments (for new field tablets and updated software), these should be much less than was required in CS2007 to bring the historical data into a single geodatabase.

During the main CS2007 contract, the Informatics work package was used to prepare and transfer data from previous Field Surveys (held in the new geodatabase) onto the mobile tablets that were taken into the field. This allowed the implementation of a 'change-only' approach to recording. The work package was also responsible for receiving and processing the Field Survey data entered by surveyors onto the mobile tablets. The systems developed also allowed automated analyses of the processed data, designed to produce the initial summary results, alongside a Web-based system which makes summary and raw data accessible to external users. As Figure 4.1 shows, during the main contract period, the Informatics work package accounted for roughly 8% of the total costs at completion, and was significantly under the original estimated budget. CEH have estimated that around 50% of the expenditure on Informatics amounted to the fixed costs of setting up the data management systems while the remaining sums were split

[55] Briggs, D. (2003) Countryside Information for policy- The lessons from CS2000. A Report on behalf of DEFRA and CEH, NERC.

between handling the data for the landscape features, habitats and vegetation work package (40% of costs), the freshwater work package (5%) and the soils work package (5%). These costs have been factored into the assessments described above.

Mobile field tablets

The use of mobile tablets for field recording was a major technological innovation in CS2007. A significant issue in CS2000 had been the quality of data capture in the field on paper forms and maps. This had produced anomalies that were often time consuming or impossible to resolve when the data were being transferred to computer and analysed. The time spent transferring hand written data to digital formats was also very significant, imposing a high cost and delay to reporting. CEH estimate that 24 staff years (12 staff for 2 years) were involved in the transfer of the 20,000 data sheets from 1998. The use of the mobile tablets has meant that none of this work was required in 2007.

For CS2007, no additional data entry or digitising staff were employed, all of this being done by the 20 teams of four surveyors in the field. CEH estimate that recording data on the mobile tablets was not significantly more time consuming than the earlier use of paper forms. Although there was an additional requirement to upload data at the end of the working day, the intuitive nature of the software, that anticipated which forms needed to be completed based on site characteristics, enabled more efficient use of surveyor time in the field.

The mobile tablets required additional training of the survey staff, compared to CS2000, amounting to an extra 8 days each for the two people in each survey team that used them, or a total of 1.5 staff years. The cost of the tablets, at £2,400 each for 50 units, was included in the Field Survey budget (WP7). However, a measure of the cost effectiveness of this investment can be gained by comparing the costs of their purchase and the additional costs of staff training with the time spent on manual data entry in the previous survey. Investment in the mobile tablets in CS2007 came to around £177,600 (equipment and staff training) compared to the cost of manual data transfer estimated at £972,000 in CS2000. Although very different kinds of expenditure, the two are comparable because the investment in tablets in CS2007 negated a repeat of the manual data transfer used in CS2000. This shows a very significant cost saving.

In comparison to the previous process of manual data entry, the use of the mobile tablets also provided significant improvements in the timing and accuracy of reporting. In CS2007, the more automated process of data entry and analysis meant that the first FS results were produced 12 months earlier than in CS2000. The tablets provided the benefit of being able to check the accuracy of previous FS data records while in the field, in some cases re-categorising features or correcting data about the presence of features in an audited system. They also allowed transfer to, and quality checking of data by, CEH supervisors on a regular basis, ensuring that virtually no data was lost during CS2007; the digital data proved to be more secure than paper records.

It may be concluded therefore that the investment made in informatics and the digital recording of data in the field therefore represents good value for money. It not only secured the existing data CS resources and facilitated more rapid publication of the CS2007 results, but also provides a data infrastructure that can largely be re-used in any future survey. The methods of digital capture of data in the field with the ability to cross refer to previous results, supported by GPS positioning, are unlikely to be overtaken by other technologies in the short to medium term, and so the capability established through CS2007 is likely to provide a sound platform for future monitoring initiatives.

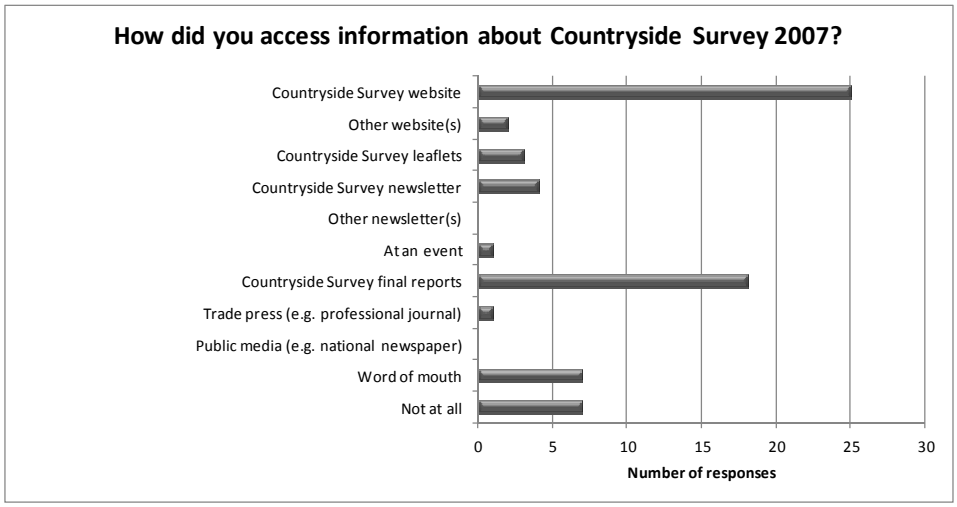
Dissemination

The final component of the Informatics work package was the development of the tools needed for dissemination of the processed results and raw data by CEH and others. This was achieved via five routes, four of them over the internet:

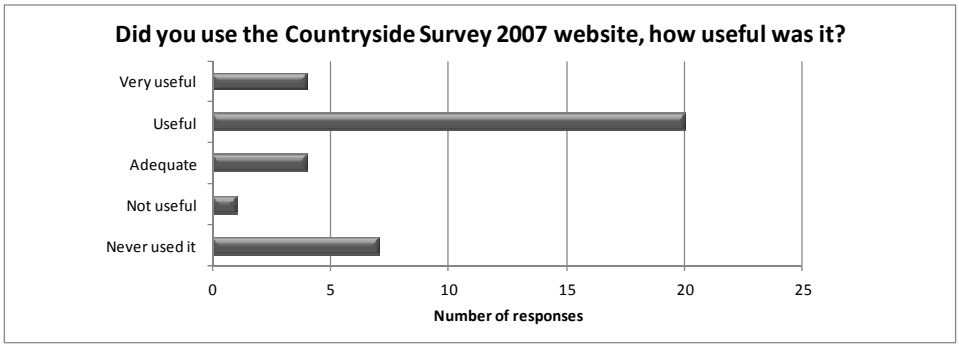
- The Countryside Survey website[56]: This website was maintained during the operational phase of CS2007 and was used to provide background material and access to results. The website included a description of Countryside Survey, a summary of the history of CS, reports from previous surveys and a description of the work carried out for CS2007. Since the completion of the contract, the website has

Figure 4.3: results of questionnaire survey on accessing CS2007 reports and data

a.



b.



been updated periodically to announce news or other developments; for example in April 2012 it was used to report that data from the first Countryside Survey in 1978 have been digitized as part of a CEH data rescue project and are now available to download from the website. The questionnaire for this Study asked users about the ways they accessed information about CS2007 and in particular what they thought about the website. The results are summarised in Figure 4.3. The data are aggregated across all the policy topic areas used to structure the survey. As these data show, the majority of those who provided information used the website as the primary source of information (Figure 4.3a), and the majority of these found it to be useful or very useful (Figure 4.3b).

- The Countryside Survey data download website[57]: Following the recommendations made in the CS2000 Review, a facility was developed allowing registered users to download the 'raw' tabular summaries of CS Field Survey data, classified into 39 thematic categories at 44 different geographic scales (for instance Counties, Landscape Character Areas and Parliamentary constituencies). Although the raw data from each square is provided, its location is not revealed. Registration on the site is simple, and CEH report that 1,931 separate requests for data have been received and delivered since 2009 to 1,002 registered users. There was a spike in downloading of data at the end of 2009, when the England Report was launched and when CS was promoted at a British Ecological Society symposium, but otherwise the rate of downloading has remained relatively constant. A breakdown of access by dataset was not available to this study, but analysis of the registered users using their email addresses (Table 4.1) suggests that 12% were from the core CS funding bodies (7% from CEH, 3% from Natural England and 1% from Defra), 27% were from academic institutions and 10% were from public bodies. Of the remaining half of the registered users, around 2% were from overseas.

Table 4.1: Use of CS2007 website

Number of users registered on the CS2007 data website
Provided by Ian Simpson, CEH, 21 August 2012

User categories			
CEH staff	73	7%	12% Funders
Defra staff	14	1%	
Natural England staff	31	3%	
Other users with a ".ac.uk" email address	271	27%	
Other users with a ".gov.uk" email address	101	10%	
Users with a ".org" email address	22	2%	
International users	16	2%	
Others including: .co.uk, .com & users with hotmail, gmail and yahoo email addresses etc	474	47%	

Total number of registered users (with duplicates removed)	1002

[57] www.cs2007.ceh.ac.uk/data-access

Table 4.2: CS2007 data downloads from the CEH Information Gateway

Number of data downloads from the CEH Information Gateway

Provided by John Watkins, CEH, 13 August 2012

Land Cover Map 2007	892	67%	92%
Land Cover Map 2000	233	18%	
Land Cover Map 1990	91	7%	
CS Habitats Data	52	4%	
CS Hedgerow Data	27	2%	
ITE Land Classification	27	2%	
Total number of downloads	1322		

- The CEH Information Gateway[58]: CEH hosts the Environmental Information Data Centre for terrestrial and freshwater sciences on behalf of NERC. Users can search the data catalogue to find, view and download data. A number of CS products are included in the data catalogue, including hedgerow and habitats data, and LCM raster and vector data. Again, registration is simple but acquiring the data may take longer and can incur a cost (for instance the LCM vector data). As Table 4.2 shows, since 2010, 92% of the CS products downloaded from this source have been LCM data, with LCM being downloaded 892 times (67% of downloads); interest in LCM already exceeds that of LCM2000. There has, however, been relatively little interest in the data from the CS Field Survey; for instance there have been a total of 52 downloads of data for Habitats and 27 downloads of Hedgerow information.
- EDINA[59]: This is a UK national academic data centre, designed to support the activity of universities, colleges and research institutes in the UK, by delivering access to a range of online data services through a UK academic infrastructure. The same CS products that are available through the CEH Information Gateway are also available through EDINA, but no download statistics are currently available.
- The CEH data licensing department: Researchers are also able to contact the CEH data licensing department directly, where the personnel are able to advise them on the most suitable product for their needs.

An issue raised at our expert workshops by users of the 'raw' tabular CS Field Survey data concerned the withholding of the location of survey squares. It has been the policy of successive CS Steering Groups not to reveal the precise location of CS survey squares in order to avoid the risk that making it available would lead to interventions in land use or management that would bias future survey results. The issue was considered again by the CS2007 Steering Group in the preparatory and delivery phases and the Steering Group had reconfirmed the earlier decisions but agreed that locations to a four figure grid reference could be provided to users under licence.

[58] www.gateway.ceh.ac.uk.
[59] www.edina.ac.uk.

At the expert workshop held as part of this study, there was concern that the inability to spatially match the 'raw' CS data with other environmental data at a sufficiently detailed resolution was a major constraint on their use. Given that it is the contextual nature of CS data that is considered to be one of its more valuable uses, it is suggested that the decision to withhold precise locational data from users should be re-examined again. The risk of the limited release, under licence, of this information leading to systematic bias should be critically reviewed.

No cost data are available for the dissemination element of the informatics work package. **However, given that the overall budget for this CS component was relatively small, and that the uptake of CS2007 data seems to be significantly better than for CS2000 at an equivalent stage, then the investment made in developing these different delivery platforms appears to have been a good one.** However, the questionnaire survey suggests that there have still been limitations on uptake, which partly reflects the complexity of the data themselves and also the capacity CEH has available to provide bespoke support to potential users.

4.2.4 Communications

The CS2000 Review identified a need to expand the number of users of CS and to improve the general awareness of the Survey amongst the environmental policy community and other audiences. To address this, an important new component of the preparatory phase for CS2007 was the preparation of an External Communications Strategy and Action Plan. This was delivered in the main contract through Work Package 10.

The budget agreed for WP10 was £790,000 or 9% of the total. CEH estimate that around 20% of the WP budget (£160,000) was allocated to Communications, amounting to 2% of the funds allocated to this component. The original intention was that the majority of the communications work would be undertaken by a new CEH Communications Team at Wallingford. However, this team was not established in time and instead it was decided to sub-contract some of the communications work to the external consultants Countryscape, who were responsible for developing and implementing the CS Communications Strategy and Action Plan (See Box 4.1), in partnership with CEH; the subcontract accounted for about half the Communications budget (£79,000). As noted above, as part of an overall cost reduction exercise, around £80,000 was transferred from WP10 in September 2007 and reallocated mostly to the Field Survey campaign (WP7); part of the sums reallocated came from the communications element of WP10.

The CS2000 Review recommended that in preparing for the publication of any future survey results, the 'headline' messages needed to be foreseen so that a reporting framework could be agreed in advance, thereby speeding up dissemination. The Communications Strategy took this recommendation forward, and a 32-page Headline Messages summary of the main UK findings was prepared for non-technical audiences. The summary document was delivered to CS partner organisations for distribution via

their own communication channels (including events, venues and circulation via post to partners' own stakeholders).

Most of the other communications activities were focused around the launch of the various CS reports. Budget limitations meant that no money had been allocated for events, and so NERC and Defra provided additional support for the launch of the main UK Report. The Scotland and Wales country reports were launched at the Royal Highland and Royal Welsh Shows respectively. These launches generated significant media interest, as summarised in Box 4.2. It would appear that much of the coverage in the mainstream media was assisted by the availability of the non-technical headline messages document.

External promotion of CS by CEH continued following the publication of the final reports in line with the recommendations of the Communications Strategy. This included a British Ecological Society symposium devoted to CS and presentations to Natural England staff, Scottish environment statisticians, NERC's Science & Innovation Strategy Board and others.

Box 4.1: The CS2007 Communications Strategy and Action Plans

The CS Communications Strategy contained sections on:

- **Perceptions:** detailing current (at the time) negative perceptions of CS that were to be addressed through communications, those being: lack of publicity; limitations of data; lack of transparency; unclear leadership.
- **Vision:** describing an overarching vision for CS communications, that being "To strengthen the impact of the Countryside Survey (CS) project through effective communications – aiming to raise awareness of its methodology, applications and benefits amongst all audiences; and to positively influence the behaviour of stakeholders in sustainable development." Additional goals were identified over the short and long term.
- **Objectives:** clarifying the specific aims of communications activity in terms of: image and identity; promotion and publicity; teamwork and partnership.
- **Principles:** setting out protocols for undertaking communications activity, applicable to the External Communications Topic Group.
- **Messages:** identifying the core message of CS alongside a range of sub-messages, categorised in terms of: generic messages (suitable for all audiences); internal messages (targeting stakeholder organisations and funders); scientific messages (targeting users of CS data).
- **Issues and opportunities:** identifying external circumstances with potential to influence CS communications during the course of the project.
- **Branding:** notes and guidance on correct use of the CS logo.
- **Audience:** identifying the different groups with which CS is required to communicate.
- **Channels:** identifying the most effective methods of engaging with each target audience.
- **Evaluation:** detailing recommendations for monitoring and evaluating CS communications.

The CS Communications Action Plan included activities relating to:

- Website development and ongoing update
- Production of CS newsletters
- Production of CS leaflets and policy briefing notes
- Media relations
- Working with partners
- Meetings and events
- CS Reporting: production of publications
- CS Reporting: launch event materials and publicity
- Communications strategy review and update

Box 4.2: Media coverage arising from the launches of the main CS2007 products

- The media launch of the UK results on 18/11/08 was co-ordinated by NERC. It resulted in half page articles in the Daily Mail and The Times print versions, as well as print/online coverage in 21 other media outlets including sectoral media (e.g. Farmers Weekly, Farmers Guardian, Horticulture Week, Wildlife Extra), UK regional media (e.g. The Scotsman, Wales Online, Western Morning News, Yorkshire Post) and international media (e.g. Germany and Spain). Radio coverage included Radio 2 (Steve Wright Show 'factoid'), Radio Solent and Radio Oxford.
- The launches of the individual country results (Scotland 25/06/09, Wales 21/07/09 and England 23/09/09) also received coverage, but to a lesser extent than the UK results launch. The England results were reported in The Daily Mail, Guardian and on Farming Today.
- The launch of LCM2007 on 05/07/11 was reported by The Guardian, Daily Mail, Telegraph and Reuters (the Guardian article in particular directed readers to CEH's news page, contributing to the nearly 5,000 unique people accessing that part of the site) and by a range of other media, including international outlets in India, Germany and New Zealand.

Information has not been collected on the awareness of CS amongst the public or specific audiences who might be expected to be interested in its findings, such as rural land owners and managers or environmental professionals. Nevertheless, there has been a modest continuing level of coverage in the national print and broadcast media, which has focused on populist issues such as an increase in 'thuggish weeds at the expense of wild flowers' and the 'concreting over of the countryside'.

ESRI's press release issued at the start of the Field Survey work (19/07/07) generated significant interest in the IT arena, with coverage in 20 specialist media outlets. Similarly, the technology sector was targeted on the release of the LCM, and this generated a significant amount of coverage in the UK and elsewhere. The 'cutting edge' nature of CS, particularly LCM, means that there is a global audience of specialists, businesses and academics that are potentially interested in the work.

Unfortunately there is little evidence available that would enable the overall impact of CS2007 communications to be compared with the CS2000 survey. **However, given the small budget allocated to communications for CS2007, and the level of coverage that was achieved, it can probably be said that the investment made in this aspect of CS2007 was worthwhile.** During our consultations it was suggested that more media coverage, of a more sophisticated type, might have been generated if CEH, NERC and its partners had developed a series of themed media releases on particular aspects of the survey, such as hedgerow management, soil carbon or the impact of set-aside on farmland diversity; but clearly the uptake of such material is as much dependent on the urgency of the message as in the way it is told. For CS 2007, however, it was decided by the project funders that the emphasis should be on reporting that largely replicated the approach of the previous Survey. **For the future it may well be that an explicit problem solving or issue focus might be included in the preparation phase, so that a more proactive and targeted dissemination strategy can be constructed.**

4.3 Conclusion

The aim of this discussion has been to describe the principle components of CS2007 in terms of the costs, and identify some of the key benefits of the outputs that were generated. A full understanding of the benefits that the investment in the Survey represented can only be made by looking at the outputs in relation to policy contribution that was assessed in Part 3. A key finding from this analysis was that it made a strong contribution to relatively few policy areas, but was notable in that it gave the policy community a good, integrated picture of state and trends in the wider countryside away from sites of highest biodiversity value.

The analysis presented in Part 4 suggests that just over half of expenditure on CS2007 can be attributed directly to scientific and policy-relevant outputs of the Survey (that is through the substantive analytical work packages and through their share of effort in other work packages such as reporting and informatics). The policy contribution of the analysis of data on landscape features, habitats and vegetation was the most significant which perhaps reflects the scale of the expenditure that this element had in the overall cost profile of CS2007. However, given the relatively small proportion of the budget that was allocated to soils, the significance of its impact must be seen as offering particularly good value for money. Much less confidence can be attached to any claims about the cost effectiveness of the freshwaters component and LCM2007. In the case of the former this largely reflects the lack of any strong evidence for widespread policy use from the analysis of the data on the headwaters of streams undertaken in Part 3. In the case of the latter, the limited time that has been available to exploit the resources provided by the Land Cover Map.

Turning to the innovations introduced into CS2007, the investment in informatics was particularly effective. It not only expedited the collection and dissemination of CS2007 data, but also ensured the integration of the outputs from earlier Surveys with the most recent campaign. It also provides a platform for any future work thereby partly minimising the scale of any further investment that will be required. The small sum invested in communications also appears to have been effective, in that the limited evidence available suggests the impact of the Survey was at least as good if not better than that of earlier Surveys. The one qualification that could be made to this conclusion is that our consultations suggest that much more effort (including by direct involvement of funding bodies) went into the preparation of the UK and country level reports that, by their nature, were reporting on generalised trends somewhat independent of specific policy requirements. In contrast, much less effort has gone into the promotion and interpretation of the 'raw' CS data that might have contributed positively to policy outcomes. This may have contributed to the lack of awareness about the relevance of CS to policy shown in the questionnaire survey. Arguably, the significant investment in the Informatics work package during the preparatory phase, and during the main CS2007 programme, has not been fully realised. A factor contributing to a lack of policy impact of

the CS outputs in some policy areas might be the limited or piecemeal funding of on-going research rather than any inadequacy of the current data infrastructure.

In drawing any final conclusions about the cost-effectiveness of the investment in CS2007, it should be noted that from the perspective of the core funders, excluding NERC/CEH, the cost of the data must be regarded as extremely good value, in that roughly 50% of the overall budget at final out-turn was provided by NERC/CEH. It could therefore be argued that if the task of collecting the same data had been let through a commercial contract, then the resources required of the core funders would have been substantially greater. For NERC/CEH the justification for their investment rests on scientific arguments as well as those relating to policy needs, and CS is regarded by them as part of their contribution to 'national capability'. While an examination of the scientific case for CS is outside the remit for this study, one cannot easily dismiss the point that that by seeking to address both scientific and policy needs CS has the potential to represent good value for money by exploiting synergies that arise from this joint use.

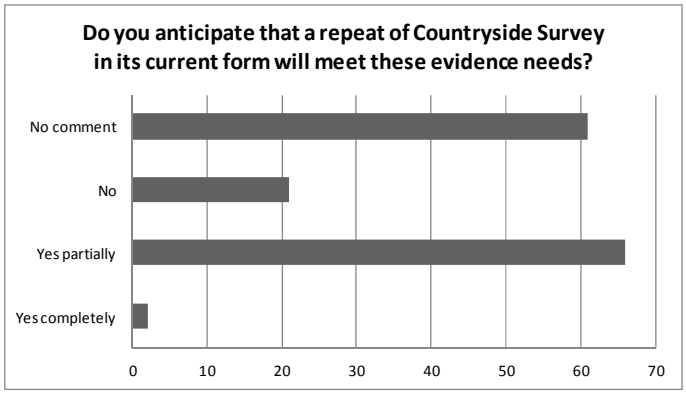
Part 5 CS2007: Meeting Future Policy Needs

5.1 Introduction

Part 5 identifies the likely future policy requirements for monitoring environmental change in the countryside. It does this through a desk review of current and forthcoming policy documents at international, national and devolved scales. It also draws on information provided by the questionnaire responses and more general comments from representatives of the bodies that funded CS2007 and other stakeholders who attended the two expert workshops organised by the project team. The review of emerging and future needs is structured around the same policy topic areas used to assess the current contribution of CS, although where new potential requirements have been identified the framework has been modified accordingly. The Chapter concludes with an assessment of the implications of these emerging and future needs for CS in its current form, and the development of a general set of monitoring requirements against which future design options can be set.

To set the context for the discussion that follows it is useful to note the 'headline results' from the questionnaire survey in which respondents were asked to describe their likely future policy needs in the short to medium term, and the extent to which CS in its current form might meet them. The overall results mirrored the findings when asked a similar question about the extent to which CS met current requirements (see section 3.2). Aggregating the results across all policy topic areas the majority of people felt that the current design of CS would only *partially* meet their future monitoring needs (Figure 5.1).

Figure 5.1: Aggregated questionnaire results on the extent to which CS is likely to meet future needs.



Breakdown of responses to question on future needs by policy topic area

Do you anticipate that a repeat of Countryside Survey in its current form will meet these evidence needs?	Biodiversity	Ecosystem services	Landscape	Sustainable agriculture	Water	Soil	Sustainable forestry	Urban development	Air quality	Climate change	Acces to nature	Unexpected cahnge	**Totals**
Yes completely	1	0	1	0	0	0	0	0	0	0	0	0	**2**
Yes partially	27	6	6	8	1	6	4	0	4	2	2	0	**66**
No	8	4	2	0	0	2	2	0	0	2	1	0	**21**
No comment	27	7	6	4	1	3	3	2	0	3	2	3	**61**

Although a number did not feel able to comment, it is clear from those who did provide an answer that about a quarter of the respondents to this question felt that it would not meet their needs. The view seems consistent across all topic areas, despite the unevenness in the number of responses (Table 5.1). The large number who did not comment on the question suggests that many people are, in fact, uncertain about what their future monitoring needs might be.

In the discussion that follows the main task is to unpack the reasons behind the view that CS would only partially meet future needs. Clearly the responses were constrained by the fact that users were asked to consider CS in its *present* form, rather than to consider any potential design modifications. Nevertheless, by asking people to identify their future needs, it is possible to look at what types of change in the structure of CS might be considered. In this respect the analysis presented in this part of the Report seeks to provide an initial mapping of future monitoring requirements in the areas currently covered by CS, and the niche that CS might be expected to fill. This understanding will provide the basis for the discussion on future monitoring options in Part 6 of this Report.

It must be acknowledged, however, that any exploration of potential 'modifications to CS' is complex, because there must come a point where suggested changes transform CS into another kind of monitoring programme. We suggest therefore that providing core features of CS are retained, such as the location of the sample squares, the sampling stratification and the field sampling protocols, then any suggested changes constitute a 'modification to CS'. More radical changes constitute a proposal for an alternative approach entirely.

5.2 Emerging and Future Policy Monitoring Needs

5.2.1: Biodiversity

Desk Review

In 2010, the 10th Conference of the Parties (COP) on the Convention on Biological Diversity was held in Nagoya in Japan. At this meeting a new ten-year Strategic Plan and a set of 20 targets for biodiversity, known as the *'Aichi Targets'*, were agreed (Box 5.1). Countries are required to develop indicators to report progress against these targets in 2014 and 2019, taking account of guidance produced by an Ad Hoc Technical Expert Group (AHTEG). The AHTEG met in June 2011 and proposed that a framework for communicating biodiversity information should respond to the following questions:

- Is the status of biodiversity improving? (status);
- What are the implications? (benefits);
- Why are we losing biodiversity? (pressures and underlying drivers); and
- What do we do about it? (responses)

Box 5.1: Summary of Aichi Targets (for fuller descriptions see: http://www.cbd.int/sp/targets/)

Strategic Goal A: **Address the underlying causes of biodiversity loss**

1. Raising awareness of the value of biodiversity
2. Inclusion in national and local development strategies and planning processes
3. Develop incentives for the conservation and sustainable use of biodiversity
4. Governments, business and stakeholders plan for sustainable production and consumption

Strategic Goal B: **Reduce the direct pressures on biodiversity and promote sustainable use**

5. Degradation and fragmentation of natural habitats is significantly reduced
6. Fish, invertebrate stocks and aquatic plants are managed and harvested sustainably
7. Areas under agriculture, aquaculture and forestry are managed sustainably
8. Pollution has been brought to levels that are not detrimental to ecosystem function
9. Invasive alien species and pathways are identified and prioritised
10. Pressures on vulnerable ecosystems impacted by climate change or ocean acidification are minimised

Strategic Goal C: **Improve the status of biodiversity by safeguarding ecosystems, species and genetic diversity**

11. At least 17% of terrestrial and inland water, and 10% of coastal and marine areas are protected
12. Extinction of known threatened species has been prevented
13. Genetic diversity of cultivated plants and farmed/domesticated animals is maintained

Strategic Goal D: **Enhance the benefits to all from biodiversity and ecosystem services**

14. Ecosystems are restored and safeguarded, taking into account the needs of communities
15. Ecosystem resilience and the contribution of biodiversity to carbon stocks is enhanced
16. The Nagoya Protocol on Access to Genetic Resources is in force and operational

Strategic Goal E: **Enhance implementation through participatory planning, knowledge management and capacity building**

17. Each Party has developed and commenced implementing a national strategy and action plan
18. Traditional knowledge, innovations and practices are respected and fully integrated
19. Knowledge and the science base relating to biodiversity are improved, shared and applied
20. Financial resources are mobilised for effectively implementing the Strategic Plan 2011-2020

The Aichi Targets are a flexible framework in that countries are not required to develop indicators for all of them, or to consider all to be priorities for implementation. Reporting against the Aichi Targets will take place at a European Union level. Work is ongoing to develop a set of European indicators, building on the Streamlining European Biodiversity Indicators (SEBI) initiative. This will enable the monitoring of progress in relation to the EU Biodiversity Strategy 2011 and the Aichi Targets. The Aichi Targets will also be monitored for the UK and devolved administrations. This work is being co-ordinated by the Four Countries' Biodiversity Group, facilitated by JNCC.

The UK's Post-2010 Biodiversity Framework was published in July 2012[60]. The translation of Aichi Targets into policy is through the country strategies: in England *Biodiversity 2020* (and Natural Environment White Paper), *Scotland 2020*, the *Natural Environment Framework in Wales*, and as yet un-revised Northern Ireland Biodiversity Strategy. The Aichi Targets will therefore be a major factor shaping the development of indicators over the next decade and define a major set of requirements against which the future potential contribution of CS to policy must be judged.

Table 5.2: UK Biodiversity Indicators 2011-2020

A1. Awareness, understanding and support for conservation		
A2. Taking action for nature: volunteer time spent in conservation		
A3. Value of biodiversity integrated into decision making		
A4. Global biodiversity impacts of UK economic activity/sustainable consumption		
B1. Agricultural and forest area under environmental management schemes	B1a. Area of land in agri-environment schemes	B1a(i). Higher-level/targeted schemes B1a(ii). Entry-level type schemes
	B1b. Area of forestry land certified as sustainably managed	
B2. Sustainable fisheries		
B3. Integration of biodiversity considerations into business activity		
B4. Pressure from climate change		
B5. Pressure from pollution	B5a. Air pollution	B5a(i). Area affected by acidity B5a(ii). Area affected by nitrogen
	B5b. Marine pollution	
B6. Pressure from invasive species	B6a. Freshwater invasive species B6b. Marine invasive species B6c. Terrestrial invasive species	
B7. Water quality		
C1. Protected sites	C1a. Total area of protected sites: on land C1b. Total area of protected sites: at sea C1c. Condition of A/SSSIs	
C2. Habitat connectivity	C2a. Broad-leaved, mixed and yew woodland C2b. Neutral grassland	
C3. Status of threatened habitats		
C4. Status of threatened species		
C5. Birds of the wider countryside and at sea	C5a. Farmland birds C5b. Woodland birds C5c. Wetland birds C5d. Seabirds C5e. Wintering water birds	
C6. Insects of the wider countryside (butterflies)	C6a. Semi-natural habitat specialists C6b. Species of the wider countryside	
C7. Plants of the wider countryside	C7a. Change in plant species richness (arable and horticultural land) C7b. Change in plant species richness (woodland and grassland) C7c. Change in plant species richness (boundary habitats)	
C8. Mammals of the wider countryside (bats)		
C9. Genetic resources for food and agriculture	C9a. Native sheep breeds C9b. Native cattle breeds	
D1. Biodiversity and ecosystem services (marine – fish size classes in the North Sea)		
D2. Biodiversity and ecosystem services (other)		
E1. Biodiversity data for decision making		
E2. Expenditure on UK and international biodiversity	E2a. Expenditure on UK biodiversity E2b. UK expenditure on international biodiversity	

[60] JNCC and Defra (on behalf of the Four Countries' Biodiversity Group) (2012): *UK Post-2010 Biodiversity Framework*. July 2012. http://jncc.defra.gov.uk/page-6189.

A meeting of the UK Biodiversity Indicator Forum was held in March 2011[61] to assess the quality and relevance of the 18 previous indicators[62] and identify gaps. Subsequent work in the UK has refined the 18 existing indicators, added a further six and is creating a number of second and third level indicators (Table 5.2). An update was published as *UK Biodiversity Indicators in Your Pocket 2012*. The intention is that the UK indicators (and the UK framework) will, where appropriate, support the production of country reports where data can be disaggregated.

As noted in Part 3 of this Report, three of the 24 indicators used draw on data from the Countryside Survey. Indicator C2 (Habitat connectivity) uses changes in land cover recorded in the CS Field Survey, to which expert opinion was used to assess the relative likelihood of movement by species between habitat patches across different intervening land cover types found in the survey; clearly LCM might make a contribution in the future. Indicator C7 (Plants in the wider countryside) uses the count of species diversity in each vegetation sample plot from the CS Field Survey for arable fields, woodlands and grasslands and boundary features. And indicator B6c (Terrestrial invasive species) makes use of species data collected from the vegetation sample plots.

A number of indicators published in *UK Biodiversity Indicators in Your Pocket 2012* are still in development, and there are several areas where CS data might make a future contribution. For example, indicator C3 (Threatened habitats) is currently based on the data used for Article 17 Reporting of Annex I Habitats, it therefore excludes ancient species rich hedgerows and arable margins, for which CS2007 is a primary source of data. However, the indicator could be modified to do so in the future. Elsewhere, CS might also be useful in providing contextual data for other indicators and be used to explain the reason for trends and to describe spatial variation, providing the requirement is included within the indicator fiche. These possibilities include: B1 (Agricultural and forest area under environmental management schemes); B4 (Pressure from climate change); B5 (Pressure from pollution); B6 (Pressure from invasive species); B7 (Water quality); C5a-c (Birds in the wider countryside); C6 (Insects of the wider countryside); C8 (Mammals of the wider countryside) and D2 (Biodiversity and ecosystem services). It has been suggested[63] that indicator C9 will have a plant genetic resources component, for which there is a possibility of using CS data. It is unlikely that CS will, however, be able to provide any support for the six UK biodiversity indicators that are presently not reported due to lack of appropriate data, namely: A1, A3, A4, B3, D2 and E1 in that they mainly deal with public engagement in biodiversity and the use of environmental data in decision making.

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[61] http://jncc.defra.gov.uk/page-5783

[62] The previous indicators had been agreed in October 2006 to measure progress against the 2010 CBD target to 'significantly reduce the current rate of biodiversity loss by 2010', and the European Union target to halt biodiversity decline.

[63] Williams, J, Pers. Comm. October 2012.

Table 5.3: England Biodiversity 2020 Indicators: 2012 Assessment

1. Extent and condition of protected areas and local sites
2. Extent and condition of priority habitats
3. Habitat connectivity in the wider countryside
4. Status of priority species
5. Species in the wider countryside: farmland
6. Species in the wider countryside: woodland
7. Species in the wider countryside: wetlands
8. Species in the wider marine environment
9. Biodiversity and ecosystem services: terrestrial habitats
10. Biodiversity and ecosystem services: species
11. Biodiversity and ecosystem services: marine
12. Genetic resources for food and agriculture
13. Public enjoyment of the natural environment
14. Taking action for the natural environment
15. Funding for biodiversity
16. Integrating biodiversity considerations into local decision making
17. Global biodiversity impacts of UK consumption
18. Climate change impacts and adaptation
19. Trends in pressures on biodiversity - pollution
20. Trends in pressures on biodiversity – invasive species
21. Trends in pressures on biodiversity – water quality
22. Agricultural and forest area in environmental management schemes
23. Sustainable fisheries: fish stocks harvested within safe limits
24. Biodiversity data and information for decision making

A separate but complementary set of biodiversity indicators has been prepared for **England** as part of the *Biodiversity Strategy 2020*. The 2012 Assessment Report published in May 2012 lists 24 indicators (a reduction from an earlier set of 26), including some that track the status of components of biodiversity and some that monitor additional responses and pressures (Table 5.3). As with the UK Biodiversity Indicators, the selection is strongly influenced by the Aichi Targets. Data from the CS Field Survey is used to report on indicators that monitor changes in habitat connectivity based on the two broad habitats of broadleaved and mixed woodland and neutral grassland (No. 3), plant species richness on farmland (part of No. 5) and woodland (part of No. 6) and in non-native vascular plants in all habitats and in riverside plots (part of No. 20). If the integrity of these four indicators is to be preserved in future reporting rounds to 2020, the same or equivalent data collection methodologies will therefore need to be employed. However, as noted earlier, the use of sample-based Field Survey data may not be optimal for the development of future connectivity indicators.

The first biodiversity strategy in **Scotland** was published in 2004[64]. The assessment of progress against the 2010 targets[65] made extensive use of CS data. An updated strategy, *The 2020 Challenge for Scotland's Biodiversity* is currently out for consultation. Under the 2004 strategy, Scottish Natural Heritage and other Scottish Government Agencies, have produced a suite of indicators, split between 16 'state indicators' that measure changes in biodiversity at the species, habitat and ecosystem level, and five 'engagement indicators'

[64] Scotland's Biodiversity: It's in Your Hands – A strategy for the conservation and enhancement of biodiversity in Scotland. http://www.scotland.gov.uk/Publications/2004/05/19366/37239

[65] www.snh.gov.uk/publications-data-and-research/publications/search-the-catalogue/publication-detail/?id=1803

that monitor how people interact with biodiversity. One of the 'state indicators', covering vascular plant diversity, uses data from Countryside Survey Field Survey; it measures changes in the number of vascular plant species recorded in 10 broad habitats in Scotland. As part of the Scottish Government's consultation on an updated biodiversity strategy, a new suite of indicators is planned to monitor progress against the Aichi targets. These are likely to make use of some of the UK indicators (Table 5.2) but will draw on data for Scotland. As noted above, CS might provide an important data source for some of these metrics.

In **Wales**, the Welsh Assembly Government's Environment Strategy (2006) established a set of 102 indicators under 39 outcomes as part of a *State of the Environment* Report. The indicators and outcomes cover the topics: Enabling change; Addressing climate change; Sustainable use of resources; Distinctive biodiversity, Landscapes and seascapes; Local environment; and Environmental hazards. One of the indicators (16b), presently uses data directly from Countryside Survey; the CS soils data on carbon stock and pH in the top 15cm of soil is used as an indicator of whether soils in Wales are being 'managed to safeguard its ability to support plants and animals, store carbon and provide other important ecosystem services'. Indicator 16a, which measures greenhouse gas emissions resulting from land use, land use change and forestry, uses CS data indirectly in that it is based on the LULUCF[66] estimates provided by the National Atmospheric Emissions Inventory.

Within the framework of biodiversity monitoring, a stronger focus is likely to be the assessment of measures to establish coherent and resilient ecological networks. Such a goal has been given particular emphasis in England by the Lawton Report, *Making Space for Nature.* However, such concerns are likely also to be relevant across the UK, given the inclusion of connectivity and fragmentation themes in both the Aichi Targets and the UK Biodiversity Indicators 2011-2020. The contribution that CS is likely to make in this area is presently unclear, given the exploratory nature of much of the current work.

Consultation

The qualitative data generated by the questionnaire largely confirmed the results of the desk study, in that the new UK Biodiversity Framework was identified by JNCC as a key future framework for evidence provision, that will link:

> *'...to both UK-internal and UK-external processes (including CBD and EUBS).' (ID11)*

The same respondent identified the need to report within the framework of the Article 17 Habitats Directive in June 2013 and June 2019 as key tasks. They went on to suggest that a key requirement was:

[66] Land Use, Land-Use Change and Forestry

'Measuring change in extent and condition through improved use of remote sensing data, matching the periodicity of analysis to the likely pace of change in a habitat type.' (ID11)

The respondent from Defra (ID36) also identified information on habitats of European importance as continuing to be a *'high priority',* followed by information on Priority Habitats. For them, data on Broad Habitats was *'of interest'* rather than required to meet a specific need. Further work is probably required, however, to determine if remote sensing techniques can be used operationally to measure change in habitat extent and condition at relevant thematic scales; we may for example need to look beyond broad habitats to EUNIS Level 3 of reporting[67].

In line with the greater emphasis placed on the integrity of ecological networks in the UK Biodiversity indicators (Table 5.2) several respondents suggested that better information in this area was an essential future requirement. A core CS user from the Countryside Council for Wales observed:

'Demonstrating the presence/expansion of habitat networks will be increasingly important in future years as policies such as agri-environment schemes are geared to improving habitat networks to address climate change and species conservation.' (ID53)

The same respondent from Defra who emphasised habitats of European importance as an essential requirement went on to suggest that monitoring ecological networks:

'Remains a key priority in England. [But] requires fairly fundamental methodological development to work out how it can be measured.' (ID36)

They went on to suggest that overall, they were more likely to:

'...invest in a series of monitoring activity, where there was an overall plan or vision of how they all worked together to address key issues.' (ID36)

The requirement for monitoring species and habitats of European importance and ecological networks was also emphasised by the representative from Scottish Natural Heritage (ID87), who suggested that while these were likely to be an important area of future investment, CS in its current form would not meet anticipated needs. Similar views were expressed by a representative of the Countryside Council for Wales (ID140). Another core user from SNH who felt that CS in its present form was unlikely to be sufficient emphasised the need for data at finer spatial and thematic spatial resolution. They argued that:

'Under the European Habitats Directive we must have good Scotland-wide maps of HD Annex I habitats area (extent) (as well as the condition of these habitats). In addition European countries must comply with the requirements of the INSPIRE

[67] see: http://eunis.eea.europa.eu/about.jsp

Directive which means habitat data displayed must comply either with Annex I or with EUNIS habitat classification.' (ID91)

The respondent from Wales emphasised that to meet their needs, CCW were currently investing in:

'....remote sensing coupled with suitable Field Survey' (ID140)

to meet future needs in relation to protected areas, but noted that they will probably lack the ability to monitor the wider countryside (including Annex I habitats not in protected areas). However, they went on to note that in 2013 the functions of the Environment Agency, CCW and Forestry Commission will be bought together within a new single body (Natural Resources Wales), and that this may lead to changes in priorities. They suggest:

'This is an opportunity to review current investment and look to future needs.' (ID140)

Other future evidence requirements identified from the questionnaire returns were the need to monitor invasive non-native species (e.g. Defra, ID36), and the maintenance and restoration of habitats (e.g. Forestry Commission, ID55).

The second expert workshop that was designed to look at future needs and options largely endorsed the findings from the desk study and the key messages from the questionnaire survey. The workshop participants were presented with a series of headline propositions in each policy topic area that summarised the initial conclusions of the analysis, and asked to comment on the list of policy drivers that had been identified and explore what this meant for monitoring in the future. The material provided for the biodiversity topic is shown in Table 5.4, which also includes a summary of the response of the workshop participants. Their key points were that for this topic area, the specific

Table 5.4: Summary future monitoring requirements for biodiversity and the response of expert workshop on future needs

Sub-topic	Key Future Policy Drivers/Issues	Implied Future Monitoring/Evidence Needs
Distribution and condition of Priority Habitats (PH)	>>Consultation suggests that future policy and reporting needs imply finer thematic and spatial resolution data for habitats and species of conservation importance. >>Consultees have identified the indicator framework of the RDPs as key policy drivers (See also Sustainable Agriculture). >> Monitoring of integrity of ecological networks likely to be a more important policy need. >>More rigorous monitoring of Invasive Non-native species required. >>Monitoring in the context of natural capital accounting (Monitoring for 'no net loss')	• High resolution data on where habitats are. This suggests an EO requirement - LCM is not sufficient - but is an EO treatment even sufficient given thematic resolution required? • Monitoring of habitat condition - CS has an inadequate coverage of high quality habitats - but it does do agricultural habitats. • Better understanding of the contextual factors driving change - it is not reasonable to expect CS to address such a broad range of factors. • Specific requirements should be framed around country biodiversity strategies, that includessuch issues as public engagement with nature; reducing pressures and sources of harm to the environment; ecological resilience and a healthy functioning environment (no net loss) and monitoring habitat change.
Distribution and condition of Broad Habitats (BH)		
Ecological networks and landscape permeability		
Species monitoring including spread of invasive non-native species		

Note: the material in the column on key policy drivers were identified prior to the workshop through the desk analysis and the questionnaire survey. The responses of the workshop participants are shown in the column to the right.

requirements should indeed be framed around the country biodiversity strategy and its equivalents elsewhere, with increased attention on issues related to public engagement with nature and strategies for reducing pressures and sources of harm to the environment. Other requirements identified were the need to monitor ecological resilience and efforts to promote a healthy functioning environment, alongside the issue of no net loss of natural capital. **The major conclusion was that for habitats and species of conservation importance (e.g. those listed in the Habitats Directive) detailed information on their distribution and condition will be needed for reporting purposes in relation to 2020 targets, and for assessing the impact of policy interventions designed to sustain ecological function and the integrity of our natural capital. The success of measures to create coherent and resilient ecological networks will also be a focus for future monitoring in some areas.**

The contribution that measures of the integrity or condition of the wider countryside will make to these future debates is, however, unclear. Thus the niche that a future Countryside Survey might fill is uncertain. The need for information about specific habitats that are often quite rare means that a more targeted or purposive monitoring programme is probably required; CS in its present form is unlikely to provide this. The interpretation of these specific kinds of biodiversity data may still require contextual information about the state of the wider countryside, however, and so the challenge for CS will be to ensure that some kind of 'read-across' between the different monitoring programmes is possible and relevant.

5.2.2 Ecosystem Services

Desk Review

As noted in Part 2 of this Report (Section 2.3.2), ecosystem services have emerged as significant new policy frameworks since the inception of CS2007 and are likely to shape future monitoring requirements across the UK. As the previous discussion on biodiversity demonstrates, indicators of ecosystem services output are increasingly being set alongside more traditional habitat or species data to measure the state and trends of the environment, and significantly to track the implications for society.

Following the completion of the first phase of the UK National Ecosystem Assessment (UK NEA), a second phase of work is now underway, and this will further refine thinking about ecosystem services and how information about them can be better generated and used. Although the work will focus on how the knowledge about ecosystem assessments (and other related initiatives) can be used more effectively by communities and businesses, there will be an attempt to refine some of the analytical approaches used in the first tranche of work, especially in relation to cultural ecosystem services. Overall the aim is to ensure that the value of ecosystem services is better taken into account by decision makers, and that more sustainable use and management of the natural environment is achieved. As with the first phase of the UK NEA, the current work will not require new data, but rather new kinds of analysis. Nevertheless, the results from CS2007 and earlier

Surveys potentially provide baseline data for some of the work packages, the initiative represents a significant opportunity for realising the value of the existing data resources; LCM2007 was largely unexploited in the first phase of work. The UK NEA may also help policy advisors better define their future monitoring requirements for ecosystem services.

A further stimulus in this policy topic area will be the various country strategies. In Wales there has been legislative revision and a single delivery body has been established to help meet the aspirations of the Natural Environment Framework. Scotland's 2020 draft strategy also has a strong ecosystem service component. In England there will be the need to meet the commitments made in the Natural Environment White Paper published in June 2011[68]. Significant amongst these was the establishment of a Natural Capital Committee to advise the Government on the state of English Natural Capital by providing advice on: (i) when, where and how assets are being used unsustainably; (ii) how action to improve natural capital could be prioritised; and (iii) on research priorities to improve future advice. The Committee held its first meeting in May 2012 and recognised that an understanding of the patterns of land use and land use change will be critical to delivering the second of these objectives. The minutes specifically referencing Countryside Survey as one important source of information[69] and CS data was cited in the Defra scoping study for natural capital asset checking[70], although it is not clear at this stage what metrics the Committee will use to support its work. An insight into the ways CS might potentially support such work is provided by the recent initiative in Scotland to develop a *Natural Capital Asset Index*[71]. The Index is based on the area of the seven BAP Broad Habitats that are important in Scotland and their quality, defined as their capacity to deliver ecosystem services; the quality component includes CS Field Survey information on headwaters. In addition to the habitat area estimates provided by CS, FS species data (and the indicators of vegetation condition built upon them) are used as part of the aggregate quality assessments; details of the calculation are provided in the methodological note by SNH (2011)[72]. It has been suggested[73], however, that although the Broad Habitats were used in the design of the Natural Capital Asset Index, in the future more detailed habitat information at EUNIS level 3, for example, may be required.

Consultation

The cross-cutting nature of the ecosystem service concept was also apparent in the questionnaire responses for the section on future monitoring needs. As with biodiversity a number of the core users of CS suggested that in its present form the Survey was

[68] TSO (2011) The Natural Choice: Securing the value of nature. The Natural Environment White Paper. CM 8082

[69] Natural Capital Committee: Minutes (23.5.12): www.defra.gov.uk/naturalcapitalcommittee/files/120626-NCC-Minutes1.pdf

[70] Howard, B.M.; Hails, R.S. ; Watt, A.; Potschin, M. and Haines-Young, R. (2011) Considerations in environmental science and management for the design of natural asset checks in public policy appraisal. Paper presented at a workshop hosted by Defra, 11th May 2011. Defra Project Code NE0122

[71] http://www.snh.gov.uk/docs/B814140.pdf

[72] http://unstats.un.org/unsd/envaccounting/seeaLES/egm/NCAindex_bk.pdf

[73] Mackey, E, Pers. Comm. October 2012

unlikely to fully meet their requirements, which involved more integrated, spatially explicit approaches to monitoring and assessment. Thus a representative from Forestry Commission Wales suggested that in conjunction with their task of reporting within the context of the *Living Wales* initiative:

> *'Spatial information on ecosystem services at national, regional and local scales will be important as we develop our new ecosystem approach.' (ID131)*

A similar view was expressed by a respondent from Scottish Government who felt that:

> *'Data will be required at a regional scale to assist decision making about land use change and land management in relation to incentives or the development of land use planning work.' (ID67)*

Some users went on to identify quite specific needs in relation to ecosystem services and land use; the ecosystem approach in Scotland calls for analysis at the scale of River Basin management Area Plans. A user from Forest Research also identified a need for better data to characterise the spatial distribution of green infrastructure and the:

> *'Extent of rural and peri-urban brownfields and those mapped/marked for regeneration to ... green space.' (ID73)*

A representative from JNCC summarised the need for integrated, spatially explicit approaches capable of delivering data of high thematic detail as follows:

> *'Key to increasing the ability to provide a spatial understanding of ecosystem services will be the ability to map important attributes of land parcels.' (ID11)*

They felt that CS in its present form would only partially be able to meet this requirement, adding:

> *'These [the attributes of land parcels] are likely to be based on an initial classification from remote sensing (potentially Land Cover Map, although greater detail would be desirable), with additional information from fieldwork and other datasets (for instance, soils data) regarding attributes.' (ID11)*

They concluded that only some of these attributes are likely to be available from a repeat of the Countryside Survey Field Survey. In terms of the range of information that might eventually be required, several users emphasised that in addition to biophysical data there was also a need for socio-economic information. For example a core partner from Defra identified a need for evidence on:

> *'Shared values in relation to all ecosystem services; public and societal attitudes, values and behaviours in relation to all aspects of the natural environment; policy and decision-making.' (ID121)*

While others (e.g. Forestry Commission Wales, ID131) required evidence to help them to explore and potentially design Payment for Ecosystem Service (PES) schemes.

Table 5.5: Summary future monitoring requirements for ecosystem services and the response of expert workshop on future needs

Sub-topic	Key Future Policy Drivers/Issues	Implied Future Monitoring/Evidence Needs
The dynamics and spatial distribution of ecosystem services at national and regional scales	>> Evidence, analysis and advice to support the application of the Ecosystem Approach and the consideration of ecosystem services within nature conservation. >> Effective and efficient indicators of ecosystem services >>Regional scale data for decision making about land use change and land management in relation to incentives or the development of land use planning work. >Ability to provide a spatial understanding of ecosystem services will be the ability to map important attributes of land parcels.	• National conceptual frameworks are still being developed (natural capital accounting) to map and quantify stocks and flows. LCM may have some value in this area (NEA) but it is not detailed enough - potential for better use of FS data to calibrate LCM data. • Monitoring of policy interventions likely to require (a) spatially fine-grained and (b) thematically detailed metrics. CS unlikely to be suitable in its present format. The implications of the Integrated Assessment work from Cs2007 for the future assessment of ecosystem services is not widely understood.

Note: the material in the column on key policy drivers were identified prior to the workshop through the desk analysis and the questionnaire survey. The responses of the workshop participants are shown in the column to the right.

The findings of the desk study and the analysis of questionnaire responses were put to the expert workshop on future monitoring requirements (Table 5.5), and the discussions largely confirmed the initial findings. The workshop participants noted that national conceptual frameworks were still being developed, but that there was a clear need to find ways of mapping the stocks of natural capital and the ecosystem service flows that it supports. **They also felt that data of higher spatial and thematic resolution than CS currently provides would probably be needed, and that there may be an opportunity to better link the Field Survey and Land Cover Map components of CS to deliver it.** The implications of the work done as part of the CS2007 Integrated Assessment for the future monitoring of ecosystem services in CS were not highlighted by the workshop participants, suggesting that its impact on thinking has been limited at this point.

Comprehensive land cover mapping could potentially provide information on the stock and change component of natural capital accounts and the Field Survey information on condition or the capacity of that resource to support the flow of ecosystem services. There were some doubts, however, about the ability of products like LCM2007 to deliver the level of detail required, especially where information on ecosystem processes and service flows are needed for planning management interventions. **To meet such requirements, we therefore may well be looking at a radical redesign of CS or even the creation of a new multi-scale, multi-source land use database to meet these new policy requirements.** These issues are considered in more detail in part 6 of this Report.

5.2.3 Landscape

Desk Review

Our review of the future policy drivers for landscape suggests that the European Landscape Convention is likely to remain the primary factor shaping requirements in this area and no significant revisions at an EU, UK or development administration level are

expected. However, in England there is likely to be an increasing trend towards sub-local authority Landscape Character Assessments to support community level planning and landscape-scale initiatives, such as HLF Landscape Partnership projects. In Part 3 of this Report it was noted that there was unmet potential for data on landscape features from the CS Field Survey, and on land cover from Land Cover Map, to contribute to assessments of landscape character. While in neither case are these data likely to be a core requirement of policy delivery, the implementation of an ecosystems approach and the need to characterise the output of ecosystem services in different places, is likely to mean that landscape scale analysis will be increasingly relevant. Planning policy in England, for example, requires local plans to protect valued landscapes, and with landscape character being a key issue used to determine the impact of large developments in the countryside such as wind farms, local planning authorities are likely to continue updating their landscape character assessments on the basis of the best available data. There will remain the potential for surveys of the countryside to provide these data. The landscape scale delivery of agri-environmental policy is also likely to require a better characterisation of the different contexts in which interventions are made.

Consultation

The questionnaire responses identified the need to monitor landscape scale delivery of policy as a priority. Thus a core user from Natural England identified a need for:

> *'Monitoring the impact of ES [Environmental Stewardship] on landscape character and quality – [as per] ERDP Pillar 2 objective' (ID10)*

together with information on protected landscapes (National Parks and Areas of Outstanding Natural Beauty) in order to monitor the Ministerial commitments. However, they observed that CS would only partially meet such needs, adding:

> *'There is a need to continue the CS time series but alternative stratifications of the data will be needed in order [to] use the field data for landscape change monitoring. In terms of understanding change in the wider countryside i.e. not just on designated sites (SSSIs and NNRs) CS offers a valuable time series data which although it only partial meets users needs does provide data on non-designated areas which make up the vast majority of the British countryside.' (ID10)*

A respondent from Defra also noted the limitations of CS, suggesting that the:

> *'Scale is not right for localised effects but may be useful in providing an overview.' (ID123)*

The importance of finding ways of monitoring landscape scale delivery of policy was also noted by a core user from Scottish Government who observed that:

> *'We are moving towards landscape scale delivery of policy requirements and greater consideration of an ecosystems approach to decision making.' (ID67)*

And it is clear from other responses that this will not only involve the collection of better spatially explicit biophysical data but also integration with socio-economic information. In looking to their future needs a representative from Scottish Natural Heritage noted:

> *'Monitoring of landscape change - not just physical features but people's experience and special qualities.' (ID101)*

The expert workshop on future needs endorsed the findings of the desk study and the analysis of the questionnaire responses (Table 5.6); although the participants did not add to the material provided, the general discussion emphasised the need to consider the landscape topic at two distinct levels. First, in terms of landscape as an 'object of policy', in that landscape character, local distinctiveness and sense of place are all important aspects of the cultural ecosystem service that the NEA captured in their concept of 'environmental settings'. Thus while landscape character may not be an explicit target of policy, the goal of sustaining cultural ecosystem services will be significant, suggesting that monitoring change in landscape character may continue to be relevant in the future. For example the importance of monitoring 'wild land' was emphasised by one respondent from Scottish Natural Heritage (ID 106).

Second, landscape as an enabling framework, in which more place-based or spatially specific analysis is undertaken. Such frameworks can support an ecosystems approach, and as one core user responding to the questionnaire put it, are needed to enable:

> *'...more detailed capacity work (especially for renewables)...' (ID89)*

Thus a better future understanding and representation of 'landscapes' as 'service providing units' is likely to be as important as the analysis of landscape character itself. The extent to which these needs can be met by the current design of CS is unclear, however. **While products such as LCM2007 can be used to describe landscape structure for the landscape character frameworks used in England, Wales and Scotland, the**

Table 5.6: Summary future monitoring requirements for landscape and the response of expert workshop on future needs

Sub-topic	Key Future Policy Drivers/Issues	Implied Future Monitoring/Evidence Needs
Landscape character, condition and management objectives	>> Although the Ecosystems Approach can be aplied at any scale, the move towards landscape scale delivery of policy and hence more spatially integrated perspectives. >> Monitoring of protected landscapes required to met Ministerial Pledge in England, and Pillar 2 objectives more generally >>Landscape impacts of agi-environment schemes needed	>>Landscape can be an 'object of policy', in that landscape character, local distinctiveness and sense of place are all important aspects of the cultural ecosystem services. >> Landscape can be used as an enabling framework, in which more place-based or spatially specific analysis of biophysical processes and ecosystem services is undertaken

Note: the material in the column on key policy drivers were identified prior to the workshop through the desk analysis and the questionnaire survey. The responses of the workshop participants are shown in the column to the right.

sample-based nature of the Field Survey means that it cannot provide information on the quality and condition of landscape features at fine spatial scales; thus the niche that the Field Survey might fulfil in terms of landscape monitoring is uncertain. The requirement for a stronger 'landscape focus' in policy design and delivery could probably not be met by Countryside Survey reporting in its present format unless the data can be re-stratified or presented in these broad spatial scales in appropriate ways.

5.2.4 Sustainable Agriculture and Agri-environment Schemes

Desk review

The next cycle of Rural Development Programmes (RDP) will run from 2014 to 2020. Although the EU regulations that will govern the RDP are subject to detailed proposals by the European Commission and agreement by Member States, it is likely that Member States will be able to operate programmes that are more streamlined and flexible than previously. The four Axes, around which RDP measures had to be administered during 2007-13, will be replaced by six EU wide priorities and the three EU sources of funding will be integrated at an operational level. The largest component of the RDPs in the UK will continue to be agri-environment schemes that incentivise management of the countryside to achieve a range of benefits. However, it is also likely that any future CS would also need to provide information on the measure to promote good agricultural environmental conditions under a broader Pillar 1, as well as the more specific programme actions associated with the current Pillar 2.

To ensure that Member States take a rigorous approach to developing and delivering effective programmes, there will be an enhanced requirement for evidence to justify the rationale for the interventions and to establish indicators to monitor progress. This evidence will be required at an earlier stage than in previous RDPs so that Member States can reference the need for interventions against the baseline situation and can demonstrate, through the process of ex-ante, mid-term and final evaluations, the impact of the interventions.

The wide range of issues that agri-environment schemes will seek to address in future (covering topics such as adaptation to climate change, safeguarding and enhancing soil quality, flood risk mitigation and enhanced public access) means that monitoring programmes should collect data on a similarly wide range of indicators. The breadth of information that is likely to be required is illustrated by the development of Tir Gofal in Wales, which 2007 monitoring was expanded and developed into a more ecosystem monitoring programme that covered, soil, species, water, climate change, as well as farmer perception and behaviour. It is likely that in the future, Glastir will have an even broader set of requirements.

Reporting will also need to take place separately by each of the devolved administrations, although data collection might be co-ordinated where monitoring needs are the same. The Welsh Government is currently commissioning a new programme which may

incorporate some of the methodology from the Countryside Survey. In England, Natural England's Integrated Site Assessment Programme (which covers both Higher Level agreements in Environmental Stewardship and the condition of Sites of Special Scientific Interest) is likely to continue, but will be supplemented by additional data on change in the wider countryside over the RDP period, and information on the impact of Entry Level agreements. In 2011, the Scottish Government established a three year programme to develop and test a methodology for monitoring the impact of its agri-environment programme using a combination of remote sensing and field survey methods.

Consultation

The importance of monitoring agri-environmental schemes was a strong, common theme that emerged from the analysis of the questionnaire responses. Commenting on the need for such monitoring data, a core user from the Countryside Council for Wales observed that it was:

> *'Critical to be able to report on impact of new Glastir agri-envt scheme in Wales.' (ID98)*

A similar view was expressed by a respondent from Scottish Government, who reported that there was a requirement for monitoring to identify:

> *'Changes in the distribution and condition of priority habitats under agricultural management - in order to help inform prioritisation under the next Scotland Rural Development Programme.' (ID133)*

In addition to habitat data, they noted that information on trends in species richness in farmland habitats was also necessary.

However, a number of respondents also noted the limitation of CS in providing the types of information that was needed for the future:

> *'Level of evidence required to report on impact of CAP and AES is more detailed than can be provided by CS. Countryside change results from a number of driving forces and disentangling which are most influential requires specific surveys/monitoring programmes covering particular schemes.' (ID98)*

A core user from Defra also emphasised the need to monitor the implementation of agri-environmental schemes and the limitations of CS, suggesting that the:

> *'Scale is not correct and descriptions of habitats do not link with agricultural descriptions, particularly for grassland.' (ID123)*

The limitations of CS data were also noted by a user from Welsh Government who felt that:

> *'Better CS alignment with the Common Monitoring and Evaluation Framework for the RDP would be desirable.'(ID139)*

Thus in common with many of the other policy topic areas covered, the views expressed in relation to agricultural policy implied the need for more thematically detailed and spatially specific information, and that for many suggested some modification to the design of CS. It was however, noted that while detailed information of the areas where interventions take place is required, more general contextual data is also needed in order to assess the effectiveness of policy. Thus, the representative from Scottish Government cited above also noted that CS is:

'Likely to be helpful in identifying headline trends for relevant habitats.' (ID133)

The role of CS in providing contextual information for monitoring the effectiveness of agri-environment schemes was strongly emphasised in the discussion of this policy topic area at the expert workshop on future needs (Table 5.7). The participants at the workshop emphasised the critical nature of monitoring in this area and stressed that an important element in the logic model for the RDP evidence and evaluation process is the monitoring of the counterfactual situation; that is the situation that exists in the absence of the interventions. They argued that any future CS has the potential to provide such data, through a combination of the Field Survey and remote sensing but use of the existing time series would be necessary to assess change. While the construction of the 'counterfactual' is clearly an aspect of policy that a future CS might support, it is unlikely that the same survey could meet the other key requirement of monitoring agri-environmental schemes, namely the measurement of outcomes at the farm scale. This would demand more targeted survey methods. **Nevertheless, as a source of baseline data, it seems clear that CS might fill an important niche in the future monitoring landscape.**

Table 5.7: Summary future monitoring requirements for sustainable agriculture and agri-environment schemes and the response of expert workshop on future needs

Sub-topic	Key Future Policy Drivers/Issues	Implied Future Monitoring/Evidence Needs
National estimates of environmental change in the farmed countryside	>>Consultees suggest to meet EU needs RDP requires its monitoring programme capable of attributing cause and effect >>Changes in the distribution and condition of priority habitats under agricultural management - needed to inform prioritisation under the country level Rural Development Programmes, or more likely the success of outcomes. >>Trends in species richness in farmland habitats - to help inform prioritisation under the next Scotland Rural Development Programme.	• Provide contextual information for understanding PHs in the wider countryside. • Agri-environmental monitoring country authorities need data to establish rationale for interventions and counter-factuals. CS does this to some extent, but reporting cycle is not aligned to RDP. Also CS needs better contextual data on AES interventions.Country authorities need detailed monitoring of impacts of interventions. These needs are country specific and change specific – i.e. need to be at end of RDP period. CS not presently suitable.
Extent and condition of farmland habitats and landscape features		
The influence of agri-environment schemes		

Note: the material in the column on key policy drivers were identified prior to the workshop through the desk analysis and the questionnaire survey. The responses of the workshop participants are shown in the column to the right.

Participants also emphasised that a critical issue for CS is the reporting timescale which in the past, has not been synchronised with RDP development and evaluation timescales. Ideally, a baseline report would cover the period immediately preceding the start of the RDP period, providing evidence for the ex-ante evaluation and a subsequent report six years later would show the counterfactual change that had taken place during the RDP period, and establish the baseline for any following RDP. Moreover, any monitoring would have to provide statistically robust data on change in the farmed countryside for each of the devolved administrations, and so future surveys would certainly need a larger number of survey sites on agricultural land. It was noted that the sampling methodology would also need to take account of the high proportion of farmland that is likely to be covered by 'entry level' agri-environment tiers (currently around 60% in England).

5.2.5 Water resources

Desk review

Our review suggests that the EU Water Framework Directive (WFD) will continue to be the key driver of policy on water quality across the UK, leading to the first reporting requirement on the status of water bodies and achievement of environmental objectives in 2015 and the subsequent cycle of monitoring and reporting thereafter. The Environment Agency (EA) and Scottish Environmental Protection Agency (SEPA) maintain monitoring programmes to meet the requirements of the WFD. Part 3 of this Report noted that there was little evidence that the CS freshwaters work package, which was designed in part to complement the EA and SEPA's data, or Land Cover Map, had made significant contributions to fulfilling the requirements of the WFD. However, it was also noted that there was currently unmet potential for Land Cover Map data to characterise factors influencing water quality.

There are significant new developments in policy on water resource and flood risk management that are likely to place new requirements on surveys in the countryside. These changes include enabling water companies to make a wider range of investments in land management as the way of achieving improvements in water supply and water quality. This would seem to imply a need for modelling the options for improving water storage, and for targeting land management interventions to improve water quality. Such work is likely to need detailed land cover and land use data, as well as information on biophysical properties and processes.

Consultation

As reported in section 3.2.5, the questionnaire response for the water topic area was poor, with only two returns. Despite this limitation, the importance of the WFD and the need for catchment scale monitoring was evident. A core user from Scottish Government for example highlighted a future need for:

> *'Evidence to understand the effectiveness of existing policy measures to mitigate rural diffuse pollution and to change polluting behaviour' (ID208)*

Table 5.8: Summary future monitoring requirements for water resources and the response of expert workshop on future needs

Sub-topic	Key Future Policy Drivers/Issues	Implied Future Monitoring/Evidence Needs
Contextual and baseline information on water bodies and aquatic habitats	>>Evidence of how to deliver catchment level collaboration for the delivery of measures with multiple benefits (e.g. biodiversity, flooding, water quality). >>Evidence to understand the opportunities for, and to minimise the potential environmental impact of, the development of renewable energy sources in Scotland (and elsewhere?)	• Monitoring changing catchment characteristics and impacts on water supply/flooding. • Integration of land use and land cover data with other sources to support modelling and assessment • Robust monitoring of small water bodies in the landscape to support assessment • WFD is the main driver for requirements in terms of water quality. EA focus will be on remote sensing, but needs ground data to calibrate EO; also there is a need for data on land management that is difficult to record via remote sensing. • Data on risks of pressure needed at fine spatial scales - CS unlikely to have a role here
Factors influencing water quality and aquatic biodiversity		
Water resource and flood models		

Note: the material in the column on key policy drivers were identified prior to the workshop through the desk analysis and the questionnaire survey. The responses of the workshop participants are shown in the column to the right.

together with evidence to:

> *'...increase the understanding and implementation of a catchment scale approach to natural flood management.' (ID208)*

They went on to emphasise that their main concern was to find ways to:

> *'Deliver catchment level collaboration for the delivery of measures with multiple benefits (e.g. biodiversity, flooding, water quality)' (ID208)*

and concluded by saying that the:

> *'CS headwater stream data complements that collected by SEPA. Understanding of water quality across the whole catchment is important to develop integrated catchment management, and to understand the whole system.' (ID208)*

In view of the limitations of the questionnaire returns we asked participants at the expert workshop on future need to pay particular attention to the water issue. The propositions from the desk review and analysis of the questionnaires are shown in Table 5.8; they were endorsed by the participants who confirmed the importance of the WFD as a key policy driver, and that this meant the need for the integrated monitoring change at the catchment scale. Fine-scale information about the pressures on the water environment was also recognised as a likely future evidence need. **However, the nature of the 'complementary' role that CS can play alongside other national freshwater monitoring schemes is unclear from the material available to this study.**

5.2.6 Soil

Desk review

The draft EU Soil Framework Directive was introduced by the European Commission in 2006 after being proposed in an EU Thematic Strategy on Soil Protection. It seeks to

harmonise and raise the level of soil protection across the EU. The approach currently proposed (and subject to negotiation) would require Member States to:

- tackle degradation (erosion, loss of soil organic matter, salinisation, landslides, acidification, compaction);
- identify and remediate contaminated land;
- consider soil protection/functions in national policy-making; and,
- control loss of soil resources to development.

The UK Government takes the view that whilst it strongly supports the overall objective of protecting Europe's soils, and agrees there is a need for action to deal with serious soil degradation in some parts of Europe, there are already robust domestic policies in place to protect soils. The UK is currently blocking the Directive on the grounds of the unnecessary financial and regulatory burden it would place on the country, as well as potentially diverting money away from other environmental priorities.

Each of the UK devolved administrations has an existing policy for soils which highlight the important contributions they make to ecosystem services including carbon storage, flood risk management and biodiversity. These strategies also emphasise the need to take a risk-based approach to identifying where soils are vulnerable to damage through pollution, poor soil structure, flooding or erosion.

Looking forward, the devolved administrations will probably need a way of tracking changes in soils, particularly in relation to ecosystem service delivery. This is likely to require monitoring of a range of soil characteristics including chemistry, structure, biodiversity and vulnerability to erosion (including through land cover and use). Under most circumstances, the character of soils is subject to relatively slow change, suggesting that frequent monitoring across all soil types is not required. The factors that are most likely to lead to increased risk of soil degradation are changes in land use and land management. It may be that the most effective monitoring programme would be one based on a stratified sample of sites, where other data has indicated that a change in land use or management has occurred, especially on soils that are known to be vulnerable.

Consultation

The responses from core CS users confirmed that in the future a more integrated approach to the monitoring of soil resources was needed to support current policy frameworks. A representative from Welsh Government, for example, observed that in the context of the Soil Framework Directive it is:

> *'...absolutely essential that any future CS is targeted for delivery of evidence needs associated with this proposed Directive.' (ID139)*

A core user from Defra (ID56) cited the vision in the England Natural Environment White Paper as defining their essential evidence needs.

The user from Wales (ID139) felt that their needs will probably require *'bespoke monitoring programmes',* other respondents felt that some modification to CS might help satisfy their needs, principally to enable:

> *'Linking data on soil nutrient status with land management/farm type to see what impact agricultural intensification may have on the environment - would like CS to include this.' (ID51)*

This respondent from Natural England went on to add that a future additional requirement was to monitor the:

> *'...loss of high quality agricultural land to development i.e. linking ag land quality to more accurate land use change data. Detailed mapped data on soil ecosystem service provision for use in land use planning.' (ID51)*

At present they felt that CS does not collect all the information that they required and that the information provided by LCM is *'too broad brush'*. In terms of any future CS, the representative from Defra identified the need for:

> *'...additional soil samples taken on agricultural land.'* (ID56)

Adding that they *'Would also like to see additional indicators monitored'.* A similar view was expressed by one of the responses in the ecosystem services topic area by a user from Natural England who argued that in the future CS should provide:

> *'Better resolution soil data for selected locations and purposes (e.g. peat depth). Soil data (e.g. on nutrients) linked to land management/farm type would like CS to include this'. (ID51)*

The importance of monitoring soil carbon was emphasised in a number of the questionnaire responses, especially by those people working on woodlands. Thus a user from Forest Research listed a number of specific priorities that included:

> *'The quantification of the impacts of afforestation on soil carbon, especially on organo-mineral soils.' (ID105)*
>
> *'Quantifying soil C changes due to different forest and land use changes management practices.' (ID105)*

and,

> '*Improving the uncertainties in forest soil C stocks estimates and changes under different forest ecosystems and soil types.' (ID105)*

The significance of other soil parameters must not be overlooked, however, as the same user from Forest Research emphasised, by adding that in the future there was also a need for:

> *'Properly quantifying the N status of UK forest soils and the likelihood to NO_3 leaching into waters - e.g. driven by the need to take into account the acidifying*

Table 5.9: Summary future monitoring requirements for soil resources and the response of expert workshop on future needs

Sub-topic	Key Future Policy Drivers/Issues	Implied Future Monitoring/Evidence Needs
Soil quality monitoring and evaluation	>>Integration of soils data into other components to provide a deeper understanding of functions >> Extent of threats from soil degradation in soil thematic strategy >> Linking data on soil nutrient status with land management/farm type to see what impact agricultural intensification may have on the environment >> information on loss of high quality agricultural land to development >> Quantification of the impacts of afforestation on soil C >> NEWP commitment that "By 2030 we want all of England's soils to be managed sustainably ...."	• Monitor changes in soil quality • Monitor resilience of soils and their changing productive capacity • Understand the interrelationships between biodiversity and soils and the changes they exhibit • Integrate with other key sources of information such as LANDIS
Coastal erosion		

Note: the material in the column on key policy drivers were identified prior to the workshop through the desk analysis and the questionnaire survey. The responses of the workshop participants are shown in the column to the right.

nature of N deposition and likely N saturation in some of the UK forests and the risk to waters acidification.'(ID105)

They went on to stress the relevance of these data to their work on the Water Framework Directive, Acidification Guidelines, and Critical Loads for N and acidity.

The participants at the expert workshop on future monitoring requirements and the implications for CS confirmed the conclusions of the desk review and analysis of the questionnaires (Table 5.9), and also stressed the need to link soils data with other sources of evidence on land characteristics (especially biodiversity) and land management. Particular emphasis was placed on the need to monitor changes in soil quality and soil resilience and to better document changes in the productive capacity of soils. **In support of the conclusions of the desk review and analysis of the questionnaire responses the participants felt that if CS was to play a role in this policy area then better integration with other sources of information was probably required.** Overall there appears to be a future policy need to understand and monitor the land use and land management factors that are most likely to lead to increased risk of soil degradation especially on soils. Although the CS soil component has the potential to provide some of the information required, these data are more likely to provide the context for the analysis of the more targeted sampling of soils that are vulnerable to change.

5.2.7 Sustainable Forestry

Desk review

In 2009, the Forestry Commission embarked on a major rolling programme of monitoring of forestry across the UK, the National Forestry Inventory (NFI). This now succeeds the earlier National Inventory of Woodland and Trees (NIWT). The NFI monitors the three key topics of biodiversity (captured through assessments of the condition of priority habitats), the economic contribution of forests (covering timber value, energy value and the storage

of carbon) and the social contribution of forests (primarily through recreational use). High resolution spatial data from the NFI is freely available in GIS format and the results of the NFI are reported at GB as well as country level.

The purpose of the NFI is to fulfil the need for strategic monitoring of sustainable forest management in the UK that complements the development of a risk-based approach to tactical and operational monitoring. The NFI also aims to provide baseline information that can be used to look at how forests might change under different policy or environmental scenarios. In England[74] the principle policy aim is to protect, restore and improve woodland areas, in line with broad Government commitment to sustain the natural environment and realise the benefits to society that flow from natural capital. Similar goals are echoed in the Forest Strategies for Scotland[75] and Wales[76].

The Forestry Commission's commitment to fund the NFI currently extends to 2014 and its future beyond that date has not been assured, although it has been designed as a continuous rolling programme. Providing that the NFI continues to collect data on land use change and biodiversity condition in woodlands beyond 2014, it would be advantageous for the same data to be collected through other surveys in the wider countryside so that comparisons can be made.

Consultation

As might be expected, the questionnaire responses on sustainable forestry were predominantly from representatives of the Forestry Commission and Forest Research who emphasised the importance of their own data collection and monitoring activities. Thus a representative from Forestry Commission confirmed that:

> *'Future requirements will be driven by forestry policy needs within the UK and by international reporting requirements on forestry. This is likely to include woodland area & composition, woodland loss, effects of climate change and contribution of woodland to combating climate change.' (ID47)*

And that to fulfil these requirements it is noted that Forestry Commission is:

> *'Already investing in National Forest Inventory; this is expected to continue in future.' (ID47)*

In terms of CS, however, they felt that it was:

> *'Unlikely to provide sufficient detail or to use relevant definitions to be particularly useful in meeting most requirements.' (ID47)*

A similar view was expressed by a respondent in Forest Research who felt that:

[74] FC England Corporate Plan (see http://www.forestry.gov.uk/forestry/hcou-4ucf8j)

[75] http://www.forestry.gov.uk/pdf/SFSImplementationPlan2012-2015.pdf/$FILE/SFSImplementationPlan2012-2015.pdf

[76] http://www.forestry.gov.uk/pdf/EnglishWfWstrategy.pdf/$FILE/EnglishWfWstrategy.pdf

'I might expect that the CS will support the evidence needs, but only tangentially. Probably because the data collection will not be framed by the specifics of the research questions, but by other drivers and the need to provide continuity between it and previous surveys.' (ID60)

Other respondents were more positive, in that they stressed that CS could nevertheless continue to provide important contextual data. Thus another user from Forestry Commission concerned with integrated land management, and especially the modelling of pests and diseases and the impact of climate change on forests, suggested that:

'The CS will be one of the datasets which provide a holistic picture of our evidence and policy needs.' (ID63)

However, they added the proviso that they would use CS:

'...as long as the cost is affordable, and there is good compatibility/synergy with our other data sets. National Forest Inventory is ongoing and provides the most comprehensive data on British forestry ever. We have an integrated monitoring programme which covers a number of surveys on pests and diseases, climate change monitoring, long term experiments etc.' (ID63)

A respondent from Forestry Commission Wales, who was concerned with monitoring pests and diseases, as well as the social value of forestry, also offered similar qualified support, suggesting that:

'We will always use other data sources as well but would be keen to include Countryside Survey information in future reporting and analysis work.'(ID131)

They added that monitoring in the context of the *Living Wales* initiative will probably require much wider range of information than is presently available.

Table 5.10: Summary future monitoring requirements for sustainable forestry and the response of expert workshop on future needs

Sub-topic	Key Future Policy Drivers/Issues	Implied Future Monitoring/Evidence Needs
The extent and character of trees, woodland and forestry	>> Evidence and modes for pests and diseases. >> Climate change impacts on the existing and new forest estate, and species choice for a changing environment >> Understanding of ecosystems and the services and how to value them, and societal expectations of forestry. >> National Adaptation Frameworks in devolved forestry departments, leading to development and application of adaptation indicators	• There is a requirement for information on habitat condition, economic contribution (timber, carbon, energy etc) and social research, but NFI does all of these, so there is no need for CS to duplicate monitoring in woodlands. But NFI data on soils and air quality is much less frequent and the sample numbers a re small. • Significant contribution to small woods (<.5 ha) and trees on wider countryside. Need consistent methodologies.

Note: the material in the column on key policy drivers were identified prior to the workshop through the desk analysis and the questionnaire survey. The responses of the workshop participants are shown in the column to the right.

The conclusions of the desk review and the analysis of the questionnaire responses (see Table 5.9) were discussed by the participants at the expert workshop on future monitoring needs who stressed the potential duplication between the NFI and some aspects of the CS FS (and indeed LCM2007). It was argued that in comparison with CS, the NFI collects a greater range of data on woodland and uses a larger sample size that allows a finer spatial resolution of results. A clear implication was that cost savings might be achieved by policy customers if a more strategic approach to different monitoring schemes was adopted. Several opportunities for developing a more targeted and synergistic approach were identified in the discussions, which suggest that an important contribution of CS might be through the information that it collects on small woods and the presence of field and hedgerow trees. At present the NFI does not cover woodland blocks smaller than 0.5ha. Moreover, while the NFI monitors soil and air quality this is only done at a small portion of sample sites, and so the data is more restricted than provided by CS. **There was a strong recommendation from the workshop that opportunities for integration of the two data streams should therefore actively be explored, although it was recognised that this may be technically challenging and institutionally difficult to achieve, given differing monitoring objectives.** Thus the niche of CS in the future monitoring in the context of sustainable forestry is unclear, given that for official purposes policy customers are likely to turn to the Forestry Commission data. If CS continues to monitor changes in the stock and condition of woodlands in the wider countryside, then a minimum step forward would be to better understand the differences in the results obtained from the two survey systems.

5.2.8 Urban Development and Infrastructure

Desk review and Consultation

In view of the limited relevance of CS in its current form to the urban environment an extensive desk review of future environmental policy in urban areas was not made as part of this study. As reported in Part 3, the number of returns dealing specifically with this policy topic were also limited and so any detailed analysis of this source of evidence is also not possible. Nevertheless, a concern with the relationships between the rural and urban environments did emerge in the questionnaire responses across a number of the other policy topic areas, and have been highlighted by reference to the general issue of land cover change (and in particular the loss of natural capital, and loss of productive soils), and the need to maintain and restore ecological networks and green infrastructure. The issue of brownfield restoration in the peri-urban fringe was, for example, cited in the questionnaire returns dealing with ecosystem services and natural capital (see section 5.2.2 above).

Table 5.11: Summary future monitoring requirements for urban development and the response of expert workshop on future needs

Sub-topic	Key Future Policy Drivers/Issues	Implied Future Monitoring/Evidence Needs
Land conversion to urban development Urban green infrastructure and inter-linkages with the countryside	>> Distribution and condition of Green infrastructure >> Urban and per-urban connections >> Fragmentation of greenspace >> Surface sealing >> Urban woodlands	• Monitoring processes of change in the peri-urban zone; • Understanding edge effects, integration of data across the rural/urban fringe (closer links to CLG concerns?)

Note: the material in the column on key policy drivers were identified prior to the workshop through the desk analysis and the questionnaire survey. The responses of the workshop participants are shown in the column to the right.

The theme of needing more integrated approaches to land management was put to the expert workshop on future monitoring needs, which was asked to consider how this might relate to CS in connection with urban issues (see Table 5.11). The participants confirmed that, in line with recent policy developments, represented by the National Planning Policy Framework in England, the Scottish Land Use Strategy[77], and the Sustaining Living Wales consultation document[78], there will be a need specifically to monitor change in the peri-urban zone, and to develop a better evidence base about edge effects and ecological and social processes at the rural urban fringe. It was suggested by one participant that the need to monitor in and around urban areas provides an opportunity to involve people in future 'citizen science' initiatives. **In that CS has not traditionally been able to report on changes in specific areas such as the 'peri-urban fringe' it seems unlikely that any future Survey that adopted a similar sampling methodology would make a strong contribution in the future.** There may, however, be scope to extend the Survey into these areas as part of a more citizen orientated initiative; this issue is explored further in Chapter 6.

5.2.9 Air Quality

Desk review

Our desk review suggests that there are not likely to be major changes in international or national policy towards air quality, and that the implementation of the Air Quality Strategy for England, Scotland, Wales and Northern Ireland (2007) will continue to develop. Nevertheless the priorities for air quality monitoring will change. Acid rain and sulphur deposition are becoming less significant as air quality issues as a result of improvements in industrial practices. Instead, nitrogen and ozone are priorities where monitoring of change in the countryside, particularly examining impacts of the former on vegetation and soils, will help guide policy. A key monitoring requirement will therefore

[77] http://www.scotland.gov.uk/Resource/Doc/345946/0115155.pdf

[78] http://wales.gov.uk/docs/desh/consultation/120210nefgreenpaperen.pdf

be data that measures gradual changes in species composition, habitat types and soil chemistry; it will also be important to identify the impact of land management factors such as fertiliser application or grazing density.

Consultation

Although the number of questionnaire responses dealing with air quality was limited they did provide considerable detail on their needs. Thus a representative from Defra suggested that:

> *'We need to develop better metric of impacts of air pollution to allow more effective communication.'(ID104)*

For them, key issues included the impact of reactive nitrogen pollution on soils and vegetation. They argued that the impacts are often overlooked in current approaches to site monitoring and that:

> *'A repeat of the mineralisable N study from Countryside Survey 2007, and continued monitoring of plant species composition change, would strengthen the evidence base for damage by reactive N.' (ID104)*

However, it is unclear what the 'better metric' for the impacts of air pollution based on CS might be. The same respondent also identified the need for a better evidence base on:

> *'...how pollution interacts with different environmental conditions and global drivers of change.'(ID104)*

And in particular there was a need to:

> *'...identify with greater confidence how pollutants impact on the C budget and thus the ecosystem service "climate regulation"' (ID104)*

For JNCC the overarching policy driver for air quality was the need for:

> *'Confidence in using critical loads in reporting biodiversity impacts, particularly when this is leading to a need for altered land management or pollution abatement in order to reach targets.' (ID11)*

For them, a specific requirement was the need to monitor:

> *'1) temporal changes in impacts and recovery and comparison of these changes to mapping of critical load exceedances for nitrogen deposition, ozone and acidification; and,*
>
> *2) improved understanding of impacts on particular habitats, notably coastal and freshwater habitats (significant for atmospheric N deposition).' (ID11)*

In order to make a:

> *'Comparison of impacts [of air pollution] relative to other environmental pressures.' (ID11)*

Table 5.12: Summary future monitoring requirements for air pollution and the response of expert workshop on future needs

Sub-topic	Key Future Policy Drivers/Issues	Implied Future Monitoring/Evidence Needs
Impacts of air pollution	>> Monitoring reactive N pollution and its cumulative effects and impacts on soils. >> Evidence on interact action with different environmental conditions and global drivers of change, and comparison of impacts relative to other environmental pressures. >> Evidence on how pollutants impact on the C budget and thus the ecosystem service "climate regulation" >> Temporal changes in impacts and recovery and comparison of these changes to mapping of critical load exceedances for N deposition, ozone and acidification >> Improved understanding of impacts on particular habitats, notably coastal and freshwater habitats	• Sulphur and pH was well covered by CS helped confirm the falling trend, but no longer a policy priority. • Nitrogen is now a focus of concern especially for its impact on biodiversity - need to measure spatial and temporal trends and impacts on floral diversity. Issues to consider include: spatial (CS does not cover sensitive habitats in enough detail); temporal there are no other long term datasets; floristic - JNCC data better, but CS does provide confirming and contextual data. Note NFI also measures air quality in woods - needs integration. • New focus for air quality is ozone, especially in relation to the public health aspect. CS does not have records of ozone concentration or damage; there is currently a Defra-sponsored project on ozone that is using CS land cover data.

Note: the material in the column on key policy drivers were identified prior to the workshop through the desk analysis and the questionnaire survey. The responses of the workshop participants are shown in the column to the right.

Clearly these kinds of requirement might apply to all sensitive habitats such as base-poor semi-natural habitats found in the uplands.

The results of the desk review and the analysis of questionnaire returns was presented to the expert workshop on future monitoring needs (Table 5.12) and the participants confirmed the shift in policy focus away from sulphur deposition and acidification towards the impacts of nitrogen and ozone. The discussion noted that although information about these issues is potentially available from several existing sources (e.g. NFI and JNCC monitoring systems), CS could have a role to play in the context of ozone but the nature of the contribution remains to be clarified. **However, support for CS was qualified in that it was also felt that the level of detail required is unlikely to be provided, from such general surveys like CS, although the kind of metrics of changes for Broad Habitat types, species abundance and soil character provided by the CS Field Survey could help corroborate and contextualise more detailed monitoring. Clearly the divergence between these two positions needs to be resolved before the future niche for CS could be identified with any confidence.** It was also suggested that more continuous monitoring of air quality (alongside water quality) in the same CS squares might increase the utility of the data. Should these proposals be taken up then any future survey programme would look very different to the current one.

5.2.10. Climate Change

Desk review

There has been a recent focus of activity under the *UN Convention on Climate Change* to plan for adaptation to climate change, including through monitoring of its impacts. The Cancun Adaptation Framework was prepared in 2010 to assist this process. To date, most of the attention has been on the needs of Least Developed Countries (LDCs), amongst

which are countries that are considered to be at greatest risk and to be least well prepared. Although there is currently no expectation from this convention for the UK to monitor the impacts of climate change on ecosystems, the European Commission has recently (November 2011) proposed legislation to significantly enhance the monitoring and reporting of GHG emissions, in particular to meet new requirements arising from the package of EU climate and energy laws for the period 2013-2020. One of the main objectives of the proposed revision is to address emissions from Land Use, Land Use Change and Forestry (LULUCF) and to support adaptation to climate change.

As recorded in Part 3, data on land use change from Countryside Survey has been a primary source of land cover data for UK estimates of emissions from LULUCF. It is not known whether future estimates will rely on updated data from CS or whether alternative sources are being developed that would allow more frequent updating of emissions estimates.

The UK's Climate Change Act 2008 specifies that a Climate Change Risk Assessment (CCRA) must be prepared every five years. The first assessment, prepared in 2012, sets out the main priorities for adaptation in the UK under five key themes of Agriculture and Forestry; Business, Industries and Services; Health and Wellbeing; Natural Environment; and Buildings and Infrastructure. The CCRA has reviewed the evidence for over 700 potential impacts of climate change in a UK context. Separate reports have been undertaken for each of the devolved administrations, applying the UK results to the circumstances in each country.

Detailed analysis was undertaken in the CCRA Evidence Report for over 100 of these impacts across eleven key sectors (each with its own report), on the basis of their likelihood, the scale of their potential consequences and the urgency with which action may be needed to address them. Of the eleven sectors covered by the CCRA evidence review, Biodiversity and ecosystem services is the one that is most relevant to Countryside Survey, although several other sectors including Agriculture, Forestry and Water also have relevance.

Each of the eleven CCRA Sector Reports considers the risk metrics that should be monitored to track the most significant climate change impacts. In the case of biodiversity and ecosystem services, the report states that the complexity of interactions, the large number of confounding factors and inherent time lags in cause-effect relationships means that developing specific risk metrics based upon climate response functions is only a partial approach for this sector. A broader contextualisation of risk is also required. The report acknowledges that Countryside Survey, along with other initiatives such as the Environmental Change Network (ECN), BICCO-NET, the Phenology Network, the National Plant Atlas, and citizen-science initiatives such as Nature's Calendar, the Butterfly Monitoring Scheme, the Botanical Society of British Isles Distribution Map scheme are all potentially important in providing the kind of contextualisation required.

Consultation

The questionnaire responses dealing with future monitoring requirements in this topic area confirmed that there was a:

> *'Continuing requirement to assess the direct impacts of climate change on biodiversity in order to inform adaptation and conservation responses. (ID11)*

This respondent was from JNCC, who went on to suggest that:

> *'This information provision will be undertaken within the new UK Biodiversity Framework, incorporating evidence needs within the UK and externally, for instance for SEBI, CBD and EUBS.' (ID11)*

However, this core organisation provided very little support for CS as a major source, commenting that:

> *'There may be some usage of Land Cover Map for improving the spatial understanding of land use change scenarios, however other habitat inventories with more detail may be more appropriate.' (ID11)*

As a result they concluded that:

> *'JNCC will continue to invest in species monitoring across a broad range of taxonomic groups, and promote the use of these data within the measurement of biodiversity impacts of climate change. There may also be complementary investments in improving surveillance of vegetation within targeted habitats, especially to assist in understanding changes in condition of these habitats.' (ID11)*

Nevertheless, a representative from Natural England reported that they had used LCM2007 in a biodiversity climate change vulnerability GIS model (Section 3.3.10) and that in the future they would need:

> *'Updated habitat and land cover data, ...[to monitor] impacts of climate change on the natural environment, habitat condition [and,] analysis species distribution data.' (ID128)*

The importance of land use change data in the context of climate was also emphasised by a user from Scottish Government who felt that there was a need for:

> *'A data set that can actually characterise the main land use changes - which are mainly happening on agricultural land.' (ID65)*

They expressed the hope that CS could be used with other datasets to achieve this goal. Some users (e.g. Scottish Government, ID120) expressed a particular requirement to monitor land use changes triggered by 'renewable generation'; however, at this stage it is unclear exactly what contribution CS could make at fine spatial scales. During the final phases of this study, attention was drawn to an alternative method for estimating Land Use, Land-Use Change and Forestry (LULUCF) GHG emissions in Scotland based upon land use data collected for the Integrated Administration Control System (IACS) of the

Common Agricultural Policy[79]. The IACS data was found to offer significantly higher spatial and temporal resolution than the CS data. It was also suggested by the consultees to this study that soils data in Scotland available from the James Hutton Institute might be of superior quality to that provided by CS. Nevertheless there might be a role for CS data to fill gaps in these other datasets, particularly IACS that has poor coverage of non-cultivated areas.

The results of the desk review and analysis of questionnaire material were put to the expert workshop on future monitoring needs who largely confirmed the findings (Table 5.13). **While improved land use change and condition data from CS was identified as a potentially valuable future contribution, it was also emphasised in designing any future initiative the goal should be to explicitly support more directly on-going Climate Change Risk Assessments and to monitor the outcomes of National Adaptation Plans.**

Table 5.13: Summary future monitoring requirements for climate change and the response of expert workshop on future needs

Sub-topic	Key Future Policy Drivers/Issues	Implied Future Monitoring/Evidence Needs
Land use change and GHG emissions	>> Requirement to assess the direct impacts of climate change on biodiversity in order to inform adaptation and conservation responses. This information provision will be undertaken within the new UK Biodiversity Framework, incorporating evidence needs within the UK and externally, for instance for SEBI, CBD and EUBS. >> Need to characterise land use change in farmed landscape, and changes due to renewable energy generation	• CS could support Climate Change Risk Assessment work more actively, and contribute to monitoring outcomes of National Adaptation Plans. It could build on the monitoring of habitat and species change to look at impacts of changing climate space, so as to disaggregate the climate signal from other driers of change.
Environmental adaptation to climate change and resilience planning		
Mitigation actions: Renewable energy production		

Note: the material in the column on key policy drivers were identified prior to the workshop through the desk analysis and the questionnaire survey. The responses of the workshop participants are shown in the column to the right.

5.2.11 Access to Nature

Desk review

In Part 2 it was noted that access to the countryside was not amongst the policy areas that were originally conceived as being addressed by CS2007. It was suggested that the development of policy on green infrastructure and the health benefits of the environment were areas where CS, particularly Land Cover Map, might provide useful information to policy makers. However, Part 3 found that there was little evidence that CS had currently provided a significant contribution to policy development or delivery in these areas. Nevertheless, the focus of the Natural Environment White Paper for England, and its equivalents in Scotland and Wales, suggests that these topics will continue to be

[79] Smith, J. U. et al, 2011 . Pilot Project to Determine the Suitability of Integrated Administration and Control System (IACS) Data to Provide Land Use Change Data for Annual Greenhouse Gas Emission Estimates . Research report to The Scottish Government. April 2011. http://www.scotland.gov.uk/Resource/Doc/348825/0116398.pdf

important. The health benefits of the environment are also a focus of interest in the UK NEA and the NERC-funded *Valuing Nature Network*[80], and this research may reinforce its future policy relevance. In the discussions of future policy requirements it should also be noted that there was considerable overlap with the issue of public understanding of biodiversity which is related to, but not necessarily dependent on, physical access to nature. Aspects of public understanding of biodiversity and conservation are factors highlighted, for example, in the Aichi Targets (Strategic Goal A.1) and the UK Biodiversity Indicators (Indicator A1) (See Box 5.1 and Table 5.1)

Consultation

Although the number of respondents who provided views on access to nature were limited in number, they confirmed that there was an interest amongst the policy community in the way people use and value the environment and the health benefits people gain from access to nature. Thus respondent from the Countryside Council for Wales stated a need for future information on:

> *'Location of access and recreation opportunities [i.e. PROW, Open Access, National Trails, climbing sites etc.]; Access and recreation demand and activity - Wales population and visitors to Wales; Access and recreation behaviour (particularly behavioural aspects of participation /non-participation in different sectors of the population and impact of interventions to encourage increased benefits).' (ID269)*

A representative of Forestry Commission Wales identified a set of specific requirements for woodlands, including:

> *'Public opinion of Forestry Quality of Experience for visitors to woodlands; Community usage of woodlands; Effects of woodlands on levels of exercise and health and well being.' (ID312)*

Some of these requirements are already met by the existing Public Opinion of Forestry and Quality of Experience Surveys from the Forestry Commission.

Table 5.14: **Summary future monitoring requirements for access to nature and the response of expert workshop on future needs**

Sub-topic	Key Future Policy Drivers/Issues	Implied Future Monitoring/Evidence Needs
Health and well-being through access to nature	>> Evidence on links between health and well being to enjoying the countryside through walks and practical volunteering. >> Location of access and recreation opportunities [i.e. PROW, Open Access, National Trails, climbing sites etc] >> Economic benefits - enhancing/supporting the economic benefits to Wales of recreation (elsewhere?)	Distance of open space to dwellings; integration with OS Mastermap probably essential.

Note: the material in the column on key policy drivers were identified prior to the workshop through the desk analysis and the questionnaire survey. The responses of the workshop participants are shown in the column to the right.

[80] http://www.valuing-nature.net/

The extent to which CS in any modified form can provide such data seems doubtful, although there clearly could be an opportunity to integrate land cover and land use information to other survey data on the use of the natural environment by people. This idea was confirmed in the expert workshop of future monitoring needs (Table 5.14), which suggested sources such as Land Cover Map could be used to estimate the distance people travel to particular types of location.

5.3 Future Monitoring Needs: Implications for Countryside Survey

The material presented here contributes to the second aim of this study, namely to identify future options for the design of Countryside Survey. The desk review and consultation was undertaken to establish the most important, medium term policy drivers across the topic areas covered by CS, and thus to draft a set of requirements against which different design options can be considered. These requirements begin to define the niche for any future survey.

In order to bring the different strands of evidence together, Table 5.15 summarises the main implications of the current analysis in terms of the work packages around which CS2007 was built. As the material presented here demonstrates, while the focus of policy has evolved since the last Survey was commissioned, the case for a general purpose survey like CS probably remains, but its relationship to other data sources needs to be considered critically, and new data products and analytical procedures are clearly required.

Despite the diversity of policy topics considered, a number of common themes have emerged from the analysis of future needs that have implications across all the existing CS work packages. Key amongst them is the general requirement for information of higher spatial and thematic resolution, potentially targeted on species and sites of high conservation importance. Such a requirement clearly poses a challenge for Countryside Survey which, by its very nature is sample based and general in character. In making the case for successive Surveys its broad-brush character and the fact that its habitats data mainly provide contextual data has always been a subject of discussion.

The requirement for such data of high thematic and spatial resolution is particularly evident in the area of agri-environmental monitoring, where more stringent auditing and surveillance regimes are likely to emerge in the future. However, despite the stated need for such information our review suggests that the need for background or strategic information on the state and trends in the wider countryside has not been eliminated. In fact the requirement for more robust monitoring systems suggests that better and more effective integration of specific and general forms of data collection are required. A clear conclusion to emerge from the responses to the questionnaire survey and the workshops is that effective integration of CS with other data sources is probably needed to answer the more specific questions policy customers seem now to be asking.

Table 5.15: Summary findings on future needs by CS2007 work package

CS Work Package		Summary Finding
WP1	Broad and Priority Habitats	• CS habitat data is used in several existing indicators and monitoring programmes, and these topic areas may continue to have relevance in the future (e.g. UK Biodiversity Indicators, NEA Phase 2); if CS is discontinued or significantly changed, there will be a question of how these data series are maintained. • Evidence suggests that in the future there is also a more pressing need to report on the extent and condition of habitats and sites of high conservation value (e.g. Annex i Habitat), at higher levels of thematic resolution (e.g. EUNIS level 3), and that more general purpose studies like CS are not seen as providing all the information that will be required. • Nevertheless, in the same way that CS has made a contribution to current policy in providing context or general understanding, this role is also likely to be valuable in the future. Moreover as at present while the basic field survey information on Broad and Priority Habitats may not completely fulfil all requirements for biodiversity monitoring, those same data do provide a resource on which a number of other applications can be built. The demand for information on linear features, ponds hedges etc, remains and CS can deliver these, as well as tracking plant composition in patches of higher quality habitats in the wider countryside;- these are important contributions because they are currently not sampled in other ways. • In the future some aspects of woodland habitats will probably be better covered by the NFI and so the duplication of data collection should be avoided; however, the nature of the overlap is unclear from evidence available. Opportunities for greater synergy between these initiatives appear to exist.
	Landscape features	• Monitoring of landscape features such as field boundaries, field trees and buildings provides a valuable baseline data for agri-environment schemes, but integration of CS approaches with those of other, bespoke monitoring systems is probably needed if counterfactual analysis is to be undertaken in a robust way. • Information on landscape features may also be of value for Local Planning policies, especially in areas of high landscape value such as AONBs, National Parks and Greenbelt, where landscape character assessments are required. • The concept of using landscape as a reporting or analytical unit in CS could be strengthened to support landscape-scale delivery of policies.
	Vegetation	• Data on species change within habitats, and overall measures of species abundance and diversity provides valuable contextual and some specific evidence for a broad range of policies, in a similar way to data on broad habitats . • An additional layer of information on land management (for instance the role of agricultural inputs and grazing type/density) would add value to the CS data on vegetation – but it is difficult to collect this information from a single site visit – would require recording of activity of longer period by land manager; since some of this information is available from other sources ability to integrate datasets would be advantageous. • The potential of CS for monitoring the distribution of invasive non-native species could be actively explored, but the contribution is only likely to be part of a wider surveillance strategy.

Table 5.15: Summary findings on future needs by CS2007 work package, cont.

CS Work Package		Summary Finding
WP2	Land cover and land use change	• Data on land cover and change provides important contextual and some specific evidence that will be used in many different policy areas. The fine-scale resolution of the LCM makes it potentially well-suited to many land use planning applications (such as evidence for Local Plan policy and targeting of agri-environment schemes), but its weakness is the lack of trend data to date, the simplicity of the land cover categories and classification accuracy. Opportunities for using satellite and airborne remote sensing (in combination with FS data) to assess the condition of features and land parcels needs to be explored. • The case for synchronising future LCM initiatives with any continuation of the field survey is unclear; greater value from both data sets is probably best derived from improved definitional consistency and the development of new indicators or measures that combine the strengths of each source.
WP4	Soils	• The growing recognition of soils as a key resource in issues such as climate change and ecosystem service delivery means that a soils monitoring programme is needed . • Any new survey programme should be capable of identifying unexpected changes and assess whether the national policy of protecting soils was being achieved . • Nevertheless, existing time series for soils is recognised as a valuable resource for future policy applications and its contribution could be enhanced by collecting additional information on land management etc.
WP6	Integrated Assessment (IA)	• The IA has demonstrated that CS data resources can be used to characterise a limited number of ecosystem services, but these insights have not been used operationally. The case for reframing CS around the concept of ecosystem services is a strong one, given the directions of present policy, and it could provide the basis for justifying a general purpose monitoring system like CS provides. • However, this may require close integration with other monitoring programmes so that data resources may need to be more open.
WP8	Informatics	• There is likely to be increased pressure in the future for data integration and speed of data access, and so the informatics platform developed for CS2007 provides a useful platform. However, if the case for general purpose survey is to be made, the conceptual linkages between CS and other monitoring systems needs to be explicit and probably engineered into the design of the data collection protocols from the outset. The development of partnerships between CEH and the other key data providers to develop a common monitoring database for the countryside seems essential.

To realise the value of the existing data resources and information generated by any repeat survey, it is evident that the case for CS could be strengthened if it were seen as a vital part of a broader monitoring strategy with a more open data infrastructure. In terms of future technical options it would be valuable to explore the issue of standardisation of outputs to make them compatible with other sources. The case is particularly strong in the area of agri-environmental monitoring, where CS potentially provides baseline data around which counterfactuals could be constructed, providing timing issues in relation to the RDP can be overcome. It is also evident in the area of monitoring woodlands, where

greater complementarity between the NFI and CS might extend the range of information about trees and woodlands that is available to decision makers.

Since people use these different sources of information in combination or as part of a strategy for developing a more complete understanding of biodiversity and land cover in the countryside, the loss of CS would clearly diminish the value of other sources. However, if support for CS is to be sustained, then additional effort is required to ensure that the databases generated are sufficiently flexible to allow linkage between monitoring systems to be accomplished, especially at country level. Such linkage is important both thematically and geographically, where despite the devolution of responsibilities, a need to report at the UK level is also still required, although less so than in the past. Effective integration of different sources of evidence is also fundamental to embedding an ecosystems approach to decision making; for CS it will remain a challenge, given the long-established confidentiality of the sampling locations.

The conclusion that the future niche of any future Countryside Survey is essentially a contextual one must not be taken to imply that a simple repeat of what has been done in the past is appropriate. The demand for using the survey as a baseline against which the results of other more targeted monitoring schemes can be compared, suggests that a future CS should provide ways to make a 'read-across' between the different sources of evidence that will be available to policy customers. This may not be easy, given the requirements to report, on Annex I habitats, for example, which are inherently difficult to sample using the CS approach. In the next part of the Report we explore what technical options might be available to enable CS to meet the policy requirements identified here and whether the scale of modification means that what we know as CS is replaced by a fundamentally different type of initiative.

Part 6 Future Options for Countryside Survey

6.1 Introduction

In this final Part of the Report we address the last major task set by the study brief, namely to examine the future options for Countryside Survey. In agreeing the terms of reference with the project Steering Group, it was agreed that key questions to explore included:

- How could CS be modified to provide a better match between data production and reporting requirements?
- Is there any redundancy in CS and could alternative data sources also meet policy future requirements?
- How might costs be reduced by spreading the expenditure across years by the design of a rolling survey programme?
- How might technological advances be used to improve the ability of the survey to detect and understand change over time?

It was also agreed, however, that the discussion should not start from the assumption that any future CS would be funded. The policy case for continuing with the Survey also needed to be examined. Thus before these more specific questions about the technical options for any future CS and its relationship with other evidence sources are considered, some of the larger questions about the broad direction of national monitoring strategy need to be explored. Clearly a comprehensive examination of UK monitoring needs cannot be made here, but some of the issues must be examined if we are to decide whether CS has a niche as a future evidence source.

6.2 The Case for CS

Conclusions about the general case for CS mostly follow from the analyses made in this study of the significance of its current contribution (Part 3), the cost effectiveness of its design (Part 4), and likely future needs in the policy areas that it broadly covers (Part 5). It is useful therefore to bring the conclusions of each of the three earlier parts of this Report together so that the general implications for CS can be seen.

In terms of the current situation, the evidence collected from the user community and related project work suggests that CS, and especially the Field Survey component, has made a contribution in a number policy areas. These are sustainable agriculture (specifically in the design and evaluation of agri-environment schemes); soils (especially in relation to long term trends in soil carbon); air pollution (especially the nitrification of soils and critical loads modelling); and possibly climate change (calculation of GHG inventories). However, the conclusion that one may draw about the relevance of the data collected through CS is a complex one.

CS was designed primarily as an ecological survey, and so it might be expected that it should support biodiversity monitoring more strongly rather than these other policy

areas. Although this was not found to be the case, it does not follow that the biodiversity data collected by CS therefore are unnecessary. The significant contribution in other policy areas in fact depends on the basic ecological information about species and habitats that is at the core of the CS Field Survey. The fact that those same ecological data only make a partial contribution in the area of biodiversity reporting reflects more the specific requirements in this area in relation to habitats and species of high conservation significance. Our investigation has shown that CS results are mainly used in the earlier stages of the policy cycle, to help people frame issues and identify possible options and trends that may require specific policy measures. Although some reporting needs are met, the survey mainly provides the basic contextual information on which decision making depends.

The case for a wide-ranging survey like CS is difficult to make at a time when resources are limited, and if specific policy requirements cannot easily be identified. On the other hand, the cost-effectiveness of collecting strategic information that can be used and re-used across a number of the policy domains of interest to Defra should also not be overlooked. Moreover, if Defra are committed to taking an ecosystems approach forward, then access to a common set of robust contextual data on the wider countryside is one way in which consistent, cross-sectoral perspectives can be established. Strong, recent evidence to support this proposition is provided by the UK National Ecosystem Assessment. It used the Broad Habitat data provided by CS as the mapping framework for the analysis, and for basic information about the stock and condition of key ecosystems and their changes over time. The data made an especially strong contribution to the chapter on Freshwaters. Specific data from CS were also used in the discussion of soil carbon, soil pH, heavy metal concentration in soils, and topsoil nitrogen and phosphorus in the chapters on Regulating and Supporting services. As the Natural Environment White Paper for England demonstrates, the results of this general, strategic analysis of existing data has helped define the framework for many current policy initiatives (e.g. biodiversity offsets, Nature Improvement Areas, Local Nature Partnerships etc.); much of the basic evidence on which the national assessment was based came from the CS Field Survey and LCM2000.

Experience suggests that a general purpose survey like CS may need to compromise some specificity if a range of needs are to be met, and that bespoke monitoring programmes generally have the edge in delivering more precisely tailored outputs. The fact that the majority of the respondents in the questionnaire survey found that CS only partially met their needs must be balanced against the finding that, of the majority of people who gave responses in the general section of the same questionnaire survey, nearly three quarters felt that CS was either an ‘essential’ or ‘good’ source of evidence that describes change. All of the remainder felt they were unable to make a judgement, rather than selecting the options that it either made ‘little contribution’ to their understanding or was ‘irrelevant’. The danger of focusing efforts on only monitoring metrics that are close to current policy

concerns is that the evidence base becomes fragmentary and so cannot provide the kind of strategic view on which sound decision making depends; it also risks the lack of baseline or control data against which the effect of interventions can be measured. Evidence-based policy requires both specific and strategic monitoring; not one or the other. The challenge is to ensure that they can be integrated effectively so that the strengths of each can be brought into the decision making arena.

The evidence collected in this Study therefore supports the proposition that the Field Survey component of CS2007 has made a significant and distinctive contribution to policy. The case for LCM is less clear, partly because the time over which it has been available has been much shorter. Again, apart from LCM it would seem that the Field Survey represented reasonable value for money in that more than half of the resources available were used to generate the data that can be used by policy customers, rather than the one-off costs of collecting it. The investment made in informatics was particularly effective in that it enabled the more efficient, accurate and rapid processing and publication of data, and has also put in place a data infrastructure that could be re-used in any future survey. It has therefore added value to the body of information available from CS2007 and previous surveys, and provides a platform on which the value of these data and any future monitoring can be realised in the future.

The finding that CS2007 has been significant in supporting certain current policy needs is not sufficient to conclude that the survey programme should continue. Thus, in addition to a more general desk review, we have also investigated the future monitoring requirements of the same people who provided views on the current outputs. Our analysis suggests that, although the scope and demands of the policy community represented by the core funders for CS20007 have not been fully met in the past they continue to evolve. Providing CS methodologies can adapt there is a *prima facie* case for its continuation in some modified form, but changes in current approaches will be required.

Our consultations suggest that in many respects the future monitoring landscape will be more demanding than at present. Quite apart from the need to reduce costs, monitoring of data at higher thematic and spatial resolution than is collected at present seems to be a common requirement. A number of the respondents from the CS2007 core funding organisations argued that to meet their future reporting requirements, site-based information on habitats and species of high conservation importance will be essential. In addition more information is needed on the impact of land management and the other drivers of change, as well as the public use of the environment and the values they place on ecosystem services. The implication is that since such information is best provided by targeted, bespoke monitoring strategies or integrated monitoring platforms, rather than a stand-alone general purpose ecological survey, the case for any follow-up to CS2007 is somehow weakened. However, it could also be argued that if such policy specific data are to be collected, then the need to consider it in the context of information about broader

trends in the wider countryside is even stronger. The evaluation of most targeted policy interventions requires some kind of counterfactual or control, and so some investment in robust baseline information is essential. **This seems to be the niche which a future Countryside Survey must fill.**

The need for good, contextual information about the state and trends of species and habitats in the wider countryside is likely to be as important in the future as at present. The most effective monitoring strategies that could be adopted are ones based on as long a time series as possible, so that directional trends can be disentangled from natural and statistical variability. **Providing the design of any future CS can be adapted to ensure that integration with other more topic specific monitoring evidence is possible, the case in support of a follow-up to CS2007, is potentially a strong one**.

At the expert-workshop on future monitoring needs organised as part of this Study, there was considerable support for the idea that, given the design of CS, it is a mistake to consider it primarily as a means of evaluating specific policy measures, unless these lead to very widespread or long term effects. **Thus the question that we need to ask about the future is not whether there is a choice between CS and other policy specific surveillance strategies, but how CS relates to other sources of contextual evidence**. Those identified at the workshop included the Northern Ireland Countryside Survey, National Forest Inventory (NFI), the various stratified species surveillance initiatives led by JNCC, the site monitoring supported by Natural England, CCW and SNH, and more general initiatives that monitor land cover and land use. It was suggested that a particular focus must be to understand how all these sources can be used collectively to help the policy community better and more effectively frame issues or identify trends that may require future action. In making this analysis it must be remembered that there is a separate scientific case for CS that eventually needs to be considered, although it is outside the brief for this study. As noted in Part 3, it is held by NERC to be part of its contribution to 'national capability'. **The strength of CS is that it supports both monitoring needs and policy relevant research, and that the research base can potentially provide a richer understanding of the environment than surveillance directed to a more narrow set of policy outcomes.** The long-term advantages of such a data resource should not be overlooked by the policy community. The discussion that follows therefore works with the assumption that CS has a continuing scientific and policy role, and examines some of the design options that might be considered by any future programme.

6.3 Designing future Countryside Surveys

6.3.1 The relationship between Field Survey and Land Cover Map

The relationship between the Field Survey component of CS and the efforts to map land cover at national scales using remotely-sensed satellite data emerged from our investigation as an important future design consideration, because the current case for treating them as part of an integrated monitoring programme did not appear to be a strong one. Although it must be recognised that the period since LCM was made available

has been short, we have not been able to identify any existing or proposed policy application that depends fundamentally on an integrated analytical product. Many of those consulted commented on the problems that the delay in publishing LCM posed for them, but none highlighted any limitation to using the Field Survey results merely because LCM was not available.

In CS2007, the data from the Field Survey squares was not used to calibrate or refine the classification methods used for LCM, nor has the availability of a complete mapping of land parcel squares been used to extrapolate or generalise information beyond the Field Survey[81]. While it must be acknowledged that the results of the Field Survey at the square and national level were used in an exercise to compare estimates from the two sources[82], this did not result in any final best estimates of different land covers from CS as a whole. Although the exercise was a useful one, it was not different to the kind of comparison that would have been expected from any such initiative, namely to compare estimates with other, existing evidence sources as part of quality assurance procedure. Overall the situation with CS2007 broadly mirrors that for CS2000, when the two sources gave different estimates of land cover at national scale that were never finally resolved, other than by saying they were derived by different methods. In fact, problems of integration are exacerbated by the fact that the remotely-sensed data cannot be fully resolved into the same set of habitat or land cover categories that are used for reporting the Field Survey results. Our consultations suggest[83] that there is on-going research that might help resolve these problems, which would need to be addressed if these kinds of data are to be fully utilised by the policy community.

The monitoring case for treating the FS and LCM as part of a single package has been that they complement each other. The first is a detailed sample based survey providing national estimates, and the second a more generalised, but complete census of land cover, that can be used at more local scales where spatially explicit data is a fundamental requirement. However, the limited read-across between them and the lack of any obvious need to synchronise them in time suggests that the analytical case is a weak one. Their present linkage tends to make the problems of funding more difficult because both require significant resources which may increasingly be difficult to find at a single point in time.

The evidence that we have collected for this study suggests that both the FS and LCM probably have potential future roles to play, but that there are advantages in treating them as separate initiatives so that each may develop in ways that ensure that their potential is more fully realised. The ability to cross-reference the two sources of evidence is important, but the deficiencies of LCM will not be overcome by technical innovations

[81] We note that the Integrated Assessment does refer to such a possibility, but the fact that it was completed before LCM was published made any joint use impossible. In the past the soil maps on the NERC soil portal (GATEWAY) feature FS data scaled up with LCM2000; CEH report that these will be updated with LCM2007.

[82] Land Cover Map 2007: Final Report. http://www.ceh.ac.uk/documents/LCM2007FinalReport.pdf

[83] Smart, S. Pers. Comm. October 2012.

involving the Field Survey. Nor does it seem that the ability of the Field Survey to better integrate with other monitoring programmes will be improved by modifications to LCM. We recommend therefore that the future development of LCM is not formally regarded as part of CS, which should focus on the merits and potential of the Field Survey programme. Although the costs of any future LCM may well be reduced given the investment made in the 2007 product, it would be unfortunate if its inclusion in the 'CS Package' undermined the case for continuation of the Field Survey, which provides the fundamental rationale for the initiative. Clearly some future integration of the two elements may be essential. However, in the present context treating them as separate initiatives may 'free up' the discussion of technical options and funding needs.

In the discussion that follows, therefore, we will treat LCM and FS as two separate programmes, and explore the opportunities and design options that might ensure that each of them can make a contribution to future monitoring needs.

6.3.2 Mapping Land Cover and Land Cover Change

Our investigation has shown that there is significant current and future need for detailed information on land cover stock and change. The Land Cover Maps for 2000 and 2007 have consistently been the most frequently downloaded part of the CS data resource, there is little doubt that LCM2007 will become the most widely used output from the Survey. Although we have focussed our assessment on the needs of the core funding organisations there is also clear evidence that the availability of these data significantly expands the potential user-base for CS. Thus our recommendation that LCM and the Field Survey are not considered as part of the same monitoring and funding initiative needs to be considered carefully.

The basis for our recommendation rests on two observations. The first is that the quality and utility of the land cover information provided by both LCM2000 & 2007 was improved significantly by moving from a pixel to a parcel-based classification approach, and that the integration with the spatial structure of OS MasterMap in CS2007 probably represents a step-change in the way these remotely-sensed data can be used. OS MasterMap provides a spatial framework that potentially allows a number of different data sources to be brought together to characterise land cover at the parcel level. Our consultations suggest that the construction of such an integrated database for land cover is likely to be a significant focus of future work.

The second observation on which our recommendation depends is that despite the promise of Earth Observation (EO) data in general to provide comprehensive land cover information, experience of LCM2007 suggests that it continues to fall short of being a universally applicable source of such data. Given the complexity of land cover and land use classifications used by the science and policy communities, it seems unlikely that any single source can provide all the information that is required and that only by integrating different evidence sources in a common spatial framework like OS MasterMap is a robust

and consistent mapping of land cover likely to be achieved. Thus whatever contribution the analysis of remotely-sensed satellite data plays in the future, it is probably best made as part of the construction of a more general database on land cover rather than as a separate, stand-alone data product.

In looking to the future, these two observations must also be considered in relation to the fact that despite the availability of two land cover maps, we still lack any national picture of land cover and land use change of both stock and condition. The mapping of land cover change is, we suggest, probably one of the most pressing priorities. Our consultations suggest that change mapping, like the classification of land cover and use, is also probably best accomplished through the construction of an integrated land cover database.

The extent to which EO data have the potential for measuring habitat stock and change, and for assessing changes in other ecological attributes that characterise ecological function, is now actively being explored by the CS core funding organisations outside this Study. The first phase of *Making Earth Observation Work for UK Biodiversity Conservation*[84] was, for example, completed in 2011. It concluded that while current habitat classification systems used for conservation monitoring are not easily implemented using EO systems, there are opportunities to use these sources to collect information on a range of important ecological characteristics in ways that are cost-effective when compared to Field Survey techniques. The initiative devised the so-called 'Crick Framework' as a way of describing the extent to which EO techniques can be used to identify BAP Priority and Annex I Habitats, and to show where ancillary data from non-EO sources is required. The framework will be expanded in the next phase of work to include measures of condition. The final report is expected in the first quarter of 2013, and it will do much to define the kinds of contribution that any future LCM initiative might make to future monitoring needs.

The work being led by Defra and JNCC must, however, also be seen in the context of a broader initiative, known as the UK Environmental Observation Framework (UK-EOF) that is part of the *Living with Environmental Change* (LWEC) Programme. The latter builds on the work of the Environment Research Funders' Forum (ERFF), which has now become part of LWEC, and in particular its 2011 review of UK observational needs[85]. Under the auspices of LWEC, recent dialogue[86] has focussed on what the development of a national land cover information system must involve, the place of EO data and other data sources within it, and how such a system might serve future policy requirements. Significant operational insights that might help progress in creating such a system may be provided

[84] http://jncc.defra.gov.uk/pdf/Making_EO_work_for_UK_biodiv_PART_A_final.pdf

[85] *UK-Earth Observational Framework: Statement of Needs.* http://www.lwec.org.uk/sites/default/files/towards-a-statement-of-need.pdf

[86] See, for example, the reports of workshops held Jan 2011 and May 2012 respectively.

by the development of the Habitat Inventory for Wales, Gwylio[87]; we recommend these are reviewed as they emerge.

Future strategies will also be affected by the availability of the GMES high resolution layers, which will be updated on a three-year cycle across Europe. These layers will provide information on specific habitats, such as forests, and issues such as soil sealing. It will also be used to construct updated CORINE mapping. Defra has commissioned work to evaluate is source, and JNCC are leading a more general initiative to test whether the time series of imagery can deliver a time series for ecological change.

Given the on-going discussions about the need for a national land cover information system and the contribution that EO might make, it is premature to draw any firm conclusions about what this means for any future CS, except to suggest that they reinforce the suggestion that efforts to increase or add value to the kinds of information represented by LCM2007 probably involve exploring issues other than those involving the relationship to the Field Survey component of CS. The existence of a national system would not eliminate the need for Field Survey data, but would require that it is used alongside other sources in a more integrated way than at present. Moreover, the design and implementation of an integrated national system is not likely to be achieved in the short term because further development work is probably required. The implication is, we suggest again, that the future contributions of LCM and the Field Survey component of CS are best treated as independent sources of evidence, and not considered as inseparable parts of the same monitoring initiative.

6.3.3 The Field Survey Programme

The need for integration and partnership

The review of future policy requirements for the CS Field Survey also showed that there was a need for better integration with other sources of information. However, the aim of this integration was not so much to overcome limitations of the data themselves, but to ensure that their value are fully realised. The requirement for better integration of different data sources is perhaps to be expected, given that many people used the Field Survey results to help them frame issues and understand trends in the wider countryside. By its very nature such efforts involve assembling and comparing different kinds of evidence in common conceptual or analytical frameworks. For example, our survey suggested that one future policy requirement was to better understand the socio-economic drivers of change. While an ecological survey like CS in its current form is unlikely to provide all the information that is needed, if it could be linked to other sources of evidence on land management, say, then much more could be done. We suggest that such possibilities are actively explored along with any requirements to preserve the confidentiality of sample locations and land management data at an individual level.

[87] http://www.gwylio.org.uk/

The ability to re-engineer and report the Field Survey data in more customised ways has, to some extent, been addressed by the investment made in the CS2007 informatics work package. However, it is also clear that more could be done by standardising definitions and monitoring protocols between different monitoring programmes. There may also be a case for designing consistent, but less demanding sampling protocols that can be used by surveyors with lower technical skills (such as volunteers) to extend the coverage of data collection for some features. Standardisation is, however, vital where CS data might be used to construct a 'control' or counterfactual, when judging the effectiveness of targeted agri-environmental measures or when making site condition assessments. In these situations CS can give a useful picture of 'average' conditions in the wider countryside, and therefore used to measure differences between areas affected by policy measures and those not, providing some kind of 'read-across' can be made; this is more likely to be achieved in agricultural landscapes rather than in ones dominated by semi-natural cover types.

Standardisation of definitions and data collection protocols is also essential where there is a need to use monitoring programmes in complementary ways. The perceived overlap between CS and the NFI in the collection of woodland data was an important issue identified during our consultations, and it was proposed that for the future more harmonised field surveys might be considered. At present there are differences in the way woodlands are defined by the two programmes. The CS Field Survey recognises woodland patches as having more than 25% cover, while the NFI sets the threshold at 20%; the former sets the minimum mappable size of a woodland parcel at 0.25ha, while the later puts it at 0.5ha. Moreover, while the size of the CS survey square is 1km x 1km, the NFI samples 1ha cells. It is also apparent that NFI generates woodland area statistics through mapped land use that is calibrated through the 1 hectare sample squares, while the CS Field Survey is derived from a sample based assessment of physical tree cover.

The significance of the differences in survey approach between CS and the NFI needs closer investigation and any future development will require more formal partnership and cooperation arrangements between CEH and Forestry Commission. Discussion in the run-up to CS2007 was not possible, and the extent to which a more standardised approach can satisfy the need of both organisations remains to be seen. However, the benefits of future collaboration may increase the usefulness of both data sources, and potentially achieve cost-savings if any duplicate data is identified. At present the complementarities of CS mainly come from the information it provides on smaller woodlands, not included in the NFI. The downside of closer integration is that more time will be needed in planning any future survey, to ensure continuity with the existing time series is maintained. A similar argument could be made about the collection of information on the quality of headwater streams, in relation to wider country level monitoring initiatives.

The possibilities of different agencies coming together to share the burden of collecting environmental data has been explored using the idea of 'coincidence mapping' as part of the UK-EOF work[88]. The analysis investigated 32 different sources of site-based or location-specific monitoring data collected across England and found that of the nearly 34,000 sites, around 34% were within 2km of another monitoring locality. It was suggested there is therefore considerable scope for future collaboration. The CS Field Survey squares were not included in the coincidence mapping exercise on grounds of confidentiality. It would be beneficial if analysis could be pursued further with the CS sample squares included.

One important contribution of CS to integrated site-based monitoring that seems to have been overlooked in these discussions is the use of the CS sampling framework represented by the CEH Land Classes. The CEH Land Classes, which are based on an analysis of the variation in climate, soils, topography and geology at national scales, describe the principle environmental gradients across Great Britain. They were first defined in 1978 and refined to accommodate the needs of country-based sampling for the 2000 Survey. The current 45 land classes play a vital role in CS because they define the sampling strata used to select a statistically representative set of Field Survey squares in England, Wales and Scotland. They also provide the means whereby national estimates are made from the sample data. Each of the 1kmx 1km squares of the OS National Grid has been assigned to a land class. The Field Survey information is used to calculate the mean value of each of the measured parameters for each land class level, and the proportions of each land class in GB are then used to calculate the weighted mean at either national and country scales. The significance of the CS sampling framework for integrated monitoring is that any set of site-based measurements could, on the basis of its location, be assigned to a Land Class and the stratification used to make estimates at broad spatial scales, providing there is no bias in the way they were selected.

The sample stratification used by CS is an under-used resource. Two issues are apparent. On the one hand it is surprising that CEH do not provide a simple on-line 'calculator' similar to the *Countryside Information System* (CIS) that can be used to generate customised estimates for user defined areas, so that the Field Survey data is more easy to use by a wider range of people[89]. On the other, it is disappointing that the Land Class system has not been used widely for the collection of environmental data that can therefore be linked to CS, other than by CEH.

While publication of the location of the sample squares used for the CS Field Survey is problematic because it may affect future measurements, the land class mapping is freely available, and there is nothing to prevent other initiatives using it to collect

[88] See for example: www.ukeof.org.uk/documents/20111209-monitoring-network-workshop-report.pdf

[89] Note: The CIS uses parametric statistics to qualify its estimates, but since CS2000, the published estimates are non-parametric (i.e. boot-strapped). CIS estimates are still valid, but look slightly different in terms of their qualifiers. CIS remains available but is not supported; CS2007 data are available for this platform.

complementary data; the sample strata could be used to collect statistically equivalent information in other locations. In fact, such a possibility may be exploited in the future through the recently commissioned work in Wales for agri-environmental monitoring[90], and we suggest that further efforts along these lines are needed. The pathfinder work in Wales will involve national monitoring to quantify change in the countryside at the national scale, and targeted work to look at the impacts of measures at specific localities. The national-scale data, which provides baseline for the monitoring approach, will not use the existing CS sample squares in Wales, but will be collected from other sample locations stratified randomly by land class. This approach will potentially allow a range of different data sources and data providers to be brought together; although the scheme is at the negotiation stage it is likely to include information from the Biological Records Centre and BTO, as well as the collection of additional data on diffuse pollution, social and economic pressures, access, landscape character and ecosystem services. Sampling at the established CS Field Survey squares in Wales can continue in parallel, and provide additional ecological intelligence to the overall monitoring programme. **We recommend that its implications of this work need to be looked at because the experience may provide a guide for how CS could be used elsewhere in relation to policies for sustainable agriculture.**

It is important to note that more generally the existence of the CEH Land Classes also provides a framework in which new 'citizen science' applications can be developed, providing suitable sampling protocols can be devised for less technical surveyors. This issue has also been explored by the UK-EOF[91]. In Scotland, the CAMERAS initiative makes reference to the important role that people can play in monitoring, as does the Welsh Natural Environmental Framework. In England greater involvement of the voluntary sector has also been identified as important both to promote stronger public engagement with nature, and potentially to reduce monitoring costs. Although the availability of mobile technologies and social media now make the involvement of people in monitoring activities more feasible, the utility of the resulting data will depend on scientifically valid ways of linking and aggregating the information. The Land Class system provides one way in which this can be done. It may also offer one way in which CS-type sampling can be extended into the urban areas, or used to gain an insight into people's use of the countryside and the values they attach to it.

Our investigations therefore suggest that the design of any future CS Field Survey programme will require the development of several key partnerships. Stronger integration and partnership working would certainly also support the claim that CS makes a significant contribution to 'national capability'; it also makes sense practically. While

[90] Lisa Norton, pers. comm., August 2012.

[91] http://www.ukeof.org.uk/co_citizen.aspx

there are many possibilities, given limitations of time and resources these will need to be prioritised, and we suggest three areas are particularly important:

1. An examination of the opportunities that exist to collect woodland data through the CS Field Survey and NFI in complementary and cost-effective ways; this could begin by an examination of current data holdings and the institutional and scientific barriers that might prevent any opportunities for closer working to be achieved.
2. An examination of how CS field protocols can be adapted to enable these data to be used as a baseline and/or contextual information against which the effectiveness of agri-environmental measures can be judged.
3. An investigation of the added value that the monitoring of headwater streams in CS squares provides, given the current monitoring programmes of the Environment Agency, Natural Resources Wales and SEPA.
4. An investigation of the extent to which complementary sampling designs and sampling protocols can be developed to enable volunteers to collect ecological data to meet the demand for information of higher thematic and temporal resolution.

The Case for a Rolling Field Survey Programme

Countryside Survey has traditionally been undertaken as a periodic exercise, with field work being undertaken over one or two years, every eight or nine years. Although such an approach has advantages in terms of statistical reporting, it poses a number of logistical and funding difficulties. Thus from time to time the case for a rolling or continuous programme of survey has been put. Given that resources available for monitoring and research within the core funding organisations are likely to be limited, we have examined this argument again as part of the discussion of the technical options open for CS[92].

The advantages of a periodic survey are that collecting all the data in a short period of time reduces sampling variability and therefore increases the ability of the survey to detect change. The highest consistency is obviously achieved if the same methods are applied at the two sampling points. There are, however, also drawbacks with periodic monitoring. It may be, for example, that a survey year may be atypical in terms of weather and so trends might be masked or exaggerated. A rolling programme, in which a proportion of the sample squares were visited each year would smooth these effects out. With a periodic survey, year to year variability is difficult or impossible to determine; although annual data from the Environmental Change Network site has been used to look at the problem given the current CS approach.

[92] We are grateful to CEH for providing their thoughts on this issue.

In management terms a periodic survey also poses problems in terms of staffing and funding. In the past, the periodic Field Survey programme has been a significant burden on CEH staff, because it interrupted their other activities during the main survey phase, but then demands concentrated analytical and reporting activities over a further 3-4 year period. While more temporary staff were recruited for CS2007 to undertake the Field Survey than was the case in the past, the need to recruit and train them is a major added cost. With periodic survey the funding case is also more difficult or challenging to make. While the cost of 'one-off' surveys may not be greater than a full rolling programme, the funds all need to be found at once. This may stretch the funds of particular organisations and may be more vulnerable to particular circumstances in those organisations that coincide with the period when the case has to be made. Annual budgeting may be easier than justifying large, one-off tranches of support and variations in budgets may be easier to plan for. In terms of wider support it has also been put to us that a rolling programme may more easily be used to enrol volunteer support for aspects of the survey, because a regular annual programme of activities could more easily be used to build long term interest and commitment (providing the confidentially of the core sampling locations could be assured).

Although we have not been able to look at the relative costs of a rolling programme versus a periodic one in detail, it does seem that the rolling programme could result in some cost-savings and improvements in data quality. For example, a smaller survey team that worked continuously would be easier to train, retain and manage. Better, more experienced surveyors might also be recruited from the outset, and continuity of staffing would probably mean that the quality of the data was better overall. Travel times may, however, be greater because sample squares may be more widely spaced in each survey year. Moreover, a smaller survey team would be easier to manage, but travelling times would increase. Although economies of scale are lost with the rolling programme (e.g. quality assurance would need to be undertaken each year rather than as a one-off exercise) the latter could result in cost savings because there will be less total effort needed each year to organise activities. However, no estimates of cost for a rolling programme have been made, and it is unclear whether it would successfully reduce the fixed costs in the field programme**. A more detailed investigation of the issue is therefore required.**

It is clearly important to consider staffing and management issues when comparing the relative merits of a period or rolling survey programme. However, we suggest that these types of issue should only affect any final decision on approach providing there are no major losses to the robustness or utility of the survey data, or to the quality and flexibility of reporting. In our discussions with CEH we have therefore paid particular attention to these types of issue. The key points to emerge are that:

- The simulation studies undertaken by CEH suggest that when the periodic and rolling options are compared over the course of two survey periods, there is little

difference between them in the power to detect a trend versus the power to detect a change. These conclusions seem to apply irrespective of the sampling parameters (e.g. vegetation, soils, freshwaters) considered.

- However, while the rolling programme allows change to be detected in any year, rather than just between periodic survey years, giving the policy customers an insight in the ways countryside is changing year on year, any within year estimates will be more uncertain because fewer sample squares are available each year for the rolling programme. This is a problem that might be exacerbated if the requirement for country level reporting is maintained. It might also be that initially several years of annual survey will be needed before robust estimates are possible.
- In terms of data integration, conclusions about the merits of each approach are mixed. On the one hand it would appear that the outputs from a rolling programme may more easily be integrated with other data sources that are also available on an annual basis, but more difficult to link if they themselves were periodic. It has been suggested to us that the annual data from a rolling programme may enable more site specific effects to be investigated.
- While periodic reporting of longer term tends and issues at the end of a survey cycle is not precluded by a rolling programme, annual reporting could be automated, although this would require some investment if a decision to change the periodic approach was made.

Our review suggests that the statistical and scientific case in favour of a periodic survey over a rolling programme is probably a finely balanced one. Thus we recommend that the transition to a rolling programme is considered with some urgency in 2013. The practical arguments in favour of moving to a rolling programme seem strong, given the situation that the core policy customers find themselves in *vis a vis* funding and management, and so we suggest that a change in monitoring approach should be actively considered. There would undoubtedly be a cost of making a change, and different design options for a rolling programme would need to be considered. However, this initial investment could be treated as first stage funding for the continuous programme of support, and would probably be no greater than the sums expended on the preparatory phases of past surveys. The main issue is whether the transition could be made in a time-frame that is acceptable, given future policy needs.

Timing, geographical scope and content

Decisions about the timing of any future Countryside Survey are dependent on a number of factors. If a periodic approach to survey is retained with the reporting window suggested above, then the next survey should take place in 2015/6 with the data released in say 2017/8. This would require major funding to be available in 2014/5 to initiate the planning of the programme and its start-up.

Our discussions suggest, however, that if a rolling programme were to be implemented it is likely that with a small survey team, a complete sweep would take 5 years. In the long term, a five or six year reporting cycle may be attractive for policy customers, because it would mean that they were basing decisions on more up to date information. The immediate disadvantage of this strategy would be that a change to a rolling programme would probably mean that the full report on the first survey cycle would not be available until 2018 at the earliest, assuming a 2013 start, which is unlikely. With a rolling programme the reporting window of 2017/8 could only be met if it were 'kick-started' with a more intensive survey phase between 2014 and 2016. From 2017 onwards the scale of the rolling programme could be reduced, and a system of annual or biennial interim reporting could be implemented, with a full update every 5 or 6 years thereafter.

In addition to these practical issues, the timing of any future survey must also be looked at in the context of policy needs. Although we may accept the proposition that the main contribution of CS is in terms of providing contextual information about state and trends in the wider countryside rather than fulfilling any specific policy reporting requirement, it is still important to synchronise outputs with the timetable associated with major policy programme and commitments that are relevant at national and country scales. Thus there will be a major requirement for biodiversity and ecosystem service data towards the end of the decade in the run-up to any review of the 2020 biodiversity and ecosystem service targets; reporting on the Aichi targets and Article 17 commitments are for example needed in 2019.

In relation to the evaluation of the country-level Rural Development Programmes, the next cycle runs from 2014 through to 2020, and so there is likely to be a requirement for a mid-term review and an evaluation of the performance of the programmes as a whole. Annual reporting associated with a rolling programme may assist with any interim review, but whatever survey approach was adopted it would be valuable if a complete report that helps evaluate the effectiveness of agri-environmental policy were available in 2018/19.

At a country level there are future commitments that would suggest significant reporting requirements in the last half of the decade; these include commitments in the England Natural Environment White Paper, for example, to improve the way natural capital is included in national accounts, over and above what had been achieved by 2013. The land use implications of commitments under the Climate Change Act, to reduce 2020 emissions by 34% compared to 1990 levels, will also need to be informed by appropriate monitoring data.

Whatever technical option for CS is adopted, we recommend the goal should be to publish the full results of the next Field Survey towards the end of 2017 or in 2018. A balance needs to be struck between the policy needs of any mid-term review for the RDPs, which would suggest an earlier reporting date, and the requirements for

monitoring the 2020 biodiversity targets, which would suggest a later reporting target date.

Our consultations suggest that the present UK and country-level reporting arrangements also remain a strong consideration for the future. There is little doubt that the ability to report separately at the scale of England, Wales and Scotland has increased the user-base for CS. However, as the countries develop different approaches and policy goals, it is likely that their particular needs will diverge, making the integrated design of any future CS more challenging. The problem for UK level reporting is also that the Northern Ireland Countryside Survey is independent of the NERC/CEH CS initiative, and so there is an additional need to maintain common reporting standards with this monitoring programme. Nevertheless, it is difficult to see how CS could sustain a claim to be part of 'national capability' unless the ability to report at these different geographical levels was preserved.

The move to country-level reporting has added significantly to the costs of the CS Field Survey programme, in that it demanded that each country level report depended only on data collected within that country. Using the original GB Land Classes, rather than the refined 45 classes needed for country level sampling, it would be possible to generate country estimates with a reduced number of sample squares and so save money. However, this would require the use of sample-based data from outside each country drawn from environmentally equivalent areas. **We do not advise upon such a strategy, which would probably be politically unacceptable and scientifically unsound.** Given that survey squares from the same land class in different countries are increasingly likely to be subject to different policy regimes, the analysis of the causes of change at national scales would be complex if not impossible.

While country-level reporting remains perhaps the minimum requirement in terms of the 'geography' of reporting, our review of future user needs also suggests that the ability to present data at landscape and catchment scales is also likely to be important. The current attempt by CEH to cross-reference the survey squares to different reporting units, ranging from environmental zones, through regions, counties and landscape character areas, is a start. However, as noted above the utility of the data would be increased if more automated on-line tools were available to allow users to re-stratify and/or map the sample squares in different ways, to support a wider range of uses. We recommend that these kinds of tool are considered as part of any future investments in informatics.

Finally we turn to the content of any Field Survey programme, that is, the set of detailed measurements made within each of the sample squares. While the number of observations must add to the time taken in the sample square and the resources needed for analysis, Part 4 showed that the fixed costs associated with the field work amounted to around 42% of the cost of surveying a square; this level of expenditure would be needed however many measurements were made in the sample squares. Major cost-

saving could therefore only be achieved by either reducing the number of squares sampled, or slimming down the amount of information collected on landscape features, habitats and vegetation (currently WP1) or freshwaters (WP3); the collection of soils data (WP4) only accounted for around 2% of the survey costs (although it requires substantial resources for analysis compared to the resources needed to process habitat and vegetation data). Our analysis suggests that there is, however, little evidence that much of the information on landscape features, habitats and vegetation is redundant or unnecessary[93]. The ability to integrate a wider range of headwaters data with information about the characteristics of adjacent land uses also remains an advantage of the CS approach, and could increasingly be important given the need to monitor risks and pressures on water quality in the context of the WFD. The cost implications of recording appropriate land cover data in WDF monitoring programmes is, however, unknown.

Our review of future policy requirements suggests that there is a need to increase or improve the range of data collected in the sample squares rather than to reduce the survey effort. For example, additional attribute data may be necessary to ensure better compatibility with other evidence sources. Moreover, a method similar to that used to record 'Key Habitats' in the 1990s[94], could be adapted for recording a larger number of widespread habitat types of greater conservation interest. In the context of monitoring agricultural land, a current weakness in the CS methodology that would need to be overcome through the collection of additional data concerns land management; this problem arises because of the difficulty of capturing this information on a single visit basis. Finally, the attention now given to ecosystem services may require additional process-based measurements to be taken on a more continuous basis; EO platforms may contribute here. There is, for example, also the possibility of developing new *in situ* measurement techniques for recording productivity and the GHG emissions of different vegetation types, and for monitoring water quality using polycarbonate gels; these can be placed in water bodies and recovered to provide an integrated measurement of conditions over time.

The pressure to increase the range of information collected in the Field Survey squares, or at least using the same sampling framework employed by the Field Survey adds further weight to the need for partnership working and the development of joint or complementary monitoring initiatives. The latter obviously must include the joint use of EO data, and while we suggest that in terms of the management of funding it would be worthwhile splitting the Field Survey from LCM developments, these two data streams must subsequently be brought together. While modern EO techniques can and should, where possible, be used to collect information on ecological condition, in the short term the cost-savings for the Field Survey of change-only update mapping of Broad Habitats using EO techniques would be marginal. The use of unmanned aerial systems and LIDAR

[93] But see our comments on the relationship between CS and the NFI, section 6.3.2
[94] See: http://nora.nerc.ac.uk/9069/2/Key_Habitats_1993_Hbk.pdf

appears to offer particular promise, but progress in planning the next Field Survey should not be held up while the operational capabilities of these experimental systems are tested. One of the merits of a rolling programme is that it can more easily accommodate new technological developments as they arise, and enable different methods to be run alongside each other for a period so that they can be fully calibrated.

Our study suggests that there is a continuing need for the range of measurements currently made by the Field Survey, but that future requirements will probably require more flexible and more sophisticated uses of these data, potentially involving the collection of additional information either simultaneously or subsequently by other means. **In looking at future technical options for the Field Survey, a primary concern therefore must be to implement an approach that would allow methods to evolve and adapt as needs become better defined and as technology changes. A rolling programme of survey would seem to offer this kind of advantage.**

6.4 Conclusions

The aim of the analysis presented in Parts 5 and 6 has been to examine whether a future Countryside Survey is needed and, if so, what form it should take. **We have found that the case for continuing with this programme is a strong one, but that its structure must evolve.** Changes are needed if it is to continue to deliver information that is relevant to the policy community, and to meet the more challenging funding regime that is likely in the future. On the basis of this analysis we suggest that:

a. **The Field Survey and land cover mapping components are treated essentially as separate programmes.** While there is merit in combining data from each source for some applications, there is at present no real analytical dependency between them. Treating them as parts of a single survey programme potentially makes the funding case more difficult and could hinder innovation. Both could be strengthened by linking them to other developments rather than to each other.

b. **The development of land cover mapping is best achieved by looking at ways of using these data in an integrated national land information system, capable of recording change over time.** This is likely to involve the integration of earth observation data with a range of other sources, principally the digital map base of the Ordnance Survey, as well as aerial photography and LIDAR information. Given the significant time and cost that would be involved in developing such a system, and given that its user base may be different to that for the Field Survey, we argue that any investment in these developments must not hinder the case for continuing with the Field Survey. Separation of FS and LCM components would allow the contribution of the latter to be looked at on its own terms.

c. **There is little evidence to suggest that there are major redundancies in the range of data currently collected by the Field Survey component of CS.** Although the strongest policy contributions were found in areas other than biodiversity, most of

the application areas investigated drew on the same, common pool of ecological data. The value of the field data lies in the range of uses that it can support, and the elimination of particular components would tend to devalue the whole. For the future, the challenge is mainly to enhance the value of the existing resource by collecting additional information or linking the Field Survey results with other sources, so that new uses and more refined indicators can be developed. Nevertheless, it is clear that the value of some of the data generated by the Field Survey has not always been fully realised, and for the future more targeted investment of analysis around specific policy applications may be advantageous.

d. **The future value of the Field Survey data would be enhanced by the building of partnerships with several key organisations, so that standardisation of measurements and survey effort can be shared.** Principally these partnerships would involve the Forestry Commission, to create synergies with their National Forest Inventory; the country level organisations responsible for the respective Rural Development Programmes and agri-environment monitoring; and the Environment Agency in England, Natural Resources Wales and SEPA.

e. Two major design options for the Field Survey have been considered, namely the periodic approach that is currently used, or a rolling programme of continuous survey. **Given that we found no major technical or statistical arguments against the rolling programme, we suggest that in terms of managing the survey programme and securing its funding, a rolling programme probably presents the best technical option.** The rolling programme would allow the survey protocols to be more easily tested and adopted as new methods and requirements are identified; these include new more automated methods of earth observation. A rolling programme also potentially allows funding to be managed in a more sustainable way. We recommend that the detailed technical case for making a transition to a rolling programme is investigated.

f. Our review of future policy needs suggests that if the FS goes ahead in its present or a modified form, then whatever sampling strategy is adopted (period or rolling) th**en the next full report should be available around 2017/8. This would ensure the data could support work related to the review of the country level RDPs, and the monitoring of progress towards the 2020 biodiversity targets.** The exact timing of the full report should be determined by the strength of the contribution that CS might make to each in each of the two policy areas, which is difficult to determine at this stage.

g. **If a rolling survey strategy were adopted, then whatever reporting date was decided upon, a plan would need to be developed to ensure that there was an appropriate transition to the new sampling approach**. To meet the timing of the reporting cycle outlined above, a rolling programme may need to be 'kick-started'

with a larger one-off initial phase to ensure that the first national sweep is completed by 2018. Thereafter a five year full reporting cycle could be maintained with the possibility of interim updates. We recommend that a detailed evaluation of the rolling survey option be undertaken in 2013, so that any decision to change approach would be able to meet the reporting requirements likely to arise at the end of the decade.

h. We **also found that there was a need to retain both a country-level and a UK reporting capability**, thus future consistency with survey methods used in Northern Ireland should be maintained.

Part 7 Key Findings and Recommendations

7.1 The contribution of CS2007 to current policy needs

The first aim of this study was to assess the policy impact and cost-effectiveness of Countryside Survey 2007. To do this we have evaluated the contribution of CS2007 to the policy applications set out in the original contract for the Survey and looked at the benefits of the investments made by the new technical options introduced into the work programme.

We have drawn our evidence from a desk review of the applications and project work that CS2007 has supported; the results of a questionnaire distributed mainly amongst key informants from the organisations that funded CS2007; and expert-based workshops.

Our finding in Part 3, for the Field Survey element of CS, is that it has made a significant contribution to policy in areas related to:

- sustainable agriculture (specifically in the design and evaluation of agri-environment schemes);
- soils (especially in relation to long term trends in soil carbon);
- air pollution (especially the nitrification of soils and critical loads modelling); and,
- climate change (calculation of GHG inventories).

The important contribution that CS Field Survey information made to the UK National Ecosystem Assessment suggests that these data resource is likely to be important in the future, given the growing policy interest in maintaining and restoring ecosystem services. Although the contribution of the Field Survey to current biodiversity reporting and species monitoring was less strong, this did not mean that the collection of such data by the Field Survey was unnecessary. The core biodiversity data are needed to support these other applications. All of the areas where the strongest applications were identified used essentially the same data from the mapping of area and linear features and the monitoring of vegetation plots and soils. No major areas of data redundancy were found, although opportunities to make better use of the data were identified. Biodiversity information collected in the Field Survey could be used to monitor some of the Aichi 2020 Targets; indicators based on the Ellenberg scores derived from the CS plot data could be used to monitor whether pollution levels are detrimental to some aspects of ecosystem function

In contrast the evidence collected in Part 3 suggested that the contribution of LCM2007 was more restricted. Our investigation suggested that there were a number of potential uses where an area-wide perspective is needed, such as landscape and sustainable agriculture. However, the use of these data has been limited because their publication was subject to delay and they have only recently been made available. We have identified

a high level of interested in LCM2007, and in the medium term the delay should not undermine the contribution that they will make.

Across all the policy topic areas investigated it was found that CS data mainly helps people at the early stages of the policy cycle. It provides contextual information that helps them frame issues and understand the context in which policy measures must be planned. Given the range of information that it provides it also helps them to look at the way issues are linked across sectors.

The uptake of CS by policy advisors is dependent on the flexibility of the underlying database and the ways the results can be tailored to meet user needs. The evidence we have collected suggests that the reporting outputs were generally regarded as appropriate and useful, but that further work may be needed to ensure better access to the raw data in customisable ways. **It was also noted that exploitation of the evidence base also depends fundamentally on the investments made by the core organisations in the further analysis of these data, and that this might also limit their contribution to policy**. In the future the balance between the resources devoted to general purpose outputs and analyses relevant to specific policy questions might be considered; greater emphasis on the latter may help uses more easily identify the policy contributions of CS.

The observations on patterns of current use are important, because they suggest that as we look to the future technical options for CS, we may need to focus more on the ways the results are better tailored or customised to meet user needs as well as the ways new types of data are collected. This may, for example, involve looking at how definitions and methods of data collection can be standardised; or it may also involve better synchronisation of monitoring efforts across different programmes. Such developments will depend on establishing effective partnerships with other key data providers. **We recommend that actions to foster such partnerships are considered actively by the Core Funders of CS.**

7.2 Cost-effectiveness

The analysis of the costs of the different components of CS2007 suggests that just over half of expenditure can be attributed directly to scientific and policy-relevant outputs; that is the substantive analytical work packages and through their share of effort in other work packages such as reporting and informatics. This we suggest represents good overall value for money in relative terms. In relation to absolute costs it remains the case that the resources needed to for CS are substantial and are likely to remain so given the sample size that is needed. The fact that for the foreseeable future many of the observations can only be made by surveyors in the field, and that the fixed costs of associated with the surveyor visits are will remain substantial given the time input and travel costs involved.

The investment made in informatics both before and during CS2007 was found to be particularly effective. It speeded up the processing of the data and the publication of the

results from the Field Survey. It has also allowed better use of the data from all the pervious Countryside Surveys. The rapid reporting from the Field Survey was also assisted by the innovation of digital recording devices (tablet computers), which also proved to be a valuable innovation.

As part of this analysis we also looked at the effectiveness of the investment in communications, and found it generally to have been beneficial. Although the size of the budget for this component was relatively small, uptake of CS2007 data seems to be significantly better than for CS2000 at an equivalent stage. Nevertheless it is also apparent that more could be done. **We recommend that in any future survey a more effective communications strategy might be built by adopting a more explicit problem solving or issue focus during the preparation phase. This would enable a more proactive and targeted dissemination strategy to be followed.**

7.3 Future Policy Needs

The second major aim of this study was to look at future policy needs and to identify the niche that CS might play in the future 'monitoring landscape'. Once again we collected evidence through a desk study, questionnaire survey and expert workshops. The work identified a number of common themes.

A key finding was that there is the general requirement for information of higher spatial and thematic resolution, potentially targeted on species and sites of high conservation importance. **Such a requirement clearly poses a challenge for Countryside Survey which, by its very nature is sample based and general in character; CS was not set up originally to provide these kinds of data**. The requirement for data of high thematic and spatial resolution is particularly evident in the area of agri-environment monitoring, where more stringent auditing and surveillance regimes are likely to emerge in the future. Similar high resolution data is needed to support work on ecosystem services and biodiversity monitoring more generally. For habitats and species of conservation importance (e.g. Priority Habitats and Species, Protected sites etc.) detailed information on their distribution and condition will be needed for reporting purposes in relation to 2020 targets, and for assessing the impact of policy interventions designed to sustain ecological function and the integrity of our natural capital. The success of measures to create coherent and resilient ecological networks, and to sustain the output of ecosystem services, will also be a concern for future monitoring.

Nevertheless, the need for strategic information on the state and trends in the wider countryside has not been eliminated. In fact, the requirement for more robust monitoring systems suggests that better and more effective integration of specific and general forms of data collection are required. **Our findings suggest that it may be fundamental for embedding an ecosystems approach in future decision making.**

The need to build partnerships with other data providers to enhance the value of CS field data was reinforced by our analysis of future policy needs. **We recommend that the immediate focus of discussions should involve an examination of:**

1. **An examination of the opportunities that exist to collect woodland data through the CS Field Survey and NFI in complementary and cost-effective ways**; this could begin by an examination of current data holdings and the institutional and scientific barriers that might prevent any opportunities for closer working to be achieved
2. **How CS field protocols can be adapted to enable these data to be used as baseline and/or contextual information against which the effectiveness of agri-environmental measures can be judged.**
3. **A critical evaluation of the added value that the monitoring of headwater streams in CS squares provides, given the monitoring programmes of the Environment Agency, Natural Resources Wales and SEPA.** This exercise may increase the visibility of the dataset outside CEH and identify the role it might play in the wider assessment of ecosystem services, given the results of the Integrated Assessment.

7.4 Designing a Future CS, the Next Steps

Given our findings on the current and potential contribution of CS, there is a good case for investing in the next Survey to meet priority policy needs linked to monitoring at country level the Rural Development Plans and Programmes, and respective biodiversity strategies. **To help plan for such an undertaking we have considered some of the main design options and recommend**:

a) **Treating the Field Survey and land cover mapping components of CS as essentially separate elements.** This would facilitate more effective technical partnerships and may assist with justification of the overall funding case.

- For LCM these technical partnerships would enable the development of a national land information system in which LCM type outputs could be embedded. A key challenge would be to provide information that could support the reporting of detailed habitat stock and change at the level of the EUNIS-3 Classification.
- For the Field Survey the partnerships would add value to the data by enabling integration of different sources through standardisation of measurements and collaborative survey effort. This might enable CS data to be used more effectively as a baseline against which the effectiveness of agri-environmental measures could be judged. Further work on the design of CS sampling protocols and analysis tools might also enable the field data to support

monitoring of Aichi targets related to ecosystem services, and ecological integrity.

b) **To meet future policy needs linked to the country-level Rural Development programmes and biodiversity strategies, it would be advantageous confirm a reporting date of 2017/8 for the next Field Survey results.** The same time-line would be relevant to the development of a national land cover database, but the there are no strong argument to synchronise such work with the Field Survey initiative. However, confirmation of this time-line would enable a timely planning process to be initiated.

c) **For the Field Survey element of CS we suggest that there is a *prima facia* case for adopting a rolling survey approach.** There appear to be no major technical or statistical arguments against a rolling survey, we suggest that in terms of managing the future programme and securing its funding, this probably represents the best technical option for the next survey. The transition to a rolling programme would, however, require further analysis and planning. **We recommend that a detailed technical study is undertaken in 2013 to determine the costs of a rolling programme and the detailed design options**. Given the reporting timetable outlined above, and the effort needed to put in place the team needed for a rolling programme, that the first survey sweep would have to be done over a period of four years, rather than the 5 or 6 years suggested in the preliminary analysis, which described the situation once the programme was in place.

d) **In designing any future approach to the CS Field Survey we found that there was a strong case for retaining the capability for country-level reporting, but also for ensuring that UK outputs can be produced by maintaining consistency of survey methods used in Northern Ireland.** Thus the planning that is undertaken in 2013 must include consideration of the situation in Northern Ireland, and the options for maintaining consistency of methods and timing between the two Countryside Surveys.

Appendix 1: Description of relevant policy areas for CS2007 as provided in the tender brief

The following policy applications for CS2007 were envisaged:

Biodiversity

Countryside Survey will provide underpinning evidence on extent, condition and change of terrestrial Broad Habitats and some widespread Priority Habitats at UK and country level, allowing assessment of status and trends and identification of major threats and the cumulative outcomes of policy interventions. Specifically results will contribute to assessment of achievement of the 2010 biodiversity target through updating of indicators on plant diversity, extent of habitat features and habitat fragmentation at UK and country levels. Results for Priority Habitats will contribute to assessment of Favourable Conservation Status under EU Habitats Directive. Land Cover Map will support delivery of Local Biodiversity Action Plans, targeting of habitat restoration/creation and integration of biodiversity into regional programmes and strategies. Data will be used to describe and assess ecological networks and landscape permeability relevant to Article 10 of the EU Habitats Directive. Some data will be available to quantify the impact/spread of some widely occurring invasive non-native species.

Natural Environment

Countryside Survey will contribute to the quantification and improved understanding of the dynamics and spatial distribution of ecosystem services[95] at national and regional scales, supporting development of ecosystems approaches to natural environment policy and frameworks for considering ecosystem services in the broad range of decisions that impact on the natural environment. Trends in the consumption and degradation of environmental assets will be assessed by comparison with previous surveys, including analysis of the cumulative impacts of different pressures and their interactions. Multi-functionality and trade-offs between ecosystem services will be investigated, including the relationship between biodiversity and ecosystem services. The methodology of land cover and habitat accounts previously developed and applied within Countryside Survey, will be extended where possible to other environmental assets. Major pressures on ecosystem services will be identified. Data, including national land cover/land use map, will be available for application in future policy modelling and scenario work and, in combination with other data, mapping of ecosystem services.

Sustainable Agriculture and Environmental Stewardship

Countryside Survey will provide national estimates of environmental change in the farmed countryside, ranging from changes in extent and distribution of major crop types,

[95] Relevant services include: carbon sequestration, soil nutrient cycling, maintaining water quality, landscape character, recreation etc.

conversion between agricultural uses, extent and condition of farmland habitats (e.g. hedgerows, uncultivated semi-natural land, small woods and set-aside), and landscape features (e.g. dry stone walls, veteran trees) to condition of aquatic habitats (headwater streams and ponds) and soils. With reference to the time series extending over 30 years, and by cross-comparison with other administrative and agricultural data, the influence of agri-environment schemes and changes in agricultural policy will be established. The survey will be the main tool for assessing progress towards the BAP target for hedgerows. Data will be available to help explain changes in farmland bird populations and inform related policy interventions. Land cover data will contribute to assessments of landscape character and targeting of agri-environment schemes. Specifically in England, Countryside Survey will contribute to the assessment of effectiveness of Environmental Stewardship and indicators used by the Agriculture Change and Environment Observatory. Countryside Survey will also contribute to evaluation of effectiveness to the Environmental Impact and Hedgerow Regulations and quantification of spread and impact of pernicious weeds (e.g. Ragwort). There are similar applications in Scotland and Wales.

Water Resources

Countryside Survey will provide contextual and baseline information to inform development of plans for meeting the requirements of the EU Water Framework Directive. The Countryside Survey freshwater sampling strategy will focus on headwater streams and ponds and will therefore be complementary to the WFD surveillance monitoring network of larger water courses and water bodies. Methods used will be fully compatible with those of the environment protection agencies. Countryside Survey will investigate factors contributing to long term trends in biological water quality, biodiversity and habitat structure of headwater streams and ponds, including land use of upstream catchments and diffuse pollution, at national and regional scales. Land cover map data will be useful as an input to water resource and flood models, where local-scale land cover and vegetation data may be important.

Soil Protection

Countryside Survey will quantify and investigate long term change in physical, chemical and biological soil quality at national and regional scales and identify the major drivers of change. [Countryside Survey will therefore contribute to country-level programmes of the commitment to establish a national programme for soil quality monitoring and evaluation contained in the Soil Strategy]. Specifically, data collection and analysis will quantify trends in acidification and eutrophication of soils, deposition of heavy metals, soil carbon and soil biodiversity. The soils data is also fundamental to understanding of ecosystem process under policy areas of natural environment, biodiversity, water resources and air quality.

Sustainable Forestry

Countryside Survey is designed to be complementary to the second National Inventory of Woodlands and Trees (NIWT2), in particular Countryside Survey provides additional

information on trends in plant diversity within woodlands, habitat conversion to and from woodland and soil quality within woodlands. Countryside Survey also provides an important source of relevant information on trees outside of woodlands. Production of Land Cover Map will be compatible integrated with NIWT2 and will provide information on ecological networks relevant to development and implementation of woodland policy targeting of woodland grant schemes. in each administration.

Urban Development

The design of Countryside Survey is not optimised for assessment of built-up areas or impacts of urbanisation, however, Countryside Survey will provide national estimates of habitat types lost to urban development. Land Cover Map will map urban land cover and identify green space within urban areas, and provide limited discrimination of urban soil sealing. (i.e. continuous/discontinuous urban cover)

Air Quality

Countryside Survey will provide assessments of impacts of air pollution (acid and nitrogen deposition, and heavy metals) on condition/quality of terrestrial habitats, soils and headwater streams and an evaluation of long term change. Data will be used subsequently in other work to further develop modelling of ecosystem responses to air pollution, contributing to UK commitments to deliver model outputs on target loads for acidity and nutrient nitrogen.

Climate Change

Countryside Survey is the main source of information for the land cover/land use change component of the National Inventory of Greenhouse Gases. Countryside Survey provides national estimates of land cover change from which carbon emissions are currently calculated. Analyses of land cover change, vegetation and soil carbon within Countryside Survey, alongside information from other sources, will provide an improved basis for estimating emissions, and attributing these to policy interventions. Countryside Survey will also provide information relevant to long term impacts of climate change and adaptation/mitigation strategies affecting land use, biodiversity, water resources and soils. The Survey will also be useful framework for scaling up results of more local, detailed studies (for example ECN) to national levels. Land cover map will provide underpinning data for development of adaptation and mitigation strategies and modelling studies. Linkages to other data will be important in this respect.

Unexpected Changes

From previous experience Countryside Survey has a known value in picking up unexpected changes in the countryside that are of policy or scientific relevance. By definition these cannot be anticipated but could be a major significance.

Appendix 2: Workshops – agenda and participants

Appendix 2a: Workshop 1 – Cross-Comparison and Horizon Scanning

Project	Policy Impact and Future Options for Countryside Survey (WC1030)	
Meeting	Cross-Comparison and Horizon Scanning Workshop	22.05.2012
Subject	Agenda and Participants	10.30-16.15
Venue	London, Mary Sumner House in 24 Tufton Street, SW1P 3RB – Mary Sumner Room http://muenterprises.org/conference/	
Attendance	Availability see appendix 1	

Purpose of the meeting is to:

1. review the hypotheses used to test the policy contribution of CS2007 using the questionnaire results; and,
2. review and advise on the emerging and future policy landscape against which any future CS would need to be set .

10.30-11.00	***Arrival and Coffee***
11.00-11.30	Analytical approach and review of initial questionnaire results
11.30-12.15	Review of hypotheses by policy topic
12.15-13.00	Synthesis of findings on current policy contributions
13.00-13.30	***Lunch***
13.30-14.00	Initial results on future policy requirements
14.15-15.00	Review of future policy landscapes by policy topic
15.00-15.45	Synthesis of future policy needs
15.45-16.00	Wrap-up and close

Workshop 1: 22.04.2012 **Participants**:

Policy Area	**Confirmed Participants**	
	Isabel Alonso	
Biodiversity	Chris Cheffings Lisa Norton Ed Mackay Keith Porter James Skates Lawrence Way	
Natural Environment (Ecosystem Services)	Hillary Miller	
Sustainable Agriculture and ES	James Skates Geoff Radley	
Water Resources		
Soil Protection	Judith Stuart James Skates Patricia Bruneau	
Sustainable Forest	Hillary Miller	
Urban Development		
Air Quality	Peter Coleman	
Climate Change	James Skates	
Landscape		
Unexpected Change	Gary Kass	
Project Team	Roy Haines-Young Marion Potschin Robert Deane Jonathan Porter	

Appendix 2b: Workshop 2 – Monitoring Needs and Options for the Future

Project	Policy Impact and Future Options for Countryside Survey (WC1030)	
Meeting	**Monitoring Needs and Options for the Future**	12.07.2012
Subject	Agenda and Participants	10.00-16.00
Venue	Charles Darwin House, 12 Roger Street, London WC1N 2JU www.charlesdarwinhouse.co.uk	
Attendance	See attached	

The aims of the workshop are to:

1. To identify the monitoring needed to support policy in the near to mid-term, across the policy topic areas potentially covered by Countryside Survey (CS).
2. To identify the options we have for meeting these future monitoring needs (both technical and institutional).
3. To identify the contribution that a future CS might play in meeting future needs, given the types of output required and when they are required.

The workshop has been designed to build on the interim conclusions of the desk study and outputs of the first workshop, and develop a better understanding of the implications of future policy needs for monitoring. The participants will include policy customers, people familiar with CS, and experts who can comment on the developments of monitoring systems and technologies more generally. As a result, the meeting will be able to identify the main monitoring options that might meet future monitoring needs and the contribution that CS might make either in its present or modified form.

The morning session will allow mixed groups to consider and establish a shared understanding of future monitoring requirements. The afternoon session will then explore more fully the technical options, however, during this stage we will exploit the mixed of expertise in the group by splitting those with a more technical understanding of CS and other monitoring technologies from the policy customers. This will allow a picture of the options for CS to be juxtaposed with the other monitoring initiatives that the organisations represented by the policy customers are considering.

Programme

10.00-10.30	***Coffee and registration***	
10.30-11.15	Introduction and aims of the day (Plenary)	A short introduction to the project, and the context for the workshop. It will set out the aims of the day and invite questions on purpose of meeting etc. *Roy Haines-Young*
11.15-12.00	Scoping future policy needs (Discussion Groups)	In discussion groups consider, refine and prioritise the ideas on future policy needs derived from the previous workshop
12.00-12.30	Prioritising future monitoring needs (Plenary)	Agreeing future monitoring needs and clarifying the kinds of evidence needed over what time periods.
12.30-13.15	***Lunch***	
13.15-13.45	Monitoring options and issues (Plenary)	*Roy Haines-Young*
13.45-14.45	Fulfilling future monitoring needs (Two discussion streams)	<u>Group 1:</u> Identifying the options across all potential monitoring initiatives <u>Group 2:</u> Exploring the potential of CS in relation to needs and technical options
14.45	***Tea***	
14.45-15.45	Understanding needs and the potential niche of CS (Plenary)	Plenary discussion on core question: What monitoring options are available to fulfil future policy needs?
15.45-1600	Wrap up & Close	

Participants list

	Group	Name	Email
1	CEH	Lisa Norton	lrn@ceh.ac.uk
2		Simon Smart	ssma@ceh.ac.uk
3		Lindsay Maskell	lcma@ceh.ac.uk
4		Ed Rowe	ecro@ceh.ac.uk
5		David B. Roy	dbr@ceh.ac.uk
6	Technical experts	Steve Keyworth	Steve.keyworth@envsys.co.uk
7		Crispin Hambridge	crispin.hambidge@environment-agency.gov.uk
8		Liz Tucker - Defra	liz.tucker@defra.gsi.gov.uk
9		Richard Alexander	Richard.Alexander@naturalengland.org.uk
10		Andrew Crowe	Andrew.Crowe@fera.gsi.gov.uk
11	Policy	Dan Osborne	dano@Nerc.ac.uk (LWEC)
12		Lorraine Gormley	Lorraine.Gormley@scotland.gsi.gov.uk
13		Andrew Baker	Andrew.Baker@naturalengland.org.uk
14		James Skates	James.Skates@wales.gsi.gov.uk
15		Ian Dunbar	Environment Agency
16		Sal Burgess	sal.burgess@DEFRA.GSI.GOV.UK
17		Ben Ditchburn	Ben.Ditchburn@forestry.gsi.gov.uk
18		Helen Pontier	Helen.PontierMCIWEM@defra.gsi.gov.uk
	Project Officer	Lawrence Way	Lawrence.Way@jncc.gov.uk
	Project Team	Roy Haines-Young	Roy.Haines-Young@Nottingham.ac.uk
		Robert Deane	Robert.Deane@landuse.co.uk
		Paul Mahony	paul@countryscape.org

Appendix 3: Questionnaire Design

Questionnaire for Biodiversity topic

Use this page to record whether you have used Countryside Survey 2007 results and other sources of evidence for applications related to Biodiversity.

Have you used Countryside Survey 2007?: *

- ☐ Yes
- ☐ No

Answering 'yes' above allows you to comment on the outputs of Countryside Survey 2007 including reports, data and Land Cover Map 2007.

Have you used other datasets?: *

- ☐ Yes
- ☐ No

Answering 'yes' above allows you to comment on other data sources relevant to Biodiversity. This may include the outputs of previous phases of Countryside Survey and Land Cover Map.

Questions for respondents who have used CS2007

This section of the questionnaire allows you to record information about Countryside Survey 2007 in relation to your work on Biodiversity.

Question Y1

What are the main priorities that you have worked on in the last 4 years in relation to Biodiversity?

Question Y2

For which of the following specific topics did you use Countryside Survey, and how critical do you feel it was in supporting these evidence needs?

We recognise that Land Cover Map 2007 was released relatively recently and your use of it may have been limited. However, we ask you to confine your answers below about Land Cover Map to this data source. There are opportunities later to comment on previous Countryside Survey outputs.

Distribution and condition of Priority Habitats
CS2007 Field Survey:

- ☐ Very important
- ☐ Quite important
- ☐ Minor importance
- ☐ Not important
- ☐ No comment

Please enter comments below:

Land Cover Map2007: *

- ☐ Very important
- ☐ Quite important
- ☐ Minor importance
- ☐ Not important
- ☐ No comment

Please enter comments below:

same categories for:
Distribution and condition of Priority Habitats

Distribution and condition of Broad Habitats

Ecological networks and landscape permeability

Species monitoring including spread of invasive non-native species

Please describe any other specific topics for which Countryside Survey 2007 provided evidence that was critical or important for Biodiversity:

Please consider the Field Survey or Land Cover Map outputs of Countryside Survey 2007.

Question Y3

Which outputs of Countryside Survey have you used as evidence for Biodiversity?

Reports:

- ☐ UK-level reporting
- ☐ Country-level reporting
- ☐ Headwater Streams Report
- ☐ Ponds Report
- ☐ Soils Report
- ☐ Integrated Assessment Report
- ☐ Quality Assurance, Technical manuals and field handbooks
- ☐ Commissioned Reports
- ☐ Peer reviewed literature

Please comment further on reports, if necessary:

Datasets:

- ☐ Freshwater Pond
- ☐ Freshwater Stream
- ☐ Landscape Area Feature (e.g. habitat patches)
- ☐ Landscape Linear Feature (e.g. hedgerows and ditches)
- ☐ Landscape Point Features (e.g. hedgerow trees)
- ☐ Vegetation plots
- ☐ Soil
- ☐ Land Cover Map 2007
- ☐ Land Cover Map 2000 as an alternative to Land Cover Map 2007

Please comment further on datasets, if necessary:

Question Y4

Why did you use Countryside Survey 2007 outputs as evidence for Biodiversity?

CS2007 Field Survey:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source

Please explain reasons for your choices:

Land Cover Map2007:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source

Please explain reasons for your choices:

Question Y5

Overall how well did outputs from CS2007 meet your evidence needs for Biodiversity?

CS2007 Field Survey: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain reasons:

Land Cover Map2007: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain reasons:

Question Y6

Please provide examples of how you have used Countryside Survey 2007 data for Biodiversity, for example by providing links to reports, indicators or headline messages that have used the data.

Question Y7

What other data sources could you have used as an alternative to Countryside Survey 2007 but decided not to?

Please list data sources and reasons for not using them:

Question Y8

Which, if any, of the following do you consider to be drawbacks or weaknesses of Countryside Survey 2007 for Biodiversity?

CS2007 Field Survey:

- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ The coverage was not appropriate
- ☐ The way the definitions of the features and other elements included in the survey did not correspond to reporting or analysis needs
- ☐ I did not fully understand the data
- ☐ I was not confident in the underpinning science

Please explain reasons:

Land Cover Map2007:

- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ The coverage was not appropriate
- ☐ The way the definitions of the features and other elements included in the survey did not correspond to reporting or analysis needs
- ☐ I did not fully understand the data
- ☐ I was not confident in the underpinning science

Please explain reasons:

Questions for respondents who have used other data sources

This section of the questionnaire allows you to record information about other data sources used either alongside or as an alternative to Countryside Survey 2007 in relation to your work on Biodiversity.

Question O1

Please list the other major data or evidence sources you have used in this topic area over the last 4 years.

This answer may include the outputs of previous phases of Countryside Survey and Land Cover Map.
Distribution and condition of Priority Habitats:

Distribution and condition of Broad Habitats:

Ecological networks and landscape permeability:

Species monitoring including spread of invasive non-native species:

Other:

Question O2

Why did you use data or evidence sources other than CS2007?

Please choose from:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source
- ☐ Other

Please explain the reason for your choice:

Question O3

How well did these other data or evidence sources meet your evidence needs for Biodiversity?

Please choose from: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain the reason for your choice:

Question for respondents who have not used CS2007

If you have not used Countryside Survey 2007 results for your work related to Biodiversity, please complete this section.

Question N1

What are the main priorities that you have worked on in the last 4 years in relation to Biodiversity?

Question N2

Why did you not use Countryside Survey results?

Please choose from:

- ☐ It was not available to me
- ☐ I was not aware of it
- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ I did not understand the data
- ☐ I was not confident in the science
- ☐ Not relevant to my work
- ☐ Other data or evidence sources were more appropriate
- ☐ Other

Other reasons:

Please explain the reason for your choice:

Questions for all respondents about future policy needs in the topic

Please complete this section to describe your future evidence needs over the next 5 years in relation to Biodiversity.

Question F1

What are likely to be your key evidence needs in this topic area over the next 5 years? If appropriate please identify what is shaping these needs (e.g. name a particular management issue, policy or regulatory framework, or organisational responsibility).

Distribution and condition of Priority Habitats:

Distribution and condition of Broad Habitats:

Ecological networks and landscape permeability:

Species monitoring including spread of invasive non-native species:

Other: (such as climate envelope modeling, access to nature or green infrastructure planning)

Question F2

Please provide references or links to any reports or reviews of future evidence needs for Biodiversity.

Question F3

Do you anticipate that a repeat of Countryside Survey in its current form will meet these evidence needs?

Please choose from: *

- ☐ Yes completely
- ☐ Yes partially
- ☐ No
- ☐ No comment

Please explain reasons:

Question F4

What survey or sampling data would your organisation be likely to invest in to meet the identified evidence needs over the next 5 years?

Note: This could be Countryside Survey or other sources.

Questionnaire for Ecosystem Services topic

Use this page to record whether you have used Countryside Survey 2007 results and other sources of evidence for applications related to Ecosystem Services.

Have you used Countryside Survey 2007?: *

- ☐ Yes
- ☐ No

Answering 'yes' above allows you to comment on the outputs of Countryside Survey 2007 including reports, data and Land Cover Map 2007.

Have you used other datasets?: *

- ☐ Yes
- ☐ No

Answering 'yes' above allows you to comment on other data sources relevant to Ecosystem Services. This may include the outputs of previous phases of Countryside Survey and Land Cover Map.

Questions for respondents who have used CS2007

This section of the questionnaire allows you to record information about Countryside Survey 2007 in relation to your work on Ecosystem Services.

Question Y1

What are the main priorities that you have worked on in the last 4 years in relation to Ecosystem Services?

Question Y2

For which of the following specific topics did you use Countryside Survey, and how critical do you feel it was in supporting these evidence needs?

We recognise that Land Cover Map 2007 was released relatively recently and your use of it may have been limited. However, we ask you to confine your answers below about Land Cover Map to this data source. There are opportunities later to comment on previous Countryside Survey outputs.

The dynamics and spatial distribution of ecosystem services at national and regional scales

CS2007 Field Survey: *

- ☐ Very important
- ☐ Quite important
- ☐ Minor importance
- ☐ Not important
- ☐ No comment

Please enter comments below:

Land Cover Map2007: *

- ☐ Very important
- ☐ Quite important
- ☐ Minor importance
- ☐ Not important
- ☐ No comment

Please enter comments below:

Please describe any other specific topics for which Countryside Survey 2007 provided evidence that was critical or important for Ecosystem Services:

Please consider the Field Survey or Land Cover Map outputs of Countryside Survey 2007.

Question Y3

Which outputs of Countryside Survey have you used as evidence for Ecosystem Services?

Reports:

- ☐ UK-level reporting
- ☐ Country-level reporting
- ☐ Headwater Streams Report
- ☐ Ponds Report
- ☐ Soils Report
- ☐ Integrated Assessment Report
- ☐ Quality Assurance, Technical manuals and field handbooks
- ☐ Commissioned Reports
- ☐ Peer reviewed literature

Please comment further on reports, if necessary:

Datasets:

- ☐ Freshwater Pond
- ☐ Freshwater Stream
- ☐ Landscape Area Feature (e.g. habitat patches)
- ☐ Landscape Linear Feature (e.g. hedgerows and ditches)
- ☐ Landscape Point Features (e.g. hedgerow trees)
- ☐ Vegetation plots
- ☐ Soil
- ☐ Land Cover Map 2007
- ☐ Land Cover Map 2000 as an alternative to Land Cover Map 2007

Please comment further on datasets, if necessary:

Question Y4

Why did you use Countryside Survey 2007 outputs as evidence for Ecosystem Services?

CS2007 Field Survey:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source

Please explain reasons for your choices:

Land Cover Map2007:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source

Please explain reasons for your choices:

Question Y5

Overall how well did outputs from CS2007 meet your evidence needs for Ecosystem Services?

CS2007 Field Survey: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain reasons:

Land Cover Map2007: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain reasons:

Question Y6

Please provide examples of how you have used Countryside Survey 2007 data for Ecosystem Services, for example by providing links to reports, indicators or headline messages that have used the data.

Question Y7

What other data sources could you have used as an alternative to Countryside Survey 2007 but decided not to?

Please list data sources and reasons for not using them:

Question Y8

Which, if any, of the following do you consider to be drawbacks or weaknesses of Countryside Survey 2007 for Ecosystem Services?

CS2007 Field Survey:

- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ The coverage was not appropriate
- ☐ The way the definitions of the features and other elements included in the survey did not correspond to reporting or analysis needs
- ☐ I did not fully understand the data
- ☐ I was not confident in the underpinning science

Please explain reasons:

Land Cover Map2007:

- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ The coverage was not appropriate
- ☐ The way the definitions of the features and other elements included in the survey did not correspond to reporting or analysis needs
- ☐ I did not fully understand the data
- ☐ I was not confident in the underpinning science

Please explain reasons:

Questions for respondents who have used other data sources

This section of the questionnaire allows you to record information about other data sources used either alongside or as an alternative to Countryside Survey 2007 in relation to your work on Ecosystem Services.

Question O1

Please list the other major data or evidence sources you have used in this topic area over the last 4 years.

This answer may include the outputs of previous phases of Countryside Survey and Land Cover Map.
The dynamics and spatial distribution of ecosystem services at national and regional scales:

Other:

Question O2

Why did you use data or evidence sources other than CS2007?

Please choose from:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source
- ☐ Other

Please explain the reason for your choice:

Question O3

How well did these other data or evidence sources meet your evidence needs for Ecosystem Services?

Please choose from: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain the reason for your choice:

Question for respondents who have not used CS2007

If you have not used Countryside Survey 2007 results for your work related to Ecosystem Services, please complete this section.

Question N1

What are the main priorities that you have worked on in the last 4 years in relation to Ecosystem Services?

Question N2

Why did you not use Countryside Survey results?

Please choose from:

- ☐ It was not available to me
- ☐ I was not aware of it
- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ I did not understand the data
- ☐ I was not confident in the science
- ☐ Not relevant to my work
- ☐ Other data or evidence sources were more appropriate
- ☐ Other

Other reasons:

Please explain the reason for your choice:

Questions for all respondents about future policy needs in the topic

Question F1

What are likely to be your key evidence needs in this topic area over the next 5 years? If appropriate please identify what is shaping these needs (e.g. name a particular management issue, policy or regulatory framework, or organisational responsibility).

The dynamics and spatial distribution of ecosystem services at national and regional scales:

Other:

(such as valuation of ecosystem services or Payment for Ecosystem Services models)

Question F2

Please provide references or links to any reports or reviews of future evidence needs for Ecosystem Services.

Question F3

Do you anticipate that a repeat of Countryside Survey in its current form will meet these evidence needs?

Please choose from: *

- ☐ Yes completely
- ☐ Yes partially
- ☐ No
- ☐ No comment

Please explain reasons:

Question F4

What survey or sampling data would your organisation be likely to invest in to meet the identified evidence needs over the next 5 years?

Note: This could be Countryside Survey or other sources.

Questionnaire for Landscape topic

Use this page to record whether you have used Countryside Survey 2007 results and other sources of evidence for applications related to Landscape.

Have you used Countryside Survey 2007?: *

- ☐ Yes
- ☐ No

Answering 'yes' above allows you to comment on the outputs of Countryside Survey 2007 including reports, data and Land Cover Map 2007.

Have you used other datasets?: *

- ☐ Yes
- ☐ No

Answering 'yes' above allows you to comment on other data sources relevant to Ecosystem Services. This may include the outputs of previous phases of Countryside Survey and Land Cover Map.

Questions for respondents who have used CS2007

This section of the questionnaire allows you to record information about Countryside Survey 2007 in relation to your work on Landscape.

Question Y1

What are the main priorities that you have worked on in the last 4 years in relation to Landscape?

Question Y2

For which of the following specific topics did you use Countryside Survey, and how critical do you feel it was in supporting these evidence needs?

We recognise that Land Cover Map 2007 was released relatively recently and your use of it may have been limited. However, we ask you to confine your answers below about Land Cover Map to this data source. There are opportunities later to comment on previous Countryside Survey outputs.

Landscape character, condition, and management objectives
CS2007 Field Survey: *

- ☐ Very important
- ☐ Quite important
- ☐ Minor importance
- ☐ Not important
- ☐ No comment

Please enter comments below:

Land Cover Map2007: *

- ☐ Very important
- ☐ Quite important
- ☐ Minor importance
- ☐ Not important
- ☐ No comment

Please enter comments below:

Please describe any other specific topics for which Countryside Survey 2007 provided evidence that was critical or important for Landscape:

Please consider the Field Survey or Land Cover Map outputs of Countryside Survey 2007.

Question Y3

Which outputs of Countryside Survey have you used as evidence for Landscape?

Reports:

- ☐ UK-level reporting
- ☐ Country-level reporting
- ☐ Headwater Streams Report
- ☐ Ponds Report
- ☐ Soils Report
- ☐ Integrated Assessment Report
- ☐ Quality Assurance, Technical manuals and field handbooks
- ☐ Commissioned Reports
- ☐ Peer reviewed literature

Please comment further on reports, if necessary:

Datasets:

- ☐ Freshwater Pond
- ☐ Freshwater Stream
- ☐ Landscape Area Feature (e.g. habitat patches)
- ☐ Landscape Linear Feature (e.g. hedgerows and ditches)
- ☐ Landscape Point Features (e.g. hedgerow trees)
- ☐ Vegetation plots
- ☐ Soil
- ☐ Land Cover Map 2007
- ☐ Land Cover Map 2000 as an alternative to Land Cover Map 2007

Please comment further on datasets, if necessary:

Question Y4

Why did you use Countryside Survey 2007 outputs as evidence for Landscape?

CS2007 Field Survey:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source

Please explain reasons for your choices:

Land Cover Map2007:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source

Please explain reasons for your choices:

Question Y5

Overall how well did outputs from CS2007 meet your evidence needs for Landscape?

CS2007 Field Survey: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain reasons:

Land Cover Map2007: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain reasons:

Question Y6

Please provide examples of how you have used Countryside Survey 2007 data for Landscape, for example by providing links to reports, indicators or headline messages that have used the data.

Question Y7

What other data sources could you have used as an alternative to Countryside Survey 2007 but decided not to?

Please list data sources and reasons for not using them:

Question Y8

Which, if any, of the following do you consider to be drawbacks or weaknesses of Countryside Survey 2007 for Landscape?

CS2007 Field Survey:

- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ The coverage was not appropriate
- ☐ The way the definitions of the features and other elements included in the survey did not correspond to reporting or analysis needs
- ☐ I did not fully understand the data
- ☐ I was not confident in the underpinning science

Please explain reasons:

Land Cover Map2007:

- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ The coverage was not appropriate
- ☐ The way the definitions of the features and other elements included in the survey did not correspond to reporting or analysis needs
- ☐ I did not fully understand the data
- ☐ I was not confident in the underpinning science

Please explain reasons:

Questions for respondents who have used other data sources

This section of the questionnaire allows you to record information about other data sources used either alongside or as an alternative to Countryside Survey 2007 in relation to your work on Landscape.

Question O1

Please list the other major data or evidence sources you have used in this topic area over the last 4 years.

This answer may include the outputs of previous phases of Countryside Survey and Land Cover Map. Landscape character, condition, and management objectives:

Other:

Question O2

Why did you use data or evidence sources other than CS2007?

Please choose from:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source
- ☐ Other

Please explain the reason for your choice:

Question O3

How well did these other data or evidence sources meet your evidence needs for Landscape?

Please choose from: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain the reason for your choice:

Question for respondents who have not used CS2007

If you have not used Countryside Survey 2007 results for your work related to Landscape, please complete this section.

Question N1

What are the main priorities that you have worked on in the last 4 years in relation to Landscape?

Question N2

Why did you not use Countryside Survey results?

Please choose from:

- ☐ It was not available to me
- ☐ I was not aware of it
- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ I did not understand the data
- ☐ I was not confident in the science
- ☐ Not relevant to my work
- ☐ Other data or evidence sources were more appropriate
- ☐ Other

Other reasons:

Please explain the reason for your choice:

Questions for all respondents about future policy needs in the topic

Please complete this section to describe your future evidence needs over the next 5 years in relation to Landscape

Question F1

What are likely to be your key evidence needs in this topic area over the next 5 years? If appropriate please identify what is shaping these needs (e.g. name a particular management issue, policy or regulatory framework, or organisational responsibility).

Landscape character, condition, and management objectives:

Other:

(such as landscape planning)

Question F2

Please provide references or links to any reports or reviews of future evidence needs for Landscape.

Question F3

Do you anticipate that a repeat of Countryside Survey in its current form will meet these evidence needs?

Please choose from: *

- ☐ Yes completely
- ☐ Yes partially
- ☐ No
- ☐ No comment

Please explain reasons:

Question F4

What survey or sampling data would your organisation be likely to invest in to meet the identified evidence needs over the next 5 years?

Note: This could be Countryside Survey or other sources.

Questionnaire for Sustainable Agriculture and Environmental Stewardship topic

Use this page to record whether you have used Countryside Survey 2007 results and other sources of evidence for applications related to Sustainable Agriculture and Environmental Stewardship.

Have you used Countryside Survey 2007?: *

☐ Yes

☐ No

Answering 'yes' above allows you to comment on the outputs of Countryside Survey 2007 including reports, data and Land Cover Map 2007.

Have you used other datasets?: *

☐ Yes

☐ No

Answering 'yes' above allows you to comment on other data sources relevant to Sustainable Agriculture and Environmental Stewardship. This may include the outputs of previous phases of Countryside Survey and Land Cover Map.

Questions for respondents who have used CS2007

This section of the questionnaire allows you to record information about Countryside Survey 2007 in relation to your work on Sustainable Agriculture and Environmental Stewardship.

Question Y1

What are the main priorities that you have worked on in the last 4 years in relation to Sustainable Agriculture and Environmental Stewardship?

Question Y2

For which of the following specific topics did you use Countryside Survey, and how critical do you feel it was in supporting these evidence needs?

We recognise that Land Cover Map 2007 was released relatively recently and your use of it may have been limited. However, we ask you to confine your answers below about Land Cover Map to this data source. There are opportunities later to comment on previous Countryside Survey outputs.

Extent and condition of farmland habitats and landscape features
CS2007 Field Survey: *

- ☐ Very important
- ☐ Quite important
- ☐ Minor importance
- ☐ Not important
- ☐ No comment

Please enter comments below:

Land Cover Map2007: *

- ☐ Very important
- ☐ Quite important
- ☐ Minor importance
- ☐ Not important
- ☐ No comment

Please enter comments below:

same categories for:
National estimates of environmental change in the farmed countryside

The influence of agri-environment schemes

Please describe any other specific topics for which Countryside Survey 2007 provided evidence that was critical or important for Sustainable Agriculture and Environmental Stewardship:

Please consider the Field Survey or Land Cover Map outputs of Countryside Survey 2007.

Question Y3

Which outputs of Countryside Survey have you used as evidence for Sustainable Agriculture and Environmental Stewardship?

Reports:

- ☐ UK-level reporting
- ☐ Country-level reporting
- ☐ Headwater Streams Report
- ☐ Ponds Report
- ☐ Soils Report
- ☐ Integrated Assessment Report
- ☐ Quality Assurance, Technical manuals and field handbooks
- ☐ Commissioned Reports
- ☐ Peer reviewed literature

Please comment further on reports, if necessary:

Datasets:

- ☐ Freshwater Pond
- ☐ Freshwater Stream
- ☐ Landscape Area Feature (e.g. habitat patches)
- ☐ Landscape Linear Feature (e.g. hedgerows and ditches)
- ☐ Landscape Point Features (e.g. hedgerow trees)
- ☐ Vegetation plots
- ☐ Soil
- ☐ Land Cover Map 2007
- ☐ Land Cover Map 2000 as an alternative to Land Cover Map 2007

Please comment further on datasets, if necessary:

Question Y4

Why did you use Countryside Survey 2007 outputs as evidence for Sustainable Agriculture and Environmental Stewardship?

CS2007 Field Survey:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source

Please explain reasons for your choices:

Land Cover Map2007:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source

Please explain reasons for your choices:

Question Y5

Overall how well did outputs from CS2007 meet your evidence needs for Sustainable Agriculture and Environmental Stewardship?

CS2007 Field Survey: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain reasons:

Land Cover Map2007: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain reasons:

Question Y6

Please provide examples of how you have used Countryside Survey 2007 data for Sustainable Agriculture and Environmental Stewardship, for example by providing links to reports, indicators or headline messages that have used the data.

Question Y7

What other data sources could you have used as an alternative to Countryside Survey 2007 but decided not to?

Please list data sources and reasons for not using them:

Question Y8

Which, if any, of the following do you consider to be drawbacks or weaknesses of Countryside Survey 2007 for Sustainable Agriculture and Environmental Stewardship?

CS2007 Field Survey:

- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ The coverage was not appropriate
- ☐ The way the definitions of the features and other elements included in the survey did not correspond to reporting or analysis needs
- ☐ I did not fully understand the data
- ☐ I was not confident in the underpinning science

Please explain reasons:

Land Cover Map2007:

- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ The coverage was not appropriate
- ☐ The way the definitions of the features and other elements included in the survey did not correspond to reporting or analysis needs
- ☐ I did not fully understand the data
- ☐ I was not confident in the underpinning science

Please explain reasons:

Questions for respondents who have used other data sources

This section of the questionnaire allows you to record information about other data sources used either alongside or as an alternative to Countryside Survey 2007 in relation to your work on Sustainable Agriculture and Environmental Stewardship.

Question O1

Please list the other major data or evidence sources you have used in this topic area over the last 4 years.

This answer may include the outputs of previous phases of Countryside Survey and Land Cover Map.
Extent and condition of farmland habitats and landscape features:

National estimates of environmental change in the farmed countryside:

The influence of agri-environment schemes:

Other:

Question O2

Why did you use data or evidence sources other than CS2007?

Please choose from:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source
- ☐ Other

Please explain the reason for your choice:

Question O3

How well did these other data or evidence sources meet your evidence needs for Sustainable Agriculture and Environmental Stewardship?

Please choose from: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain the reason for your choice:

Question for respondents who have not used CS2007

If you have not used Countryside Survey 2007 results for your work related to Sustainable Agriculture and Environmental Stewardship, please complete this section.

Question N1

What are the main priorities that you have worked on in the last 4 years in relation to Sustainable Agriculture and Environmental Stewardship?

Question N2

Why did you not use Countryside Survey results?

Please choose from:

- ☐ It was not available to me
- ☐ I was not aware of it
- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ I did not understand the data
- ☐ I was not confident in the science
- ☐ Not relevant to my work
- ☐ Other data or evidence sources were more appropriate
- ☐ Other

Other reasons:

Please explain the reason for your choice:

Questions for all respondents about future policy needs in the topic

Please complete this section to describe your future evidence needs over the next 5 years in relation to Sustainable Agriculture and Environmental Stewardship

Question F1

What are likely to be your key evidence needs in this topic area over the next 5 years? If appropriate please identify what is shaping these needs (e.g. name a particular management issue, policy or regulatory framework, or organisational responsibility).

Extent and condition of farmland habitats and landscape features:

National estimates of environmental change in the farmed countryside:

The influence of agri-environment schemes:

Other:

Question F2

Please provide references or links to any reports or reviews of future evidence needs for Sustainable Agriculture and Environmental Stewardship.

Question F3

Do you anticipate that a repeat of Countryside Survey in its current form will meet these evidence needs?

Please choose from: *

- ☐ Yes completely
- ☐ Yes partially
- ☐ No
- ☐ No comment

Please explain reasons:

Question F4

What survey or sampling data would your organisation be likely to invest in to meet the identified evidence needs over the next 5 years?

Note: This could be Countryside Survey or other sources.

Questionnaire for Water Resources topic

Use this page to record whether you have used Countryside Survey 2007 results and other sources of evidence for applications related to Water Resources.

Have you used Countryside Survey 2007?: *

- ☐ Yes
- ☐ No

Answering 'yes' above allows you to comment on the outputs of Countryside Survey 2007 including reports, data and Land Cover Map 2007.

Have you used other datasets?: *

- ☐ Yes
- ☐ No

Answering 'yes' above allows you to comment on other data sources relevant to Water Resources. This may include the outputs of previous phases of Countryside Survey and Land Cover Map.

Questions for respondents who have used CS2007

This section of the questionnaire allows you to record information about Countryside Survey 2007 in relation to your work on Water Resources.

Question Y1

What are the main priorities that you have worked on in the last 4 years in relation to Water Resources?

Question Y2

For which of the following specific topics did you use Countryside Survey, and how critical do you feel it was in supporting these evidence needs?

We recognise that Land Cover Map 2007 was released relatively recently and your use of it may have been limited. However, we ask you to confine your answers below about Land Cover Map to this data source. There are opportunities later to comment on previous Countryside Survey outputs.

Contextual and baseline information on water bodies and aquatic habitats

CS2007 Field Survey: *

- ☐ Very important
- ☐ Quite important
- ☐ Minor importance
- ☐ Not important
- ☐ No comment

Please enter comments below:

Land Cover Map2007: *

- ☐ Very important
- ☐ Quite important
- ☐ Minor importance
- ☐ Not important
- ☐ No comment

Please enter comments below:

same categories for:
Factors influencing water quality and aquatic biodiversity

Water resource and flood models

Please describe any other specific topics for which Countryside Survey 2007 provided evidence that was critical or important for Water Resources:

Please consider the Field Survey or Land Cover Map outputs of Countryside Survey 2007.

Question Y3

Which outputs of Countryside Survey have you used as evidence for Water Resources?

Reports:

- ☐ UK-level reporting
- ☐ Country-level reporting
- ☐ Headwater Streams Report
- ☐ Ponds Report
- ☐ Soils Report
- ☐ Integrated Assessment Report
- ☐ Quality Assurance, Technical manuals and field handbooks
- ☐ Commissioned Reports
- ☐ Peer reviewed literature

Please comment further on reports, if necessary:

Datasets:

- ☐ Freshwater Pond
- ☐ Freshwater Stream
- ☐ Landscape Area Feature (e.g. habitat patches)
- ☐ Landscape Linear Feature (e.g. hedgerows and ditches)
- ☐ Landscape Point Features (e.g. hedgerow trees)
- ☐ Vegetation plots
- ☐ Soil
- ☐ Land Cover Map 2007
- ☐ Land Cover Map 2000 as an alternative to Land Cover Map 2007

Please comment further on datasets, if necessary:

Question Y4

Why did you use Countryside Survey 2007 outputs as evidence for Water Resources?

CS2007 Field Survey:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source

Please explain reasons for your choices:

Land Cover Map2007:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source

Please explain reasons for your choices:

Question Y5

Overall how well did outputs from CS2007 meet your evidence needs for Water Resources?

CS2007 Field Survey: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain reasons:

Land Cover Map2007: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain reasons:

Question Y6

Please provide examples of how you have used Countryside Survey 2007 data for Water Resources, for example by providing links to reports, indicators or headline messages that have used the data.

Question Y7

What other data sources could you have used as an alternative to Countryside Survey 2007 but decided not to?

Please list data sources and reasons for not using them:

Question Y8

Which, if any, of the following do you consider to be drawbacks or weaknesses of Countryside Survey 2007 for Water Resources?

CS2007 Field Survey:

- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ The coverage was not appropriate
- ☐ The way the definitions of the features and other elements included in the survey did not correspond to reporting or analysis needs
- ☐ I did not fully understand the data
- ☐ I was not confident in the underpinning science

Please explain reasons:

Land Cover Map2007:

- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ The coverage was not appropriate
- ☐ The way the definitions of the features and other elements included in the survey did not correspond to reporting or analysis needs
- ☐ I did not fully understand the data
- ☐ I was not confident in the underpinning science

Please explain reasons:

Questions for respondents who have used other data sources

This section of the questionnaire allows you to record information about other data sources used either alongside or as an alternative to Countryside Survey 2007 in relation to your work on Water Resources.

Question O1

Please list the other major data or evidence sources you have used in this topic area over the last 4 years.

This answer may include the outputs of previous phases of Countryside Survey and Land Cover Map.
Contextual and baseline information on water bodies and aquatic habitats:

Factors influencing water quality and aquatic biodiversity:

Water resource and flood models:

Other:

Question O2

Why did you use data or evidence sources other than CS2007?

Please choose from:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source
- ☐ Other

Please explain the reason for your choice:

Question O3

How well did these other data or evidence sources meet your evidence needs for Water Resources?

Please choose from: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain the reason for your choice:

Question for respondents who have not used CS2007

If you have not used Countryside Survey 2007 results for your work related to Water Resources, please complete this section.

Question N1

What are the main priorities that you have worked on in the last 4 years in relation to Water Resources?

Question N2

Why did you not use Countryside Survey results?

Please choose from:

- ☐ It was not available to me
- ☐ I was not aware of it
- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ I did not understand the data
- ☐ I was not confident in the science
- ☐ Not relevant to my work
- ☐ Other data or evidence sources were more appropriate
- ☐ Other

Other reasons:

Please explain the reason for your choice:

Questions for all respondents about future policy needs in the topic

Please complete this section to describe your future evidence needs over the next 5 years in relation to Water Resources

Question F1

What are likely to be your key evidence needs in this topic area over the next 5 years?

If appropriate please identify what is shaping these needs (e.g. name a particular management issue, policy or regulatory framework, or organisational responsibility).

Contextual and baseline information on water bodies and aquatic habitats:

Factors influencing water quality and aquatic biodiversity:

Water resource and flood models:

Other: (such as changing soil characteristics in relation to water run-off and infiltration)

Question F2

Please provide references or links to any reports or reviews of future evidence needs for Water Resources.

Question F3

Do you anticipate that a repeat of Countryside Survey in its current form will meet these evidence needs?

Please choose from: *

- ☐ Yes completely
- ☐ Yes partially
- ☐ No
- ☐ No comment

Please explain reasons:

Question F4

What survey or sampling data would your organisation be likely to invest in to meet the identified evidence needs over the next 5 years?

Note: This could be Countryside Survey or other sources.

Questionnaire for Soil Protection topic

Use this page to record whether you have used Countryside Survey 2007 results and other sources of evidence for applications related to Soil Protection.

Have you used Countryside Survey 2007?: *

- ☐ Yes
- ☐ No

Answering 'yes' above allows you to comment on the outputs of Countryside Survey 2007 including reports, data and Land Cover Map 2007.

Have you used other datasets?: *

- ☐ Yes
- ☐ No

Answering 'yes' above allows you to comment on other data sources relevant to Soil Protection. This may include the outputs of previous phases of Countryside Survey and Land Cover Map.

Questions for respondents who have used CS2007

This section of the questionnaire allows you to record information about Countryside Survey 2007 in relation to your work on Soil Protection.

Question Y1

What are the main priorities that you have worked on in the last 4 years in relation to Soil Protection?

Question Y2

For which of the following specific topics did you use Countryside Survey, and how critical do you feel it was in supporting these evidence needs?

We recognise that Land Cover Map 2007 was released relatively recently and your use of it may have been limited. However, we ask you to confine your answers below about Land Cover Map to this data source. There are opportunities later to comment on previous Countryside Survey outputs.

Soil quality monitoring and evaluation
CS2007 Field Survey: *

- ☐ Very important
- ☐ Quite important
- ☐ Minor importance
- ☐ Not important
- ☐ No comment

Please enter comments below:

Land Cover Map2007: *

- ☐ Very important
- ☐ Quite important
- ☐ Minor importance
- ☐ Not important
- ☐ No comment

Please enter comments below:

same categories for:
Coastal erosion

The influence of agri-environment schemes

Please describe any other specific topics for which Countryside Survey 2007 provided evidence that was critical or important for Soil Protection:

Please consider the Field Survey or Land Cover Map outputs of Countryside Survey 2007.

Question Y3

Which outputs of Countryside Survey have you used as evidence for Soil Protection?

Reports:

- ☐ UK-level reporting
- ☐ Country-level reporting
- ☐ Headwater Streams Report
- ☐ Ponds Report
- ☐ Soils Report
- ☐ Integrated Assessment Report
- ☐ Quality Assurance, Technical manuals and field handbooks
- ☐ Commissioned Reports
- ☐ Peer reviewed literature

Please comment further on reports, if necessary:

Datasets:

- ☐ Freshwater Pond
- ☐ Freshwater Stream
- ☐ Landscape Area Feature (e.g. habitat patches)
- ☐ Landscape Linear Feature (e.g. hedgerows and ditches)
- ☐ Landscape Point Features (e.g. hedgerow trees)
- ☐ Vegetation plots
- ☐ Soil
- ☐ Land Cover Map 2007
- ☐ Land Cover Map 2000 as an alternative to Land Cover Map 2007

Please comment further on datasets, if necessary:

Question Y4

Why did you use Countryside Survey 2007 outputs as evidence for Soil Protection?

CS2007 Field Survey:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source

Please explain reasons for your choices:

Land Cover Map2007:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source

Please explain reasons for your choices:

Question Y5

Overall how well did outputs from CS2007 meet your evidence needs for Soil Protection?

CS2007 Field Survey: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain reasons:

Land Cover Map2007: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain reasons:

Question Y6

Please provide examples of how you have used Countryside Survey 2007 data for Soil Protection, for example by providing links to reports, indicators or headline messages that have used the data.

Question Y7

What other data sources could you have used as an alternative to Countryside Survey 2007 but decided not to?

Please list data sources and reasons for not using them:

Question Y8

Which, if any, of the following do you consider to be drawbacks or weaknesses of Countryside Survey 2007 for Soil Protection?

CS2007 Field Survey:

- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ The coverage was not appropriate
- ☐ The way the definitions of the features and other elements included in the survey did not correspond to reporting or analysis needs
- ☐ I did not fully understand the data
- ☐ I was not confident in the underpinning science

Please explain reasons:

Land Cover Map2007:

- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ The coverage was not appropriate
- ☐ The way the definitions of the features and other elements included in the survey did not correspond to reporting or analysis needs
- ☐ I did not fully understand the data
- ☐ I was not confident in the underpinning science

Please explain reasons:

Questions for respondents who have used other data sources

This section of the questionnaire allows you to record information about other data sources used either alongside or as an alternative to Countryside Survey 2007 in relation to your work on Soil Protection.

Question O1

Please list the other major data or evidence sources you have used in this topic area over the last 4 years.

This answer may include the outputs of previous phases of Countryside Survey and Land Cover Map.
Soil quality monitoring and evaluation:

Coastal erosion:

The influence of agri-environment schemes:

Other:

Question O2

Why did you use data or evidence sources other than CS2007?

Please choose from:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source
- ☐ Other

Please explain the reason for your choice:

Question O3

How well did these other data or evidence sources meet your evidence needs for Soil Protection?

Please choose from: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain the reason for your choice:

Question for respondents who have not used CS2007

If you have not used Countryside Survey 2007 results for your work related to Soil Protection, please complete this section.

Question N1

What are the main priorities that you have worked on in the last 4 years in relation to Soil Protection?

Question N2

Why did you not use Countryside Survey results?

Please choose from:

- ☐ It was not available to me
- ☐ I was not aware of it
- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ I did not understand the data
- ☐ I was not confident in the science
- ☐ Not relevant to my work
- ☐ Other data or evidence sources were more appropriate
- ☐ Other

Other reasons:

Please explain the reason for your choice:

Questions for all respondents about future policy needs in the topic

Please complete this section to describe your future evidence needs over the next 5 years in relation to Soil Protection

Question F1

What are likely to be your key evidence needs in this topic area over the next 5 years? If appropriate please identify what is shaping these needs (e.g. name a particular management issue, policy or regulatory framework, or organisational responsibility).

Soil quality monitoring and evaluation:

Coastal erosion:

Other: (such as distribution of land use in relation to soil types)

Question F2

Please provide references or links to any reports or reviews of future evidence needs for Soil Protection.

Question F3

Do you anticipate that a repeat of Countryside Survey in its current form will meet these evidence needs?

Please choose from: *

- ☐ Yes completely
- ☐ Yes partially
- ☐ No
- ☐ No comment

Please explain reasons

Question F4

What survey or sampling data would your organisation be likely to invest in to meet the identified evidence needs over the next 5 years?

Note: This could be Countryside Survey or other sources.

Questionnaire for Sustainable Forestry topic

Use this page to record whether you have used Countryside Survey 2007 results and other sources of evidence for applications related to Sustainable Forestry.

Have you used Countryside Survey 2007?: *

☐ Yes

☐ No

Answering 'yes' above allows you to comment on the outputs of Countryside Survey 2007 including reports, data and Land Cover Map 2007.

Have you used other datasets?: *

☐ Yes

☐ No

Answering 'yes' above allows you to comment on other data sources relevant to Sustainable Forestry. This may include the outputs of previous phases of Countryside Survey and Land Cover Map.

Questions for respondents who have used CS2007

This section of the questionnaire allows you to record information about Countryside Survey 2007 in relation to your work on Sustainable Forestry.

Question Y1

What are the main priorities that you have worked on in the last 4 years in relation to Sustainable Forestry?

Question Y2

For which of the following specific topics did you use Countryside Survey, and how critical do you feel it was in supporting these evidence needs?

We recognise that Land Cover Map 2007 was released relatively recently and your use of it may have been limited. However, we ask you to confine your answers below about Land Cover Map to this data source. There are opportunities later to comment on previous Countryside Survey outputs.

The extent and character of trees, woodland and forestry
CS2007 Field Survey: *

- ☐ Very important
- ☐ Quite important
- ☐ Minor importance
- ☐ Not important
- ☐ No comment

Please enter comments below:

Land Cover Map2007: *

- ☐ Very important
- ☐ Quite important
- ☐ Minor importance
- ☐ Not important
- ☐ No comment

Please enter comments below:

Please describe any other specific topics for which Countryside Survey 2007 provided evidence that was critical or important for Sustainable Forestry:

Please consider the Field Survey or Land Cover Map outputs of Countryside Survey 2007.

Question Y3

Which outputs of Countryside Survey have you used as evidence for Sustainable Forestry?

Reports:

- ☐ UK-level reporting
- ☐ Country-level reporting
- ☐ Headwater Streams Report
- ☐ Ponds Report
- ☐ Soils Report
- ☐ Integrated Assessment Report
- ☐ Quality Assurance, Technical manuals and field handbooks
- ☐ Commissioned Reports
- ☐ Peer reviewed literature

Please comment further on reports, if necessary:

Datasets:

- ☐ Freshwater Pond
- ☐ Freshwater Stream
- ☐ Landscape Area Feature (e.g. habitat patches)
- ☐ Landscape Linear Feature (e.g. hedgerows and ditches)
- ☐ Landscape Point Features (e.g. hedgerow trees)
- ☐ Vegetation plots
- ☐ Soil
- ☐ Land Cover Map 2007
- ☐ Land Cover Map 2000 as an alternative to Land Cover Map 2007

Please comment further on datasets, if necessary:

Question Y4

Why did you use Countryside Survey 2007 outputs as evidence for Sustainable Forestry?

CS2007 Field Survey:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source

Please explain reasons for your choices:

Land Cover Map2007:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source

Please explain reasons for your choices:

Question Y5

Overall how well did outputs from CS2007 meet your evidence needs for Sustainable Forestry?

CS2007 Field Survey: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain reasons:

Land Cover Map2007: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain reasons:

Question Y6

Please provide examples of how you have used Countryside Survey 2007 data for Sustainable Forestry, for example by providing links to reports, indicators or headline messages that have used the data.

Question Y7

What other data sources could you have used as an alternative to Countryside Survey 2007 but decided not to?

Please list data sources and reasons for not using them:

Question Y8

Which, if any, of the following do you consider to be drawbacks or weaknesses of Countryside Survey 2007 for Sustainable Forestry?

CS2007 Field Survey:

- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ The coverage was not appropriate
- ☐ The way the definitions of the features and other elements included in the survey did not correspond to reporting or analysis needs
- ☐ I did not fully understand the data
- ☐ I was not confident in the underpinning science

Please explain reasons:

Land Cover Map2007:

- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ The coverage was not appropriate
- ☐ The way the definitions of the features and other elements included in the survey did not correspond to reporting or analysis needs
- ☐ I did not fully understand the data
- ☐ I was not confident in the underpinning science

Please explain reasons:

Questions for respondents who have used other data sources

This section of the questionnaire allows you to record information about other data sources used either alongside or as an alternative to Countryside Survey 2007 in relation to your work on Sustainable Forestry.

Question O1

Please list the other major data or evidence sources you have used in this topic area over the last 4 years.

This answer may include the outputs of previous phases of Countryside Survey and Land Cover Map.
The extent and character of trees, woodland and forestry:

Other:

Question O2

Why did you use data or evidence sources other than CS2007?

Please choose from:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source
- ☐ Other

Please explain the reason for your choice:

Question O3

How well did these other data or evidence sources meet your evidence needs for Sustainable Forestry?

Please choose from: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain the reason for your choice:

Question for respondents who have not used CS2007

If you have not used Countryside Survey 2007 results for your work related to Sustainable Forestry, please complete this section.

Question N1

What are the main priorities that you have worked on in the last 4 years in relation to Sustainable Forestry?

Question N2

Why did you not use Countryside Survey results?

Please choose from:

- ☐ It was not available to me
- ☐ I was not aware of it
- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ I did not understand the data
- ☐ I was not confident in the science
- ☐ Not relevant to my work
- ☐ Other data or evidence sources were more appropriate
- ☐ Other

Other reasons:

Please explain the reason for your choice:

Questions for all respondents about future policy needs in the topic

Please complete this section to describe your future evidence needs over the next 5 years in relation to Biodiversity.

Question F1

What are likely to be your key evidence needs in this topic area over the next 5 years? If appropriate please identify what is shaping these needs (e.g. name a particular management issue, policy or regulatory framework, or organisational responsibility).

The extent and character of trees, woodland and forestry:

Other: (such as the spread of invasive species within woodland or the spatial relationship between woodland and other land use types)

Question F2

Please provide references or links to any reports or reviews of future evidence needs for Sustainable Forestry.

Question F3

Do you anticipate that a repeat of Countryside Survey in its current form will meet these evidence needs?

Please choose from: *

- ☐ Yes completely
- ☐ Yes partially
- ☐ No
- ☐ No comment

Please explain reasons:

Question F4

What survey or sampling data would your organisation be likely to invest in to meet the identified evidence needs over the next 5 years?

Note: This could be Countryside Survey or other sources.

Questionnaire for Urban Development topic

Use this page to record whether you have used Countryside Survey 2007 results and other sources of evidence for applications related to Urban Development.

Have you used Countryside Survey 2007?: *

- ☐ Yes
- ☐ No

Answering 'yes' above allows you to comment on the outputs of Countryside Survey 2007 including reports, data and Land Cover Map 2007.

Have you used other datasets?: *

- ☐ Yes
- ☐ No

Answering 'yes' above allows you to comment on other data sources relevant to Urban Development. This may include the outputs of previous phases of Countryside Survey and Land Cover Map.

Questions for respondents who have used CS2007

This section of the questionnaire allows you to record information about Countryside Survey 2007 in relation to your work on Urban Development.

Question Y1

What are the main priorities that you have worked on in the last 4 years in relation to Urban Development?

Question Y2

For which of the following specific topics did you use Countryside Survey, and how critical do you feel it was in supporting these evidence needs?

We recognise that Land Cover Map 2007 was released relatively recently and your use of it may have been limited. However, we ask you to confine your answers below about Land Cover Map to this data source. There are opportunities later to comment on previous Countryside Survey outputs.

Urban green infrastructure and interlinkages with the countryside

CS2007 Field Survey: *

- ☐ Very important
- ☐ Quite important
- ☐ Minor importance
- ☐ Not important
- ☐ No comment

Please enter comments below:

Land Cover Map2007: *

- ☐ Very important
- ☐ Quite important
- ☐ Minor importance
- ☐ Not important
- ☐ No comment

Please enter comments below:

same categories for:
Land conversion to urban development

Please describe any other specific topics for which Countryside Survey 2007 provided evidence that was critical or important for Urban Development:

Please consider the Field Survey or Land Cover Map outputs of Countryside Survey 2007.

Question Y3

Which outputs of Countryside Survey have you used as evidence for Urban Development?

Reports:

- ☐ UK-level reporting
- ☐ Country-level reporting
- ☐ Headwater Streams Report
- ☐ Ponds Report
- ☐ Soils Report
- ☐ Integrated Assessment Report
- ☐ Quality Assurance, Technical manuals and field handbooks
- ☐ Commissioned Reports
- ☐ Peer reviewed literature

Please comment further on reports, if necessary:

Datasets:

- ☐ Freshwater Pond
- ☐ Freshwater Stream
- ☐ Landscape Area Feature (e.g. habitat patches)
- ☐ Landscape Linear Feature (e.g. hedgerows and ditches)
- ☐ Landscape Point Features (e.g. hedgerow trees)
- ☐ Vegetation plots
- ☐ Soil
- ☐ Land Cover Map 2007
- ☐ Land Cover Map 2000 as an alternative to Land Cover Map 2007

Please comment further on datasets, if necessary:

Question Y4

Why did you use Countryside Survey 2007 outputs as evidence for Urban Development?

CS2007 Field Survey:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source

Please explain reasons for your choices:

Land Cover Map2007:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source

Please explain reasons for your choices:

Question Y5

Overall how well did outputs from CS2007 meet your evidence needs for Urban Development?

CS2007 Field Survey: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain reasons:

Land Cover Map2007: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain reasons:

Question Y6

Please provide examples of how you have used Countryside Survey 2007 data for Urban Development, for example by providing links to reports, indicators or headline messages that have used the data.

Question Y7

What other data sources could you have used as an alternative to Countryside Survey 2007 but decided not to?

Please list data sources and reasons for not using them:

Question Y8

Which, if any, of the following do you consider to be drawbacks or weaknesses of Countryside Survey 2007 for Urban Development?

CS2007 Field Survey:

- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ The coverage was not appropriate
- ☐ The way the definitions of the features and other elements included in the survey did not correspond to reporting or analysis needs
- ☐ I did not fully understand the data
- ☐ I was not confident in the underpinning science

Please explain reasons:

Land Cover Map2007:

- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ The coverage was not appropriate
- ☐ The way the definitions of the features and other elements included in the survey did not correspond to reporting or analysis needs
- ☐ I did not fully understand the data
- ☐ I was not confident in the underpinning science

Please explain reasons:

Questions for respondents who have used other data sources

This section of the questionnaire allows you to record information about other data sources used either alongside or as an alternative to Countryside Survey 2007 in relation to your work on Urban Development.

Question O1

Please list the other major data or evidence sources you have used in this topic area over the last 4 years.

This answer may include the outputs of previous phases of Countryside Survey and Land Cover Map.
Urban green infrastructure and interlinkages with the countryside:

Land conversion to urban development:

Other:

Question O2

Why did you use data or evidence sources other than CS2007?

Please choose from:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source
- ☐ Other

Please explain the reason for your choice:

Question O3

How well did these other data or evidence sources meet your evidence needs for Urban Development?

Please choose from: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain the reason for your choice:

Please complete this section to describe your future evidence needs over the next 5 years in relation to Urban Development

Question for respondents who have not used CS2007

If you have not used Countryside Survey 2007 results for your work related to Urban Development, please complete this section.

Question N1

What are the main priorities that you have worked on in the last 4 years in relation to Urban Development?

Question N2

Why did you not use Countryside Survey results?

Please choose from:

- ☐ It was not available to me
- ☐ I was not aware of it
- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ I did not understand the data
- ☐ I was not confident in the science
- ☐ Not relevant to my work
- ☐ Other data or evidence sources were more appropriate
- ☐ Other

Other reasons:

Please explain the reason for your choice:

Questions for all respondents about future policy needs in the topic

Please complete this section to describe your future evidence needs over the next 5 years in relation to Biodiversity.

Question F1

What are likely to be your key evidence needs in this topic area over the next 5 years?

If appropriate please identify what is shaping these needs (e.g. name a particular management issue, policy or regulatory framework, or organisational responsibility).

Urban green infrastructure and interlinkages with the countryside:

Land conversion to urban development:

Other: (such as mapping in relation to green infrastructure)

Question F2

Please provide references or links to any reports or reviews of future evidence needs for Urban Development.

Question F3

Do you anticipate that a repeat of Countryside Survey in its current form will meet these evidence needs?

Please choose from: *

- ☐ Yes completely
- ☐ Yes partially
- ☐ No
- ☐ No comment

Please explain reasons:

Question F4

What survey or sampling data would your organisation be likely to invest in to meet the identified evidence needs over the next 5 years?

Note: This could be Countryside Survey or other sources.

Questionnaire for Air Quality topic

Use this page to record whether you have used Countryside Survey 2007 results and other sources of evidence for applications related to Air Quality.

Have you used Countryside Survey 2007?: *

- ☐ Yes
- ☐ No

Answering 'yes' above allows you to comment on the outputs of Countryside Survey 2007 including reports, data and Land Cover Map 2007.

Have you used other datasets?: *

- ☐ Yes
- ☐ No

Answering 'yes' above allows you to comment on other data sources relevant to Air Quality. This may include the outputs of previous phases of Countryside Survey and Land Cover Map.

Questions for respondents who have used CS2007

This section of the questionnaire allows you to record information about Countryside Survey 2007 in relation to your work on Air Quality.

Question Y1

What are the main priorities that you have worked on in the last 4 years in relation to Air Quality?

Question Y2

For which of the following specific topics did you use Countryside Survey, and how critical do you feel it was in supporting these evidence needs?

We recognise that Land Cover Map 2007 was released relatively recently and your use of it may have been limited. However, we ask you to confine your answers below about Land Cover Map to this data source. There are opportunities later to comment on previous Countryside Survey outputs.

Impacts of air pollution
CS2007 Field Survey: *

- ☐ Very important
- ☐ Quite important
- ☐ Minor importance
- ☐ Not important
- ☐ No comment

Please enter comments below:

Land Cover Map2007: *

- ☐ Very important
- ☐ Quite important
- ☐ Minor importance
- ☐ Not important
- ☐ No comment

Please enter comments below:

Please describe any other specific topics for which Countryside Survey 2007 provided evidence that was critical or important for Air Quality:

Please consider the Field Survey or Land Cover Map outputs of Countryside Survey 2007.

Question Y3

Which outputs of Countryside Survey have you used as evidence for Air Quality?

Reports:

- ☐ UK-level reporting
- ☐ Country-level reporting
- ☐ Headwater Streams Report
- ☐ Ponds Report
- ☐ Soils Report
- ☐ Integrated Assessment Report
- ☐ Quality Assurance, Technical manuals and field handbooks
- ☐ Commissioned Reports
- ☐ Peer reviewed literature

Please comment further on reports, if necessary:

Datasets:

- ☐ Freshwater Pond
- ☐ Freshwater Stream
- ☐ Landscape Area Feature (e.g. habitat patches)
- ☐ Landscape Linear Feature (e.g. hedgerows and ditches)
- ☐ Landscape Point Features (e.g. hedgerow trees)
- ☐ Vegetation plots
- ☐ Soil
- ☐ Land Cover Map 2007
- ☐ Land Cover Map 2000 as an alternative to Land Cover Map 2007

Please comment further on datasets, if necessary:

Question Y4

Why did you use Countryside Survey 2007 outputs as evidence for Air Quality?

CS2007 Field Survey:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source

Please explain reasons for your choices:

Land Cover Map2007:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source

Please explain reasons for your choices:

Question Y5

Overall how well did outputs from CS2007 meet your evidence needs for Air Quality?

CS2007 Field Survey: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain reasons:

Land Cover Map2007: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain reasons:

Question Y6

Please provide examples of how you have used Countryside Survey 2007 data for Air Quality, for example by providing links to reports, indicators or headline messages that have used the data.

Question Y7

What other data sources could you have used as an alternative to Countryside Survey 2007 but decided not to?

Please list data sources and reasons for not using them:

Question Y8

Which, if any, of the following do you consider to be drawbacks or weaknesses of Countryside Survey 2007 for Air Quality?

CS2007 Field Survey:

- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ The coverage was not appropriate
- ☐ The way the definitions of the features and other elements included in the survey did not correspond to reporting or analysis needs
- ☐ I did not fully understand the data
- ☐ I was not confident in the underpinning science

Please explain reasons:

Land Cover Map2007:

- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ The coverage was not appropriate
- ☐ The way the definitions of the features and other elements included in the survey did not correspond to reporting or analysis needs
- ☐ I did not fully understand the data
- ☐ I was not confident in the underpinning science

Please explain reasons:

Questions for respondents who have used other data sources

This section of the questionnaire allows you to record information about other data sources used either alongside or as an alternative to Countryside Survey 2007 in relation to your work on Air Quality.

Question O1

Please list the other major data or evidence sources you have used in this topic area over the last 4 years.

This answer may include the outputs of previous phases of Countryside Survey and Land Cover Map.
Impacts of air pollution:

Other:

Question O2

Why did you use data or evidence sources other than CS2007?

Please choose from:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source
- ☐ Other

Please explain the reason for your choice:

Question O3

How well did these other data or evidence sources meet your evidence needs for Air Quality?

Please choose from: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain the reason for your choice:

Question for respondents who have not used CS2007

If you have not used Countryside Survey 2007 results for your work related to Air Quality, please complete this section.

Question N1

What are the main priorities that you have worked on in the last 4 years in relation to Air Quality?

Question N2

Why did you not use Countryside Survey results?

Please choose from:

- ☐ It was not available to me
- ☐ I was not aware of it
- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ I did not understand the data
- ☐ I was not confident in the science
- ☐ Not relevant to my work
- ☐ Other data or evidence sources were more appropriate
- ☐ Other

Other reasons:

Please explain the reason for your choice:

Questions for all respondents about future policy needs in the topic

Please complete this section to describe your future evidence needs over the next 5 years in relation to Air Quality

Question F1

What are likely to be your key evidence needs in this topic area over the next 5 years? If appropriate please identify what is shaping these needs (e.g. name a particular management issue, policy or regulatory framework, or organisational responsibility).

Impacts of air pollution:

Other: (such as research relating local air quality to vegetation types)

Question F2

Please provide references or links to any reports or reviews of future evidence needs for Air Quality.

Question F3

Do you anticipate that a repeat of Countryside Survey in its current form will meet these evidence needs?

Please choose from: *

- ☐ Yes completely
- ☐ Yes partially
- ☐ No
- ☐ No comment

Please explain reasons:

Question F4

What survey or sampling data would your organisation be likely to invest in to meet the identified evidence needs over the next 5 years?

Note: This could be Countryside Survey or other sources.

Questionnaire for Climate Change topic

Use this page to record whether you have used Countryside Survey 2007 results and other sources of evidence for applications related to Climate Change.

Have you used Countryside Survey 2007?: *

- ☐ Yes
- ☐ No

Answering 'yes' above allows you to comment on the outputs of Countryside Survey 2007 including reports, data and Land Cover Map 2007.

Have you used other datasets?: *

- ☐ Yes
- ☐ No

Answering 'yes' above allows you to comment on other data sources relevant to Climate Change. This may include the outputs of previous phases of Countryside Survey and Land Cover Map.

Questions for respondents who have used CS2007

This section of the questionnaire allows you to record information about Countryside Survey 2007 in relation to your work on Climate Change.

Question Y1

What are the main priorities that you have worked on in the last 4 years in relation to Climate Change?

Question Y2

For which of the following specific topics did you use Countryside Survey, and how critical do you feel it was in supporting these evidence needs?

We recognise that Land Cover Map 2007 was released relatively recently and your use of it may have been limited. However, we ask you to confine your answers below about Land Cover Map to this data source. There are opportunities later to comment on previous Countryside Survey outputs.

Land use change and GHG emissions
CS2007 Field Survey: *

- ☐ Very important
- ☐ Quite important
- ☐ Minor importance
- ☐ Not important
- ☐ No comment

Please enter comments below:

Land Cover Map2007: *

- ☐ Very important
- ☐ Quite important
- ☐ Minor importance
- ☐ Not important
- ☐ No comment

Please enter comments below:

same categories for:
Environmental adaptation to climate change and resilience planning

Mitigation actions: renewable energy production

Please describe any other specific topics for which Countryside Survey 2007 provided evidence that was critical or important for Climate Change:

Please consider the Field Survey or Land Cover Map outputs of Countryside Survey 2007.

Question Y3

Which outputs of Countryside Survey have you used as evidence for Climate Change?

Reports:

- ☐ UK-level reporting
- ☐ Country-level reporting
- ☐ Headwater Streams Report
- ☐ Ponds Report
- ☐ Soils Report
- ☐ Integrated Assessment Report
- ☐ Quality Assurance, Technical manuals and field handbooks
- ☐ Commissioned Reports
- ☐ Peer reviewed literature

Please comment further on reports, if necessary:

Datasets:

- ☐ Freshwater Pond
- ☐ Freshwater Stream
- ☐ Landscape Area Feature (e.g. habitat patches)
- ☐ Landscape Linear Feature (e.g. hedgerows and ditches)
- ☐ Landscape Point Features (e.g. hedgerow trees)
- ☐ Vegetation plots
- ☐ Soil
- ☐ Land Cover Map 2007
- ☐ Land Cover Map 2000 as an alternative to Land Cover Map 2007

Please comment further on datasets, if necessary:

Question Y4

Why did you use Countryside Survey 2007 outputs as evidence for Climate Change?

CS2007 Field Survey:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source

Please explain reasons for your choices:

Land Cover Map2007:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source

Please explain reasons for your choices:

Question Y5

Overall how well did outputs from CS2007 meet your evidence needs for Climate Change?

CS2007 Field Survey: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain reasons:

Land Cover Map2007: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain reasons:

Question Y6

Please provide examples of how you have used Countryside Survey 2007 data for Climate Change, for example by providing links to reports, indicators or headline messages that have used the data.

Question Y7

What other data sources could you have used as an alternative to Countryside Survey 2007 but decided not to?

Please list data sources and reasons for not using them:

Question Y8

Which, if any, of the following do you consider to be drawbacks or weaknesses of Countryside Survey 2007 for Climate Change?

CS2007 Field Survey:

- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ The coverage was not appropriate
- ☐ The way the definitions of the features and other elements included in the survey did not correspond to reporting or analysis needs
- ☐ I did not fully understand the data
- ☐ I was not confident in the underpinning science

Please explain reasons:

Land Cover Map2007:

- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ The coverage was not appropriate
- ☐ The way the definitions of the features and other elements included in the survey did not correspond to reporting or analysis needs
- ☐ I did not fully understand the data
- ☐ I was not confident in the underpinning science

Please explain reasons:

Questions for respondents who have used other data sources

This section of the questionnaire allows you to record information about other data sources used either alongside or as an alternative to Countryside Survey 2007 in relation to your work on Climate Change.

Question O1

Please list the other major data or evidence sources you have used in this topic area over the last 4 years.

This answer may include the outputs of previous phases of Countryside Survey and Land Cover Map.
Land use change and GHG emissions:

Environmental adaptation to climate change and resilience planning:

Mitigation actions: renewable energy production:

Other:

Question O2

Why did you use data or evidence sources other than CS2007?

Please choose from:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source
- ☐ Other

Please explain the reason for your choice:

Question O3

How well did these other data or evidence sources meet your evidence needs for Climate Change?

Please choose from: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain the reason for your choice:

Question for respondents who have not used CS2007

If you have not used Countryside Survey 2007 results for your work related to Climate Change, please complete this section.

Question N1

What are the main priorities that you have worked on in the last 4 years in relation to Climate Change?

Question N2

Why did you not use Countryside Survey results?

Please choose from:

- ☐ It was not available to me
- ☐ I was not aware of it
- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ I did not understand the data
- ☐ I was not confident in the science
- ☐ Not relevant to my work
- ☐ Other data or evidence sources were more appropriate
- ☐ Other

Other reasons:

Please explain the reason for your choice:

Questions for all respondents about future policy needs in the topic

Please complete this section to describe your future evidence needs over the next 5 years in relation to Climate Change

Question F1

What are likely to be your key evidence needs in this topic area over the next 5 years? If appropriate please identify what is shaping these needs (e.g. name a particular management issue, policy or regulatory framework, or organisational responsibility).

Land use change and GHG emissions:

Environmental adaptation to climate change and resilience planning:

Mitigation actions: renewable energy production:

Other:

Question F2

Please provide references or links to any reports or reviews of future evidence needs for Climate Change.

Question F3

Do you anticipate that a repeat of Countryside Survey in its current form will meet these evidence needs?

Please choose from: *

- ☐ Yes completely
- ☐ Yes partially
- ☐ No
- ☐ No comment

Please explain reasons:

Question F4

What survey or sampling data would your organisation be likely to invest in to meet the identified evidence needs over the next 5 years?

Note: This could be Countryside Survey or other sources.

Questionnaire for Access to Nature topic

Use this page to record whether you have used Countryside Survey 2007 results and other sources of evidence for applications related to Access to Nature.

Have you used Countryside Survey 2007?: *

- ☐ Yes
- ☐ No

Answering 'yes' above allows you to comment on the outputs of Countryside Survey 2007 including reports, data and Land Cover Map 2007.

Have you used other datasets?: *

- ☐ Yes
- ☐ No

Answering 'yes' above allows you to comment on other data sources relevant to Access to Nature. This may include the outputs of previous phases of Countryside Survey and Land Cover Map.

Questions for respondents who have used CS2007

This section of the questionnaire allows you to record information about Countryside Survey 2007 in relation to your work on Access to Nature.

Question Y1

What are the main priorities that you have worked on in the last 4 years in relation to Access to Nature?

Question Y2

For which of the following specific topics did you use Countryside Survey, and how critical do you feel it was in supporting these evidence needs?

We recognise that Land Cover Map 2007 was released relatively recently and your use of it may have been limited. However, we ask you to confine your answers below about Land Cover Map to this data source. There are opportunities later to comment on previous Countryside Survey outputs.

Health and well-being through access to nature
CS2007 Field Survey: *

- ☐ Very important
- ☐ Quite important
- ☐ Minor importance
- ☐ Not important
- ☐ No comment

Please enter comments below:

Land Cover Map2007: *

- ☐ Very important
- ☐ Quite important
- ☐ Minor importance
- ☐ Not important
- ☐ No comment

Please enter comments below:

Please describe any other specific topics for which Countryside Survey 2007 provided evidence that was critical or important for Access to Nature:

Please consider the Field Survey or Land Cover Map outputs of Countryside Survey 2007.

Question Y3

Which outputs of Countryside Survey have you used as evidence for Access to Nature?

Reports:

- ☐ UK-level reporting
- ☐ Country-level reporting
- ☐ Headwater Streams Report
- ☐ Ponds Report
- ☐ Soils Report
- ☐ Integrated Assessment Report
- ☐ Quality Assurance, Technical manuals and field handbooks
- ☐ Commissioned Reports
- ☐ Peer reviewed literature

Please comment further on reports, if necessary:

Datasets:

- ☐ Freshwater Pond
- ☐ Freshwater Stream
- ☐ Landscape Area Feature (e.g. habitat patches)
- ☐ Landscape Linear Feature (e.g. hedgerows and ditches)
- ☐ Landscape Point Features (e.g. hedgerow trees)
- ☐ Vegetation plots
- ☐ Soil
- ☐ Land Cover Map 2007
- ☐ Land Cover Map 2000 as an alternative to Land Cover Map 2007

Please comment further on datasets, if necessary:

Question Y4

Why did you use Countryside Survey 2007 outputs as evidence for Access to Nature?

CS2007 Field Survey:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source

Please explain reasons for your choices:

Land Cover Map2007:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source

Please explain reasons for your choices:

Question Y5

Overall how well did outputs from CS2007 meet your evidence needs for Access to Nature?

CS2007 Field Survey: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain reasons:

Land Cover Map2007: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain reasons:

Question Y6

Please provide examples of how you have used Countryside Survey 2007 data for Access to Nature, for example by providing links to reports, indicators or headline messages that have used the data.

Question Y7

What other data sources could you have used as an alternative to Countryside Survey 2007 but decided not to?

Please list data sources and reasons for not using them:

Question Y8

Which, if any, of the following do you consider to be drawbacks or weaknesses of Countryside Survey 2007 for Access to Nature?

CS2007 Field Survey:

- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ The coverage was not appropriate
- ☐ The way the definitions of the features and other elements included in the survey did not correspond to reporting or analysis needs
- ☐ I did not fully understand the data
- ☐ I was not confident in the underpinning science

Please explain reasons:

Land Cover Map2007:

- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ The coverage was not appropriate
- ☐ The way the definitions of the features and other elements included in the survey did not correspond to reporting or analysis needs
- ☐ I did not fully understand the data
- ☐ I was not confident in the underpinning science

Please explain reasons:

Questions for respondents who have used other data sources

This section of the questionnaire allows you to record information about other data sources used either alongside or as an alternative to Countryside Survey 2007 in relation to your work on Access to Nature.

Question O1

Please list the other major data or evidence sources you have used in this topic area over the last 4 years.

This answer may include the outputs of previous phases of Countryside Survey and Land Cover Map.

Health and well-being through access to nature:

Other:

Question O2

Why did you use data or evidence sources other than CS2007?

Please choose from:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source
- ☐ Other

Please explain the reason for your choice:

Question O3

How well did these other data or evidence sources meet your evidence needs for Access to Nature?

Please choose from: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain the reason for your choice:

Question for respondents who have not used CS2007

If you have not used Countryside Survey 2007 results for your work related to Access to Nature, please complete this section.

Question N1

What are the main priorities that you have worked on in the last 4 years in relation to Access to Nature?

Question N2

Why did you not use Countryside Survey results?

Please choose from:

- ☐ It was not available to me
- ☐ I was not aware of it
- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ I did not understand the data
- ☐ I was not confident in the science
- ☐ Not relevant to my work
- ☐ Other data or evidence sources were more appropriate
- ☐ Other

Other reasons:

Please explain the reason for your choice:

Questions for all respondents about future policy needs in the topic

Question F1

What are likely to be your key evidence needs in this topic area over the next 5 years? If appropriate please identify what is shaping these needs (e.g. name a particular management issue, policy or regulatory framework, or organisational responsibility).

Health and well-being through access to nature:

Other: (such as the relationship between land use and pollution or the impact of events such as heat waves and flooding on health)

Question F2

Please provide references or links to any reports or reviews of future evidence needs for Access to Nature.

Question F3

Do you anticipate that a repeat of Countryside Survey in its current form will meet these evidence needs?

Please choose from: *

- ☐ Yes completely
- ☐ Yes partially
- ☐ No
- ☐ No comment

Please explain reasons:

Question F4

What survey or sampling data would your organisation be likely to invest in to meet the identified evidence needs over the next 5 years?

Note: This could be Countryside Survey or other sources.

Questionnaire for Other topic

Use this page to record whether you have used Countryside Survey 2007 results and other sources of evidence for applications related to Other / Unexpected Changes.

Have you used Countryside Survey 2007?: *

- ☐ Yes
- ☐ No

Answering 'yes' above allows you to comment on the outputs of Countryside Survey 2007 including reports, data and Land Cover Map 2007.

Have you used other datasets?: *

- ☐ Yes
- ☐ No

Answering 'yes' above allows you to comment on other data sources relevant to Other / Unexpected Changes. This may include the outputs of previous phases of Countryside Survey and Land Cover Map.

Questions for respondents who have used CS2007

This section of the questionnaire allows you to record information about Countryside Survey 2007 in relation to your work on Other / Unexpected Changes.

Question Y1

What are the main priorities that you have worked on in the last 4 years in relation to Other / Unexpected Changes?

Question Y2

For which of the following specific topics did you use Countryside Survey, and how critical do you feel it was in supporting these evidence needs?

We recognise that Land Cover Map 2007 was released relatively recently and your use of it may have been limited. However, we ask you to confine your answers below about Land Cover Map to this data source. There are opportunities later to comment on previous Countryside Survey outputs.

Unexpected changes in the countryside
CS2007 Field Survey: *

- ☐ Very important
- ☐ Quite important
- ☐ Minor importance
- ☐ Not important
- ☐ No comment

Please enter comments below:

Land Cover Map2007: *

- ☐ Very important
- ☐ Quite important
- ☐ Minor importance
- ☐ Not important
- ☐ No comment

Please enter comments below:

Please describe any other specific topics for which Countryside Survey 2007 provided evidence that was critical or important for Other / Unexpected Changes:

Please consider the Field Survey or Land Cover Map outputs of Countryside Survey 2007.

Question Y3

Which outputs of Countryside Survey have you used as evidence for Other / Unexpected Changes?

Reports:

- ☐ UK-level reporting
- ☐ Country-level reporting
- ☐ Headwater Streams Report
- ☐ Ponds Report
- ☐ Soils Report
- ☐ Integrated Assessment Report
- ☐ Quality Assurance, Technical manuals and field handbooks
- ☐ Commissioned Reports
- ☐ Peer reviewed literature

Please comment further on reports, if necessary:

Datasets:

- ☐ Freshwater Pond
- ☐ Freshwater Stream
- ☐ Landscape Area Feature (e.g. habitat patches)
- ☐ Landscape Linear Feature (e.g. hedgerows and ditches)
- ☐ Landscape Point Features (e.g. hedgerow trees)
- ☐ Vegetation plots
- ☐ Soil
- ☐ Land Cover Map 2007
- ☐ Land Cover Map 2000 as an alternative to Land Cover Map 2007

Please comment further on datasets, if necessary:

Question Y4

Why did you use Countryside Survey 2007 outputs as evidence for Other / Unexpected Changes?

CS2007 Field Survey:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source

Please explain reasons for your choices:

Land Cover Map2007:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source

Please explain reasons for your choices:

Question Y5

Overall how well did outputs from CS2007 meet your evidence needs for Other / Unexpected Changes?

CS2007 Field Survey: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain reasons:

Land Cover Map2007: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain reasons:

Question Y6

Please provide examples of how you have used Countryside Survey 2007 data for Other / Unexpected Changes, for example by providing links to reports, indicators or headline messages that have used the data.

Question Y7

What other data sources could you have used as an alternative to Countryside Survey 2007 but decided not to?

Please list data sources and reasons for not using them:

Question Y8

Which, if any, of the following do you consider to be drawbacks or weaknesses of Countryside Survey 2007 for Other / Unexpected Changes?

CS2007 Field Survey:

- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ The coverage was not appropriate
- ☐ The way the definitions of the features and other elements included in the survey did not correspond to reporting or analysis needs
- ☐ I did not fully understand the data
- ☐ I was not confident in the underpinning science

Please explain reasons:

Land Cover Map2007:

- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ The coverage was not appropriate
- ☐ The way the definitions of the features and other elements included in the survey did not correspond to reporting or analysis needs
- ☐ I did not fully understand the data
- ☐ I was not confident in the underpinning science

Please explain reasons:

Questions for respondents who have used other data sources

This section of the questionnaire allows you to record information about other data sources used either alongside or as an alternative to Countryside Survey 2007 in relation to your work on Other / Unexpected Changes.

Question O1

Please list the other major data or evidence sources you have used in this topic area over the last 4 years.

This answer may include the outputs of previous phases of Countryside Survey and Land Cover Map.

Unexpected changes in the countryside:

Other:

Question O2

Why did you use data or evidence sources other than CS2007?

Please choose from:

- ☐ Data readily available
- ☐ Accuracy of data
- ☐ Timeliness of results
- ☐ Appropriate reporting frequency
- ☐ Historic time series
- ☐ Ease of understanding
- ☐ Appropriate scale
- ☐ Relevance
- ☐ Robustness of science
- ☐ Authoritative source
- ☐ Other

Please explain the reason for your choice:

Question O3

How well did these other data or evidence sources meet your evidence needs for Other / Unexpected Changes?

Please choose from: *

- ☐ Completely
- ☐ Partially
- ☐ Not at all
- ☐ No comment

Please explain the reason for your choice:

Question for respondents who have not used CS2007

If you have not used Countryside Survey 2007 results for your work related to Other / Unexpected Changes, please complete this section.

Question N1

What are the main priorities that you have worked on in the last 4 years in relation to Other / Unexpected Changes?

Question N2

Why did you not use Countryside Survey results?

Please choose from:

- ☐ It was not available to me
- ☐ I was not aware of it
- ☐ The results were not ready when I needed them
- ☐ The spatial scale of the data is too broad
- ☐ I did not understand the data
- ☐ I was not confident in the science
- ☐ Not relevant to my work
- ☐ Other data or evidence sources were more appropriate
- ☐ Other

Other reasons:

Please explain the reason for your choice:

Questions for all respondents about future policy needs in the topic

Please complete this section to describe your future evidence needs over the next 5 years in relation to Other / Unexpected Changes

Question F1

What are likely to be your key evidence needs in this topic area over the next 5 years? If appropriate please identify what is shaping these needs (e.g. name a particular management issue, policy or regulatory framework, or organisational responsibility).

Unexpected changes in the countryside:

Other:

Question F2

Please provide references or links to any reports or reviews of future evidence needs for Other / Unexpected Changes.

Question F3

Do you anticipate that a repeat of Countryside Survey in its current form will meet these evidence needs?

Please choose from: *

- ☐ Yes completely
- ☐ Yes partially
- ☐ No
- ☐ No comment

Please explain reasons:

Question F4

What survey or sampling data would your organisation be likely to invest in to meet the identified evidence needs over the next 5 years?

Note: This could be Countryside Survey or other sources.

General questions about Countryside Survey 2007

Question G1

Have you ever used evidence from earlier countryside surveys, if so which?

Please select: *

- [ ] 1978
- [ ] 1984
- [ ] 1990
- [ ] 2000
- [ ] None

Question G2

How did you access information about Countryside Survey 2007?

Please select all relevant options: *

- [ ] Countryside Survey website
- [ ] Other website(s)
- [ ] Countryside Survey leaflets
- [ ] Countryside Survey newsletter
- [ ] Other newsletter(s)
- [ ] At an event
- [ ] Countryside Survey final reports
- [ ] Trade press (e.g. professional journal)
- [ ] Public media (e.g. national newspaper)
- [ ] Word of mouth
- [ ] Not at all

Other - please specify:

Question G3

Did you use the Countryside Survey 2007 website, how useful was it?

Please select: *

- [ ] Very useful
- [ ] Useful
- [ ] Adequate
- [ ] Not useful

- ☐ Never used it

Question G4

To what extent are the outputs of Countryside Survey 2007 clear and accessible?

Please select: *

- ☐ Clear and accessible
- ☐ Adequate
- ☐ Unclear and inaccessible
- ☐ I have no experience on which to base a judgement

Question G5

What other forms of reporting would better meet your needs

Question G6

How do communications from Countryside Survey 2007 compare to previous years?

Please select: *

- ☐ Much better
- ☐ Better
- ☐ Same
- ☐ Worse
- ☐ Much worse
- ☐ I have no experience on which to base a judgement

Question G7

In general terms, to what extent does Countryside Survey 2007 contribute to understanding of change in the countryside?

Please select: *

- ☐ It is essential to understanding change
- ☐ It is a good source for describing change
- ☐ It makes little contribution to understanding or describing change
- ☐ It is irrelevant to understanding or describing change
- ☐ I have no experience on which to base a judgement

Do you have any other comments or suggestions about future options for Countryside Survey that have not been captured elsewhere by this questionnaire?

Appendix 4: Overview of results of project review

Project	Sponsor	Policy Topic and Subtopic	Support for contribution to policy
Analysis of change in frequency and abundance of injurious weed and selected invasive non native species in England	Defra	Species monitoring including spread of invasive non-native	Strong (FS)
Changes in English Moorlands	Natural England	Species and habitat monitoring	Strong (FS)
Conwy Macronutrients project	NERC	Contextual and baseline information on water bodies and aquatic habitats	None (FS)
Correlative Analysis	Natural England	The influence of agri-environment schemes	Strong (FS)
CS and birds	NERC	Other	None
DEFRA UKREATE (UK Research on the Eutrophication and Acidification of Terrestrial Ecosystems)	DEFRA	Impacts of air pollution	Strong (FS)
Detecting and attributing air pollution impacts during SSSI condition assessment	JNCC	Impacts of air pollution	Weak
Developing an indicator of the abundance, extent and impact of invasive non-native species	JNCC, Defra, Natural England	Species monitoring including spread of invasive non-native species	Strong (FS)
Ecosystem Interactions	Defra	Factors influencing water quality and aquatic biodiversity	Indetrminate - not yet completed (FS, LCM)
Insect Pollinator Initiative – Agriland: Linking agriculture and land use change to pollinator populations	LWEC	Extent and condition of farmland habitats and landscape features	P - not yet completed (FS, LCM)
Isolated Hedgerow trees	Defra	The extent and character of trees, woodland and forestry	Strong (FS)
Lowland Raised bogs in Scotland: vulnerability and threats	Scottish Wildlife Trust and the IUCN UK Peatland Programme	Distribution and condition of Priority Habitats (PH)	None
REFORM	European Commission DG Research	Factors influencing water quality and aquatic biodiversity	None
Restoration of Herbaceous Hedgerow Flora: Review and Analysis of Ecological Factors and Restoration Techniques. Phase 1.	Defra	Distribution and condition of Priority Habitats (PH)	Strong (FS)
RoTAP (Report on Transboundary Air Pollution)	Defra	Impacts of air pollution	Strong (FS)
UK National Ecosystem Assesment	Defra, NERC, Scottish Government, Welsh Government, ESRC,	The dynamics and spatial distribution of ecosystem services at national and	Strong (FS)
European Biodiversity Observation Network: Design of a plan for an integrated biodiversity observing system in space and time	European Commission DG Research	Other (methodology)	None
Habitat Connectivity – Developing an indicator for UK and country level reporting.	Defra, Countryside Council for Wales, Environment Agency, Natural England, Forestry Commission, Northern Ireland Environment Agency, Scottish Natural Heritage, Welsh Assembly Government (Llywodraeth Cynulliad Cymru), Woodland Trust	Ecological networks and landscape permeability	None - already included in assessment
BIOPRESS	European Commission DG Research	Other - Land cover change	None
'Important Areas for Ponds' project	All regional national conservation agencies; the work has been sponsored by various agencies and private funders.	Prioirity Habitats (PH) and water	Partial (FS)
PondNet: Developing a national pond surveillance strategy for widespread and localised species	Natural England	Prioirity Habitats (PH) and water	Partial (FS)
Change in Great Crested Newt Habitat Suitability Index between 1996 and 2007 assessed using lowland Countryside Survey data	JNCC.	Prioirity Habitats (PH) and water	Partial (FS)