ERFF REPORT 02

Environment Research
Funders' Forum

STRATEGIC ANALYSIS OF UK ENVIRONMENTAL MONITORING ACTIVITY




Summary Report

GLOSSARY OF TERMS AND ACRONYMS

ERFF MEMBERS

BBSRC	Biotechnology & Biological Sciences Research Council
Defra	Department for Environment, Food and Rural Affairs
DFID	Department For International Development
DfT	Department for Transport
EA	Environment Agency
ESRC	Economic & Social Research Council
MRC	Medical Research Council
NE	Natural England
NERC	Natural Environment Research Council
SE	Scottish Executive
SEPA	Scottish Environment Protection Agency

ERFF CORRESPONDING MEMBERS

EPSRC	Engineering & Physical Sciences Research Council
FC	Forestry Commission
FSA	Food Standards Agency
HSE	Health and Safety Executive
JNCC	Joint Nature Conservation Committee
Met Office	Met Office
WAG	Welsh Assembly Government

OTHER TERMS

AQC	Analytical Quality Control
BAP	Biodiversity Action Plan
BRC	Biological Records Centre
CEH	Centre for Ecology & Hydrology
CCW	Countryside Council for Wales
ECN	Environmental Change Network
EHSNI	Environment and Heritage Service, Northern Ireland
EO	Earth Observation
ERFF	Environment Research Funders' Forum
ERANET	European Research Area Network
EU	European Union
FEC	Full Economic Costs
GECC	Global Environmental Change Committee
GB	Great Britain
GPS	Global Positioning System
IPR	Intellectual Property Rights
ISO	International Organisation for Standardisation
NBN	National Biodiversity Network
NGO	Non-governmental organisation
NI	Northern Ireland
NICS	Northern Ireland Countryside Survey
RAE	Research Assessment Exercise
RCs	Research councils
SEERAD	Scottish Executive Environment & Rural Affairs Department
SDRN	Sustainable Development Research Network
SNIFFER	Scotland & Northern Ireland Forum For Environmental Research
SOP	Standard Operating Procedure
SWOT	Strengths, Weaknesses, Opportunities & Threats
UK	United Kingdom
UKAS	United Kingdom Accreditation Service
UKBRAG	UK Biodiversity Research Action Group
UKERC	UK Energy Research Centre

Correct at time of printing August 2007

CONTENTS

EXECUTIVE SUMMARY

Environmental monitoring is essential for shaping and informing policy, particularly where it identifies and provides evidence of new or unexpected environmental trends or issues. It is also necessary for understanding and managing our natural resources as well as for meeting regulatory and statutory requirements, for example, water and air quality reporting.

This report provides a summary of a review of current terrestrial and freshwater environmental monitoring in the UK, carried out by ADAS UK Ltd. on behalf of ERFF[1]. It also covers the proceedings of a workshop[2] involving members of the environmental monitoring community, and the recommendations made as a result of these activities to the ERFF main board.

The review identified, obtained (using an electronic survey) and categorised information (metadata) describing environmental monitoring by UK organisations. Environmental monitoring was defined for the review as encompassing long-term activities with ongoing repeat data collection in the UK. There are many other activities with associated datasets and products that were not included in the review such as compliance and marine monitoring, etc.

Where pertinent, the conclusions of work in the marine sector were provided by Defra but the review is a partial assessment of environmental monitoring activities. The current status and nature of this environmental monitoring is described below.

- The UK monitoring community is large and fragmented. 132 individuals from 53 organisations were involved in completing over 400 survey forms for known monitoring activities. Yet we still do not have a complete picture of spend or activity.
- Monitoring is undertaken for a variety of reasons with the most common being long-term research and informing policy development. About a third of the activities are meeting or contributing to statutory requirements.
- There appears to be a lack of baseline data and data on long-term trends in specific topic areas including climate change impacts.
- The cost of monitoring covered by the review has been very conservatively estimated at upwards of £88 million and could be up to £500m.
- The lack of secure funding was identified as the major risk to long-term datasets. Other risks include organisational and staffing changes and the reliance on the volunteer continuity who collect approximately one third of the terrestrial datasets.

The principle recommendation of the review and workshop is that a clear vision, strategy and framework for long-term environmental monitoring are required. Other recommendations for implementation within the overarching framework are listed at the end of the report.

The ERFF main board accepted the findings of the review and agreed to develop a UK strategy for environmental monitoring and the work is in the ERFF delivery plan for 2007-2010. A full project plan to develop and implement the strategy will be considered by the ERFF members late in 2007.

In developing the UK strategy we will endeavour to engage with all key stakeholders to ensure that the UK can meet its obligations to monitor as well as use the information for better regulation and management of the natural environment. The strategy will also play a vital role in ensuring that the UK is well placed in international fora and can respond and adapt to environmental change, particularly that resulting from climate change.

The next phase of the monitoring work will be under a broader scope and remit than this review. The database will be made available on line.

[1] *Ref .1.* [2] *Ref .2.*

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND

The Environment Research Funders' Forum (ERFF) was established in 2002 to bring together the main UK public bodies which fund or use environmental research[3] and trained scientists. The forum aims to maximise the coherence and effectiveness of the funding of UK environmental sciences. It achieves this through improving communications between the member organisations, encouraging partnerships and enhancing the effectiveness of science funding. More detailed information about ERFF's aims, its member organisations and activities to date are given on its website: www.erff.org.uk

In 2003, ERFF undertook a review of environmental science in the UK to identify key issues that should be the focus of its activities. Environmental monitoring, including security of maintaining long-term datasets and barriers to more effective coordination were identified as key issues to be addressed. Environmental monitoring has an important role in shaping policy, particularly where it identifies and provides evidence of new or unexpected environmental trends or issues. It is also necessary for meeting regulatory and statutory requirements, for example, water and air quality.

In January 2006, ERFF appointed ADAS UK Ltd to carry out a strategic review of environmental monitoring in the UK. The objectives of the review were to:

- identify, obtain and categorise information describing UK environmental monitoring datasets
- develop, build and populate a database to hold information on UK environmental monitoring datasets
- review current environmental monitoring activities within the UK, identify potential gaps and overlaps, report findings and make recommendations
- provide a top-level analysis of all the information collected, including consideration of the strategic issues present findings at the ERFF workshop.

The review concentrated on terrestrial and freshwater monitoring activities as marine activities are covered by a separate process led by Defra and the devolved administrations to develop a new UK Marine Monitoring and Assessment Strategy (UKMMAS).

A workshop was held on September 2006 to discuss the results of the review. The workshop also sought views from the monitoring community about the strategic issues that affect the efficacy of monitoring of the environment in the UK and how these can be resolved.

This report provides a summary of the scope, findings, outputs and key recommendations from both the final report of the Review[1] and from the workshop proceedings[2]. Action subsequently agreed by ERFF is reported in chapter 7.

Copies of the workshop proceedings and of the final report can be obtained from the ERFF website: www.erff.org.uk/reports

[1]Ref .1. [2]Ref .2. [3]Environmental research is defined by ERFF as research and associated monitoring, survey, policy, regulation and training.

CHAPTER 2: APPROACH TO THE REVIEW OF ENVIRONMENTAL MONITORING IN THE UK

2.1 REVIEW SCOPE AND METHODOLOGIES

This chapter provides a summary description of the scope and methodology used in the review.

For the purposes of the review *environmental monitoring* was defined as sampling of the environment (air, water, soil, vegetation, animals) that can be compared with baseline samples to see if any changes have occurred. Long-term monitoring was defined as monitoring activities (data collection) of a duration of 20 years or more. Information on monitoring activities with a shorter duration was also collected to facilitate future work.

The review set out to identify and gather information (metadata) about UK environmental monitoring. It includes only ongoing monitoring activities associated with data collection in UK terrestrial and freshwater environments. Clearly, environmental monitoring encompasses many more activities, associated datasets and other outputs than were included in the review. It was therefore a partial assessment of environmental monitoring activities. In essence, it encompassed long-term activities with ongoing repeat data collection in the UK.

Using two existing databases describing monitoring activities, literature reviews and Internet searches, a list of UK environmental monitoring was produced. Each monitoring activity was assigned to a topic (hydrology, freshwater ecology, freshwater chemistry, terrestrial ecology, climate change, meteorology, air, geology and soil, and other). An overview topic was established to allow the inclusion of records describing coordination initiatives (e.g. for metadata and records centres, partnerships, reporting frameworks). Terrestrial ecology and freshwater ecology activities were assigned sub-topics by the JNCC (birds, plants, habitats, fish, invertebrates, all mammals, reptiles and amphibians).

This known information was used to populate electronic survey forms about each monitoring activity. 413 survey forms were created to capture information about monitoring activity in the UK. Representatives from over 53 survey organisations were asked to check and or complete the electronic forms. The request for information had been generally well received by the environmental monitoring community and a return rate of about 85% was achieved. A full list of projects included in the review is given in Appendix 4 of the full report.

Completed survey forms were checked and uploaded to a Microsoft Access database, created to hold the metadata in a structure that allows reporting of data through simple queries, with outputs to Access reports.

The analysis included all monitoring activities for which there was information, including cases where the survey forms were not completed but where previous activities by ERFF meant that key basic descriptive information about the monitoring activity was available.

Note: for ongoing ERFF Monitoring work, the scope will be broadened.

2.2 KNOWN GAPS AND OMISSIONS

Considerable effort was made to ensure that all current UK monitoring activities targeted by the review were included in the survey. Inevitably, some monitoring activities were missed.

In terms of omissions from the database, it was concluded that:

- monitoring activities in Northern Ireland are poorly represented in the database

- there are very few EU-funded activities suggesting that European or worldwide initiatives involving data collection in the UK may have been missed
- datasets describing land cover and land use change are under-represented
- monitoring activities where the periodicity of repeat data gathering is relatively long (many geological and soil monitoring activities) are under-estimated; survey organisations were not always able to predict whether these activities would be likely to be repeated
- monitoring undertaken by private companies (particularly water-related monitoring) is under-represented
- far more long-term, small-scale localised monitoring (particularly terrestrial ecology) occurs than is represented in the database.

Compliance monitoring involves ongoing proof that regulatory controls are functioning as expected. It also identifies incidents where regulatory measures/controls have been breached, for example, pollution to a water course. The original remit of the review did not include compliance monitoring. However, some such monitoring was included, particularly monitoring involving ongoing validation of the effects of regulatory controls (e.g, obligations placed on site operators through permits). The more general monitoring of water and air quality (statutory monitoring driven by legislative drivers) was included, as was monitoring of protected areas (e.g, Common Standards Monitoring).

CHAPTER 3: FINDINGS OF THE SURVEY

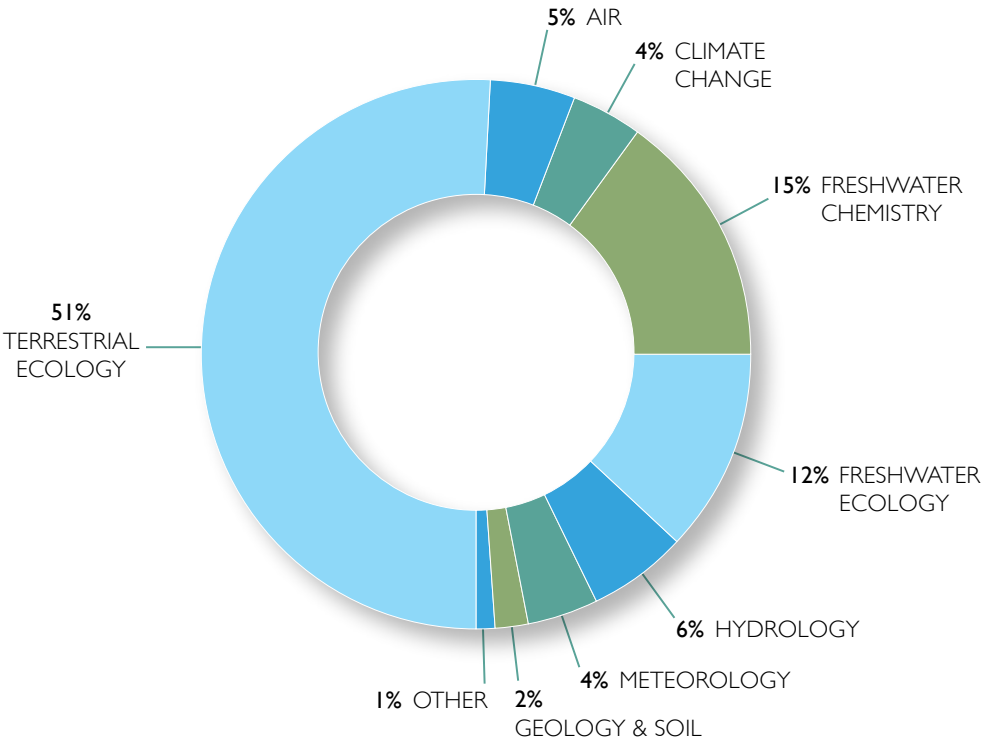

Figure 1:
Categorisation of monitoring activities in the UK (by number of projects). Based on 392 monitoring activities in the database..

3.1 GENERAL CONCLUSIONS

A DISPARATE COMMUNITY

The UK monitoring community is large and fragmented, involving many organisations, funding bodies and monitoring activities. The 413 survey forms created to capture information about monitoring activity in the UK encompassed the work of 347 monitoring projects. Some 132 individuals from 53 organisations were involved in completing survey forms. A full list of projects included in the review is given in Appendix 4 of the full report.

The activities within the original ERFF database were reviewed and restructured to ensure that monitoring activities were as far as possible defined in the database in a coherent and consistent way. However, monitoring activities were referred to by a variety of names in literature, on the Internet and in the two databases sourced. Project titles were not used consistently and did not always convey clearly or simply the essence of the monitoring.

3.2 AN ANALYSIS OF ENVIRONMENTAL MONITORING ACTIVITY IN THE UK

ACTIVITIES

Given the caveats outlined in chapter 2.2 we can conclude that terrestrial ecology monitoring in the UK constitutes half the activities identified and recorded in the database. Invertebrate, bird and plant monitoring make up the majority of this. All active voluntary recording schemes were included in the database and these made up just over a third (71 of 201 activities) of the terrestrial ecology monitoring activities (Figure 1).

Monitoring of the freshwater environment (including hydrology, ecology and chemistry) makes up a third (33%) of the activities and is dominated by the activities of the EA, SEPA and EHSNI.

Whilst data collected by monitoring activities may lend itself to use in climate change monitoring, relatively few activities were categorised as collecting data primarily for this purpose.

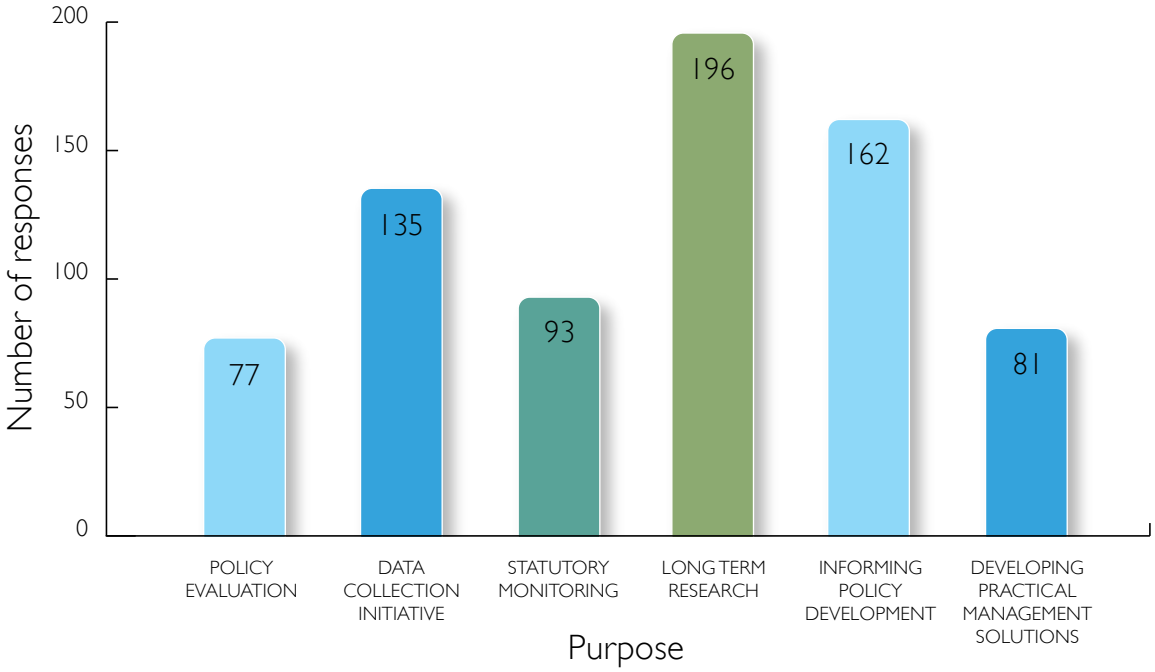

Figure 2: Purpose of monitoring. Based on responses from 277 activities (214 of which selected more than one purpose).

3.3 FUNDERS, DELIVERERS AND THE PURPOSE OF MONITORING

Organisations reported that most monitoring (77% of 277 records) has multiple drivers. The most common are meeting long-term research requirements and informing policy development (Figure 2). Long-term environmental monitoring encompasses both research to improve understanding of processes and the production of an evidence base to underpin policy. There is a close, sometimes indistinct, association between scientific research and policy in environmental monitoring.

About a third of the activities are meeting or contributing to statutory requirements. This included a range of water-related monitoring (water quality, water quantity, biological and fisheries monitoring) undertaken for a range of reasons, including: fulfilling EU Directive requirements, assessing regulatory compliance, informing environmental assessments and investigating incidents. It also included some air and forest monitoring and some terrestrial monitoring activities, for example, those associated with Common Standards Monitoring, the Habitats Directive and Biodiversity Action Plan (BAP) reporting.

Findings suggest that statutory monitoring is used in a very specific way. It was the driver least likely to be associated with other drivers and is tailored very specifically to legislative/regulatory reporting requirements. Of the 93 monitoring activities that stated statutory monitoring was a purpose, 40% (39 activities) had no other purpose.

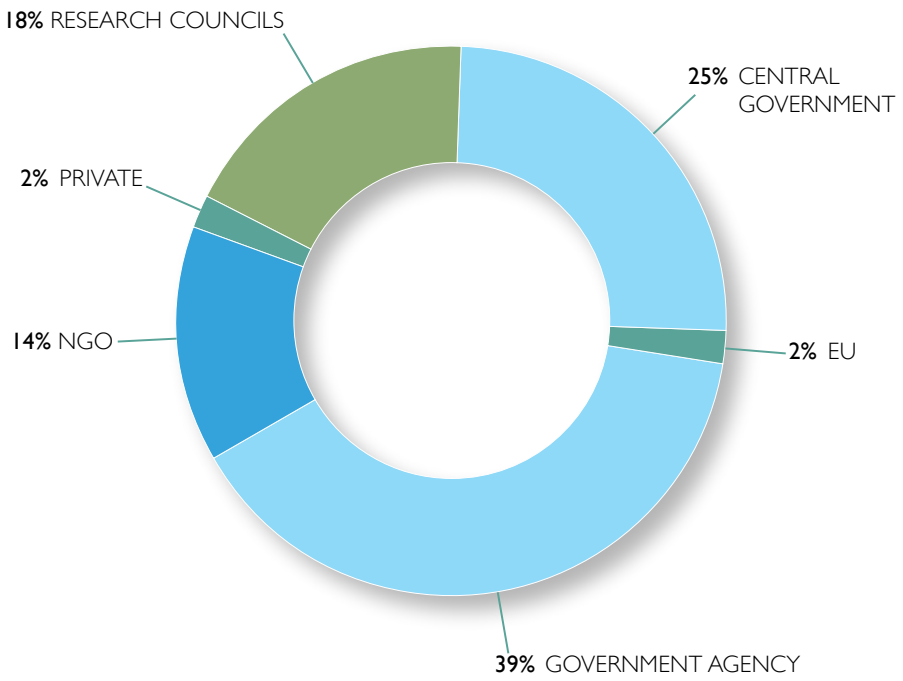

Figure 3: Lead funders of environmental monitoring in the UK. Based on responses from 200 monitoring activities.

3.4 WHO IS FUNDING MONITORING?

Two-thirds (67%) of monitoring activities (208 of 310) are funded by a single organisation (including activities entirely dependent on the work of volunteers).

Two or more partners jointly fund the remaining activities. About a fifth of the monitoring activities (18%, 57 records) have three or more funders, and of these, just under half receive funding through a combination of research council and central government/government agency funding (Figure 3).

Few (2%) of the monitoring activities have funding from the European Union, suggesting that the review may not have picked up all EU-funded monitoring in the UK.

Central government and its agencies are lead funders of most of the monitoring activities. Research bodies (in particular NERC) and NGOs lead the funding of a significant amount.

3.5 MONITORING THAT IS NOT FUNDED

Just over a fifth (22% of 310) of activities receive no funding and many are almost entirely run by volunteers. This includes nearly all of the invertebrate voluntary recording schemes as well as other plant, invertebrate, mammal, amphibian and reptile recording schemes. Although it is likely that there is considerable variation in the quality of records and in data collection methods, the value of such activities lies in the very long-term nature of the data and the ability to pick up changes in the distribution of species.

INFORMATION USED IN THE ASSESSMENT OF COSTS	NUMBER OF ACTIVITIES	TOTAL ANNUAL COST TO FUNDERS
Actual annual cost supplied by survey organisations, including summary costs for EA and SEPA	185	£71.2m
Approximate costs supplied by survey orgs (from a chosen range e.g, £50k - £100k)[1]	20	£2.0m (estimate)
Not funded (voluntary)	70	-
No information supplied (small – medium scale activities)[2]	60	£10m (estimate)
No information supplied (NI statutory monitoring and NICS)[3]	21	£5m (estimate)
All terrestrial and freshwater activities[4]	**356**	**£88.2m (min. estimate)**
Marine monitoring (approximate)[5]	-	£38m (min. estimate)

Table 1: Estimated cost of UK monitoring

1. The few (6 activities) that submitted costs in the highest cost bands (>£1m+ over 10 years) have an assumed cost of £100,000 / annum which is likely to be an under-estimate.
2. Estimate is based on applying the average cost of monitoring of the 139 activities with known costs.
3. Based on the costs of similar work undertaken by SEPA and the Centre for Ecology & Hydrology.
4. Overview records describing initiatives and networks, etc. were not included in cost analysis. Component activities of large projects (e.g, ECN) are not included to avoid double counting of costs.
5. Additional work estimate by UKMMAS ref 3.

3.6 ESTIMATED COSTS OF UK ENVIRONMENTAL MONITORING ACTIVITIES

Using the financial information provided by survey organisations and, where no information was available, estimates, a total cost of UK monitoring identified in the review was produced (Table 1).

It is estimated that the cost of UK monitoring included in this review is upwards of £88m per annum.

This estimated cost should be viewed in context and treated with caution. The costs identified relate to a partial assessment of the costs of UK environmental monitoring owing to the relatively narrow focus of the review. In addition, in relation to the monitoring included in the review, many organisations have not included the full costs of staff, materials and supporting data and no account has been taken of the cost of voluntary inputs. These costs are substantial.

Marine monitoring is estimated as at least an additional £38m.

Most voluntary schemes (70 activities) confirmed they had no funding and have not been assigned a cost. They are therefore undervalued in the costing assessment.

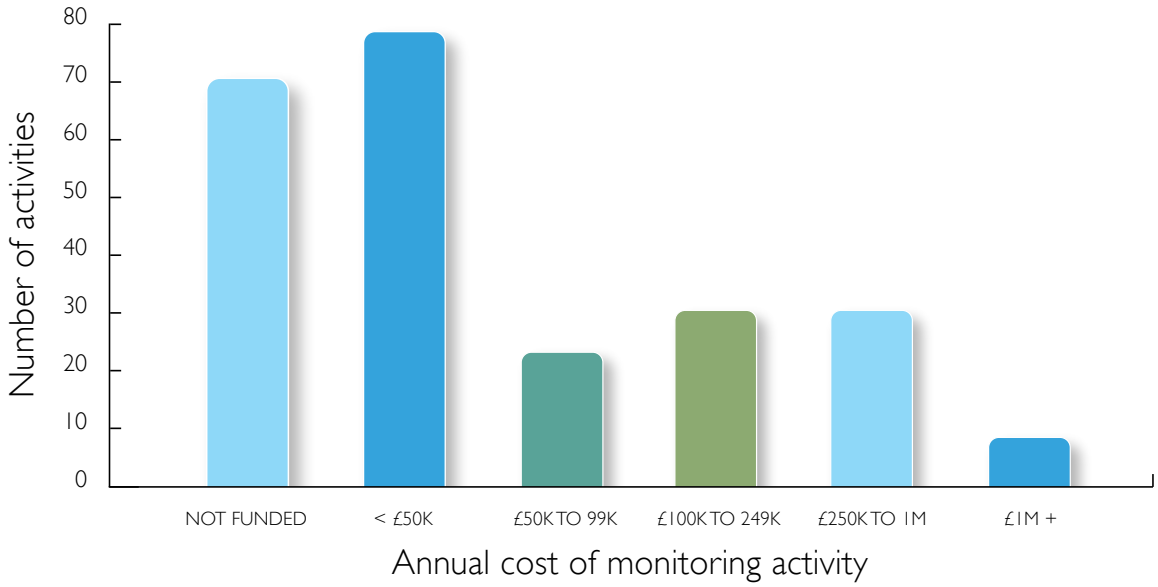

Figure 4: Distribution of funding/costs between monitoring activities.
Based on responses from 237 activities (and excludes EA monitoring).

3.7 MONITORING COSTS AND STATUTORY MONITORING

Statutory/compliance monitoring is required by EU Directives and other legislative and regulatory drivers. It could be assumed that resources tied up in such monitoring are unlikely to be released in the short-term for other monitoring purposes. Current levels of known funding, which are mainly for the statutory monitoring of air, water and habitats, account for approximately £60 million. This is 68% of the total cost of monitoring identified in this review. There is, therefore, only approximately £28 million spent on non-statutory monitoring per annum. In seeking short-term efficiencies (e.g, through very focused monitoring), the wider application of the results from statutory/compliance is often constrained.

By far the largest component is EA activities estimated at £46m. It should be noted that the EA are currently reviewing the costs of monitoring.

3.8 DISTRIBUTION OF FUNDING/ COSTS BETWEEN ACTIVITIES

The high number of small-scale activities in UK long-term monitoring (Figure 4), coupled with the relatively large number of organisations and funders involved, presents a challenge for the strategic coordination and further, more detailed, assessment of UK long-term monitoring activity.

3.9 COLLABORATION

A reasonably high proportion of monitoring activities (45%, 128 of 282 activities) were in collaboration with other organisations or volunteers.

Collaboration during delivery, including project planning and management, was most common (115 activities). Collaboration during analysis and reporting was also quite common (75 activities). Analysis of project data (both quantitative and qualitative) with data from other projects was reported for about a third (30%) of activities (84 out of 282 activities).

3.10 GEOGRAPHIC EXTENT OF DATA COLLECTION AND REPORTING

About half (140 out of 291) of the activities supplying information on reporting, do so at one specific geographic level. A third of the activities reporting at the country level, do so at that level only.

Few activities report at the full range of scales, with only eight activities reporting at UK, GB and country level.

There are many activities collecting and reporting data for UK and national purposes. Country level reporting is now a requirement following the devolution of statutory and other responsibilities and this is reflected in the many activities that are reported at the country level but no higher. Devolved monitoring increases the likelihood of varied sampling strategies and monitoring techniques.

3.11 DURATION OF MONITORING

Just under half of the monitoring activities covered by the review had been running for more than 20 years.

The monitoring which spans 20+ years, is more likely than other monitoring activities to be driven by the need to develop practical management solutions, long-term research and inform policy development.

The 20+ years monitoring comprises a higher proportion of activities where the lead funding is provided by central government departments. These long-term activities also contain a higher than average proportion of multi-variable data collection (both for multiple site and single site activities).

3.12 RISKS IDENTIFIED BY SURVEY ORGANISATIONS

Security of funding was the most frequently reported risk to monitoring activities, although organisational and staffing risks (especially volunteer continuity) were also reported in high numbers and 89 monitoring activities reported multiple risks (Table 2). The number of activities (90) that reported that they had not secured funding for the forthcoming financial year was high, though it was anticipated that most activities would continue in the longer-term.

RISK	NUMBER OF PROJECTS
Funding	124
Staff continuity	65
Scientific issues	12
Organisational change	64
Data access issues	17
Other	96

Table 3.2: Risks identified.
Based on responses from 225 activities.

3.13 RATE OF ATTRITION

During the survey, a few monitoring activities described in the original databases were reported to be no longer running. Though few in number, the closure of these activities has occurred over a relatively short period (less than five years).

The database produced for ERFF does not include details of 'one-off' and 'completed' surveys. Such surveys included repeat gathering of data, some of which are based on robust samples and methodologies. UK government has invested and will continue to invest significant resources in such surveys. The opportunity should be taken to ensure that where possible, they should contribute to and inform the long-term environmental monitoring evidence base.

3.14 USE OF TECHNOLOGY

Half of monitoring activities (161 out of 315) reported the use of technologies, such as telemetry and remote data collection. GPS is now commonplace and were reported as being in use in 47 activities and possibly used in a further 66 voluntary schemes. Over 100 activities used at least one technology with 48 activities using two or more.

3.15 USE OF SUPPORTING DATA

A total of 184 monitoring activities provided information on the use of supporting data. Of these, the majority specified one supporting data set (115 out of 184), though eleven used up to five different datasets.

A very wide range of datasets are used to support activities, the most common being Ordnance Survey maps or digital data, followed by climate data.

3.16 DATA AVAILABILITY

Most activities make raw data available but with constraints on its use (e.g, non-commercial use or no disclosure of site locations). Just under a fifth of activities reported that raw data were freely available and the remaining activities do not provide access to their raw data. This implies less than 20% of data is freely available. As expected, value-added data are more readily available than raw data. Where the value-added data are available, this is often constrained by the requirement for a license agreement.

3.17 USE OF DATA REPOSITORIES

A total of 118 activities provided information on the data repositories they use, with the Biological Records Centre (BRC) and the National Biodiversity Network (NBN) being used by the most number of projects.

3.18 QUALITY ASSURANCE

Quality assurance procedures were reported to be in use by 195 monitoring activities. Data validation procedures in the voluntary schemes (98 activities) accounted for much of this. A wide range of other assurance measures were reported, including UKAS Accreditation (11 activities), ISO accreditation (4 activities), internal AQC (9 activities), the use of a Joint Code of Practice (10 activities) and the use of SOPs or protocols (9 activities).

CHAPTER 4: PRELIMINARY ANALYSIS OF GAPS IN ENVIRONMENTAL MONITORING

4.1 GAPS

This chapter begins to draw conclusions from the information in the database and discusses gaps and overlaps.

The following gaps in environmental monitoring were identified from the review.

Insufficient baseline data and data on long-term trends in specific topic areas:

- monitoring of changes to soil biodiversity and soil erosion
- land cover change for some rare, important terrestrial and coastal habitats
- carbon sequestration and carbon budgets, including the acidification of the sea
- change in the condition of landscape features, such as hedges, trees and walls
- impacts of diffuse pollution
- impacts of climate change
- coastal changes.

Insufficient capacity for integrated monitoring and analysis. An ecosystem-based approach to managing the natural environment requires an improved understanding of ecosystem function, an holistic view of environmental pressures, impacts and changes and better assessments of the benefits that ecosystems provide to society.

Providing this evidence to policy-makers, requires the monitoring community to identify datasets that can be brought together for analysis and to develop data integration systems, approaches, trend analysis and forecasting techniques. Increasing the capacity for integrated monitoring and analysis should add value to monitoring data.

At present there are many narrowly focused environmental monitoring activities in the UK with incompatible databases. This presents significant challenges in identifying candidate data to be brought together.

Current integrated analysis efforts are from research and larger monitoring activities gathering a wide range of environmental data within a single sampling framework. Links between terrestrial and freshwater monitoring are developing but are still poor, as are links between socio-economic and environmental data, urban and rural environments, environmental monitoring and human health.

Insufficient information is available on long-term environmental trends at the national level, particularly for Scotland, Wales and Northern Ireland and at regional and local scales. Trends can be slow to emerge and there is often uncertainty about the cause of change observed.

Infrequency of data collection. Data collection within long-term monitoring is sometimes too infrequent to meet key policy reporting requirements and scientific needs. It would be useful to assess the level to which key policy reporting commitments have not been adequately met as a result of timing issues alone.

Insufficient coordination and communication of results. There are many parties involved with the funding and delivery of monitoring and thus coordination of activity and dissemination of results within the environmental community and stakeholders is inadequate and difficult to achieve. Lessons from the marine monitoring community may provide pointers to the way ahead to achieve an integrated programme of monitoring.

Gaps in the availability or use of supporting data. Whilst there is information on the location of and change to UK Broad Habitats, the information on the location and change to some of the rarer and most valuable component UK Priority Habitats is less complete. The increased availability of digital maps has improved the use of supporting data but Earth observation data remains under-utilised.

4.2 OVERLAPS

The following overlaps in environmental monitoring were identified from the review.

Redundant data collection is considered most likely to be related to the frequency of monitoring. For example, for many compliance/statutory monitoring activities, particularly water-related monitoring, it is the legislative drivers that are determining what variables are monitored and the frequency of monitoring. In many cases the likely or known rate of change does not merit the intensity of monitoring stipulated by the particular driver. Redundancy of data also relates to the quality of data collected (i.e, whether it is fit for purpose) and whether it is analysed, reported and used. There are many examples of monitoring activities either seeking funding to analyse collected data or that do not fully analyse or report on the data collected.

Duplication of data collection. Policy requirements drive the timing of data collection in a considerable proportion of long-term environmental monitoring activities. This leads to duplication of effort and fragmentation of monitoring. An existing monitoring activity may collect suitable data but may not be able to deliver results within the timescales required by new policy reporting requirements, leading to the creation of new monitoring activities, rather than adaptation of existing ones. The largest programmes of monitoring are collecting information on a very wide range of variables. At the same time, other monitoring activities collect information about the same variables, usually as part of more detailed and specific monitoring of a particular environmental feature. There is a role for both approaches, but differences in sampling frameworks and methods may have resulted in differing estimates of stock and change of particular environmental features which can cause difficulties in policy assessment and reporting.

4.3 RECOMMENDED APPROACH FOR FURTHER ANALYSIS OF GAPS AND OVERLAPS

Knowledge of the data collection activity and associated outputs of long-term monitoring activities provides an incomplete basis for the identification of potential gaps or overlaps. It needs to be combined with:

- an understanding of the hierarchy of policy and scientific drivers
- an understanding of the way in which environmental monitoring activities deliver or present a potential source of data
- recognition that an inherent tension exists between the demand for rapid measurement and evidence of changes that occur within the policy-making field and the fundamental character and values of long-term datasets.

Barriers. There is also a need to understand and address the barriers to effective collection and use of long-term environmental monitoring data. The main barriers are:

- Funding and organisational issues including: the need for a decision-making framework; the lack of an overarching strategy/vision and organisational structure to assess whether the monitoring is fit for purpose at the strategic level; the impact of the available time and means to obtain funding; and, the demand for rapid results for policy use and the need to meet statutory requirements.
- Lack of accessible knowledge among both researchers and funders including: who is undertaking what monitoring activities (and how, where and why); the most effective means of achieving monitoring objectives (method, frequency of collection, sampling analysis, determining trends); and when to stop or change approach.

- Integration issues including: identifying opportunities to integrate within and between activities; methods of achieving this; organisational barriers to achieving this; and, access to data.

Some long-term datasets and collections that have previously appeared to have limited utility have since proven to be extremely valuable, for example, in the context of assessing climate change. This needs to be taken into account when assessing overlaps in relation to what may appear to be 'redundant' data collection. However, the rationale of unexpected change should not be used as a barrier to hamper well-reasoned cases for adaptation, change, or even cessation of unnecessary data collection, otherwise monitoring will stagnate.

Identifying gaps and overlaps may lead to suggested modifications to a monitoring activity. Changes in survey methods must not, however, compromise the underlying purpose (if this remains relevant to policy and/or scientific requirements) or its ability to produce information on long-term environmental trends.

4.4 EFFICIENCY OF PROJECT RESOURCES

Difficulties were encountered in establishing the range of monitoring work taking place for nearly all topic areas. There were relatively few individuals within survey organisations or funding organisations with knowledge of the appropriate contacts and range of monitoring taking place within a particular topic. These issues are symptomatic of a body of work that requires more systematic management. Inefficiencies are usually a hallmark of fragmented and poorly coordinated systems. This is not a criticism of individual monitoring activities but an issue for the integrated management of the collective body of UK environmental monitoring. The UKMMAS also found this. With no ownership or strategic importance given to the monitoring activities, there is little management.

Greater efficiency could be achieved by a more integrated management of the collective body of UK environmental monitoring and by an increased sharing of project resources, developments in methodology and results. There are also opportunities to recognise where sponsor needs are too tightly defined. The relatively small differences in the funder's needs may not justify the resources used to create separate datasets.

The EA are currently reviewing how modernisation of monitoring can improve efficiency through the use of new techniques for data collection and new systems for managing monitoring activity. The results of this work will be of interest to ERFF.

4.5 THE ERFF DATABASE

As part of the wider strategy for monitoring, ERFF will need to develop a model for the continuation of the database. This will require further consideration of how the metadata will be used and communication of the value of the metadata as a planning tool for environmental monitoring. Without such a strategy, model and plan for communication, there is a high risk that the monitoring community will become disengaged from future requests for assistance.

The re-use of existing metadata when updating the database should be core to the model for the continuation of the database.

Links will need to be developed and maintained with related metadata initiatives (both sector based and country based). An immediate requirement will be to coordinate the metadata developments for marine monitoring programmes in the UK. Metadata should be in the same format, as should systems of collecting data.

CHAPTER 5: THE WORKSHOP: A SUMMARY

5.1 PROCEEDINGS AND OUTPUTS

This chapter summaries the proceedings and outputs of the workshop held on 6 September 2006 (Ref 2) to discuss the results of the review (summarised above). In advance of the meeting, all participants were provided with the draft report of the review of monitoring in the UK.

The aims of the workshop were:

- to consider the findings of the review of monitoring in the UK
- to identify barriers affecting monitoring in the UK
- to develop a 'top down' view of what was needed and how the issues could be resolved.

Key questions asked were:

- what is the vision for UK environmental monitoring?
- is UK monitoring fit for purpose?
- can funding for monitoring projects be made more secure?
- what are the barriers that hamper the effective commissioning, collection and use of environmental monitoring datasets?
- how can these be overcome?

Discussion at the workshop focused on the fact that the ADAS Review represented a bottom-up view of UK monitoring activities, yet there is also clearly the need to take a top-down view. This would entail establishing what monitoring is required to meet the UK's policy and other needs, rather than simply perpetuating the current state of affairs. The top-down and bottom-up approaches need to be brought together to properly assess gaps and overlaps. It was agreed that the bottom-up approach needed to be related to a much more strategic and long-term approach to environmental monitoring in the UK, not just to meet policy needs, which change over time.

It was argued that the UK monitoring community could learn many lessons from the work undertaken by the marine sector. The same challenges are faced in terrestrial and freshwater sectors, namely, securing funding, overcoming the lack of transparency of the 'who, what and where' of monitoring, dealing with the organisational challenges when there are many interested parties to co-ordinate and issues around data and metadata.

Participants discussed the most important issues effecting environmental monitoring in the UK, and seven clear themes emerged. These were:

1. overarching strategy and vision
2. top-level ownership
3. need for an enabling process
4. effective funding strategy
5. cross-organisational decision-making
6. overcoming barriers to integration
7. communicating value.

All were agreed that the requirement for an overarching strategy for UK monitoring is key and that organisational structures will need to be put in place to develop and implement this strategy. Delegates felt that the strategy should develop objectives and priorities for environmental monitoring. It should also develop a process to better understand how existing monitoring relates to long-term policy and scientific requirements for the environment (both in the UK and internationally).

Delegates believed that such a strategy would enable a change in ethos, so that monitoring is valued and is included in high-level strategy. It will promote the sharing of knowledge by setting out the rationale and assisting in setting up the structures to overcome some of the technical and organisational barriers that have been identified.

CHAPTER 6: KEY WORKSHOP RECOMMENDATIONS

6.1 RECOMMENDATIONS

The principle recommendation of the review was endorsed and supported namely that:

A **A clear vision, strategy and framework for long-term environmental monitoring are required.**

Within this framework the following were also concluded:

B A clear structure for the strategic coordination of all aspects of monitoring activities is needed. This requires a body with the relevant authority to take responsibility for the ownership of environmental monitoring as a whole.

C ERFF should engage with existing networks and the key individuals involved in the review to develop a coordination network for further information gathering and dissemination and to facilitate bringing key people together when necessary.

D Examples of successful collaboration should be sought by ERFF and promoted.

E Exemplars of projects that have achieved efficiencies (e.g, through developments in sampling techniques, use of technology, analysis and reporting techniques) should be sought and promoted.

F Strategic planning for monitoring should continue to recognise the value and close association between scientific research and policy in environmental monitoring. The particular roles and relationships of these drivers in monitoring should be examined and defined more clearly.

G ERFF should establish the wider utility of compliance monitoring data for long-term environmental monitoring, including datasets not covered in this review.

H ERFF should consider UK commitments to statutory monitoring in the UK and international monitoring collaborations to assess whether these are being met.

I A UK-wide examination of the costs of long-term monitoring, including in relation to the costs and social benefits of all related main policy areas is required to assess accurately the proportion of costs and social benefits taken up by UK monitoring.

J Opportunities to capitalise on the value of studies, which are more usually treated as 'one-off' policy assessments, should be sought, recognised and promoted.

K The implications of loss of volunteer resource should be investigated.

L Longer-term funding mechanisms need to be established.

M The rate of attrition should continue to be monitored for activities at highest risk of closure and their 'value' for research and policy assessed.

N A common terminology and set of definitions for environmental monitoring is needed, together with examples of monitoring activities.

O It is important that the consistency of definition of monitoring activities is retained in future updates to the database.

P Commissioning and delivery organisations involved in long-term monitoring should adopt appropriate, clear project titles. This will help to promote a wider understanding of UK monitoring activity and assist in its co-ordination and management.

Q Once the gaps in monitoring are known and fully understood in relation to policy needs, ERFF should identify completed surveys that might have potential to address known needs.

R A requirements-based approach is recommended for the further, more detailed, assessment of gaps and overlaps and for assessing whether monitoring activities are fit for purpose. The need for horizon-scanning activities to identify emerging drivers, likely developments in data collection techniques and methodologies should be considered by ERFF.

CHAPTER 7: ACTIONS FOR ERFF AND ITS MEMBERS

In November 2006, the recommendations from this review and workshop were endorsed by the ERFF main board. There was agreement that ERFF should develop a UK strategy for environmental monitoring and in doing so to address the other recommendations made. ERFF agreed to continue the monitoring database and to make this publicly available on the ERFF website. These objectives form part of the ERFF delivery plan for 2007-2010, (see ERFF Report 1).

Funding for the first step in delivering and implementing the strategy (defining the processes) has been provided and this will be considered in 2007. In developing the UK strategy we will endeavour to engage with all key stakeholders to ensure that the UK can meet its obligations to monitor as well as use the information for better regulation and management of the natural environment. The strategy will also play a vital role in ensuring that the UK is well placed in international fora and can respond and adapt to environmental change, particularly that resulting from climate change.

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APPENDIX 1: SUMMARY OF THE WORKSHOP'S RECOMMENDATIONS TO THE ERFF MAIN BOARD

1 An organisation (possibly Defra) is required to 'own' UK environmental monitoring and lead a cross-organisational body, facilitated by ERFF, to produce and implement an overarching strategy for environmental monitoring which will:

- articulate a vision for environmental monitoring (e.g, 'to secure and provide long-term data and a robust evidence base to manage the UK environment and to meet our international commitments')
- set strategic objectives and priorities for environmental monitoring (by carrying out further analysis of UK monitoring needs and how these relate to existing monitoring)
- include a prioritisation process to facilitate funding decisions by its members;
- bring together key operators to implement the strategy
- create a central process for continued coordination of environmental monitoring activity and data use.

2 In developing the vision, objectives and priorities, monitoring should be considered as part of an integrated package including research and development.

3 Ministerial support is required to endorse this overarching strategy for environmental monitoring and its implementation.

4 A top-level champion for environmental monitoring should be enlisted from within government to secure high-level support for the strategy.

5 ERFF should bring together case studies to demonstrate the value of monitoring so that key achievements can be communicated to underpin and support strategy development both in terms of cost-benefit and societal benefit.

6 Project champions from within the environmental monitoring community should lead the engagement process.

7 ERFF should demonstrate the benefits of having common objectives of monitoring and promote examples of good practice.

8 Opportunities to increase the range of uses for the data should be sought based on requirements identified by the UK strategy.

9 ERFF/individual funders should consider how to stimulate the development of technical solutions to allow datasets to be better integrated.

10 Funders and data providers should develop standards and protocols for dealing with data ownership, IPR and confidentiality issues (e.g, Ordnance Survey licensing issues).

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