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ERFF/UKMMAS

**Assessing our investments  
in observing our environment**

**Final Report and Background to the Guidelines**

Version 2.0

15 September 2008

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Authors:	<b>Zofia Stott</b>

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Assimila Ltd  
1 Earley Gate  
The University of Reading  
Reading, RG6 6AT  
Tel: +44 (0)118 966 0554  
Mobile: +44 (0)7932 565822  
email: zof.stott@assimila.eu

*Assimila Limited is incorporated in England and Wales with company registration number 5967399.  
Its registered office is located at 45 Green Road, READING, Berkshire, UK*

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# 1. Overview

## 1.1 Introduction

This report has been prepared by Assimila Limited as part of a contract to develop guidelines for assessing our investments in observing our environment. From work previously undertaken in the UK it is estimated that the UK spends between £88M and £500M per annum on monitoring. There is a need to understand this wide range of estimates and to narrow uncertainties through the development of a consistent, commonly agreed method for costing which is applicable to the very wide range of activities undertaken.

This study forms part of a major UK activity to develop a United Kingdom Environmental Observation Framework (UK-EOF) - that will identify and address the issues surrounding environmental observations made for and by the UK. The framework seeks to provide a cost effective mechanism to work in partnership across government, the devolved administrations, agencies and the voluntary sector to make best use of expertise and resources in support of national and international goals.

The aim in developing cost guidelines is not to replace existing funding/budgeting arrangements or to interfere with activities within individual organisations but to understand more clearly the basis for cost estimates, to try to put these on a common footing and to gain an overall understanding of costs associated with observing the environment. Once cost information has been collected using the proposed method it will provide one element which will feed into recommendations for funding mechanisms and levels, as part of the UK government's Spending Review 2010. A key aim for 2013 is that *"funding for observation programmes will be effective, transparent and capable of supporting the long-term information needs of the UK and the role of the UK in a global perspective."* [Ref 1]. As such the main emphasis is on looking strategically in major areas.

Today most questions related to costs and funding are difficult to answer accurately, eg:

- "How much does Defra spend on observing the environment?" Defra does not have a single environmental observation budget so answering the question requires aggregation of costs from different policy directorates.
- "What are the relative contributions of the public/private/voluntary sectors towards observing the environment?" The relative contributions of the public, private and voluntary sectors are rarely recorded using a common basis.
- What is the balance of spend on observing the environment between different policy areas or between different needs within one policy area?"
- "What are future funding requirements in the light of new legislation likely to be?" The burden of statutory and compliance monitoring is increasing with new obligations

related to European directives and environmental strategies (eg Marine Strategy) and international environmental treaties (eg revisions to OSPAR). The Water Framework Directive has been cited by those interviewed during this study as a recent example where very significant increases in monitoring resources are required as a result of new legislation.

- “What is the balance of spend between compliance/statutory monitoring and the broader needs of government and the research community?”.

The information collected on our investments will form part of the picture to assess the cost effectiveness of observing activities and help to identify areas where improved coordination and collaboration will provide benefits (eg reduced costs, improved sampling). The information will also provide valuable inputs to decision making on future needs and funding resources.

## **1.2 Sources of information**

This study has used a variety of inputs, building on work already carried out, particularly on previous and ongoing activities of the UK Marine Monitoring and Assessment Strategy (UKMMAS) and the Environment Research Funders’ Forum (ERFF). Inputs have included one to one telephone conversations, email exchanges, meetings, documents and databases of monitoring activities. Sources of information are summarised in Appendix A.

## 2. Basis for cost estimation

*The overall objective is to provide an annual, full economic cost for our investments in observing the environment, including start up costs for new activities and new infrastructure; on going operational costs; and costs of coordination activities.*

### 2.1 Definition of observations

UK-EOF is concerned with shaping the UK's capability to:

- *Facilitate the ongoing environmental evidence required to understand the changing natural environment, thus guiding current and future environmental management, policy, science and innovation priorities for economic benefit and quality of life.[Ref 1]*

There is no agreed set of definitions in use across the diverse observation community to define the scope of environmental observations, leading to subtly different understandings of the words such as “monitoring”, “observation”, “surveillance” and “evidence”, depending on the scientific or policy context.

In this study we have used the definitions of observations and environmental being developed by UK-EOF [Ref 1]:

- **Observations:** *the taking, on a reasonably regular basis, of any form of observations relative to the status of the environment, regardless of frequency of, or purpose for which, the observations are made, or however they are made (from satellites, ships, etc). Such observations are designed to meet a wide range of societal needs by providing a variety of products and services. Surveys are in scope for some work streams.*
- **Environmental:** *the broadest sense of observations from the natural environment concerning physical (including geological), chemical and biological properties of the environment. This includes observations collected on land, in air, in ice, in freshwater and in the coastal and marine environment, compliance or statutory information, Earth observations from space and the effects of humans on the environment. Note the exceptions are social science and human health data.*

There is no complete database of all activities which fall within these definitions. From a practical perspective this study has used the ERFF UK Environmental Monitoring Database [Ref 2] and UK Directory of Marine Observing Systems (UKDMOS) [Ref 3] as a guide, mindful that there are known omissions [Ref 4]; for example with respect to Earth observation from satellites and compliance monitoring.

### 2.2 The life cycle of the observing process

The life cycle of the observing process is illustrated, in simplified form, below (Figure 1). All elements within the pink “observing process” box are included for costing purposes. The

observing process starts with a requirement and ends with quality controlled data, fit for purpose and available to meet the meet its primary objective. It is recognised that the process may, in practice, be iterative or cyclic.

The “Definition and planning” and “Implementation” parts of the process include all the one off start up costs of a new activity, including the purchase of new infrastructure such as ships, aircraft, instrumentation and laboratories. The “Operations” parts of the process represent the repeated operational data gathering, analysis and data handling. Increasingly there is also an overarching “Policy, coordination, command and control” effort across a wide range of observing activities.

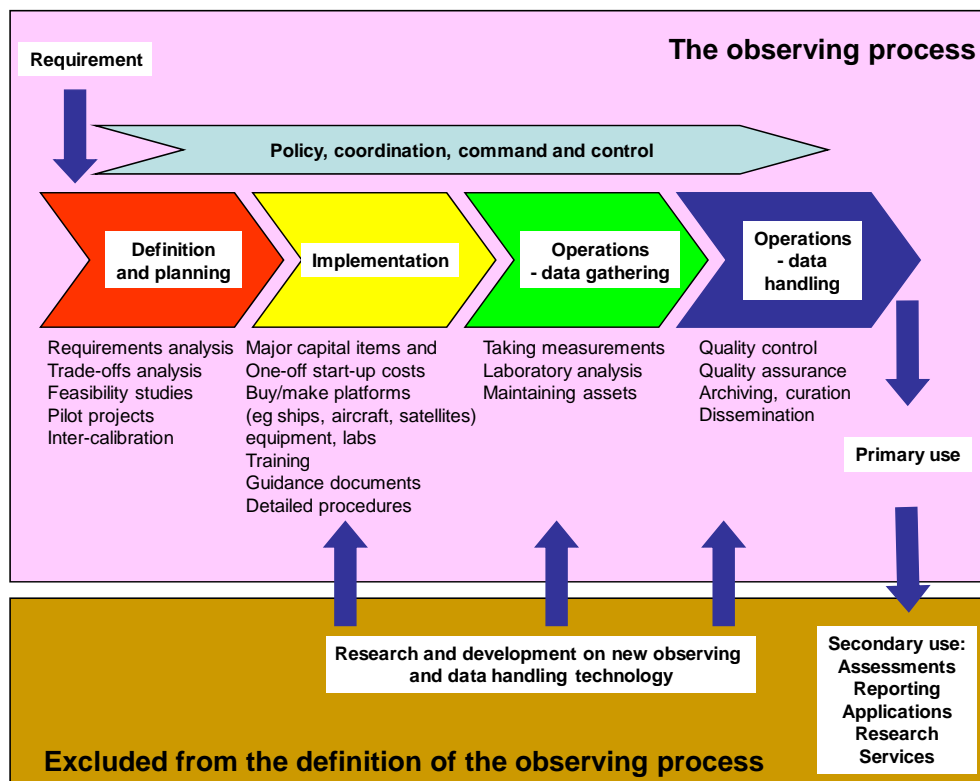


Figure 1: The life cycle of the observing process

In more detail a specific activity (project, programme) has four main parts:

- **Definition and planning:** The “Definition and planning” part of an activity takes place in the early stages. It includes requirements analysis and examination of observation trade-offs. In the context of new European Directives and Environmental Strategies and International Environmental Treaties this can be a lengthy process, requiring significant staff resources to consider the implications of what is being proposed, and to investigate and negotiate the type and level of observations required. Standard questions which will need to be answered include:

- Why is the observing activity being proposed?



- What data needs to be delivered?
- How are data going to be delivered?
- What are the timescales?
- Who will be involved?
- What are the obstacles and risks that may prevent delivery?
- What controls need to be put in place which will ensure timely delivery of the required observations?
- What are the likely costs?

The definition activity may also include feasibility studies and pilot projects to test observing options and inter calibration between proposed techniques, before final choices are made and rolled out on a national scale or agreed in an international context.

- **Implementation:** Once the observing requirements have been finalised implementation can take place. This part of the process includes all the one-off start up costs for a new programme. Observing platforms (eg satellites, ships, aircraft), instruments and equipment need to be bought and assembled, facilities developed, procedures finalised and staff trained. If the decision has been made to procure services through third parties contracts, these will need to be finalised and service level agreements negotiated.
- **Operations – data gathering:** At the end of the implementation process, operations will start. This part of the process includes observing and taking measurements, analysis of samples and ongoing costs associated with maintaining equipment and facilities.
- **Operations - data handling:** Finally the data collected will be quality controlled, archived and made available for use by primary and secondary users. This part of the process includes costs associated with, for example data centres used to record the results of the measurements.

In addition to these parts of the process attributable to specific activities, increasing there are more general coordination activities. These are shown in Figure 1 as **Policy, coordination, command and control** to capture overarching activities, either within organisations or, as in the case with UK-EOF across the UK.

The current ERFF and UKDMOS databases [Ref 2, 3, 4] have been centred on capturing a description of the operations – data gathering phase.

## 2.3 Exclusions from the observing process

Figure 1 also shows what has been excluded from the definition of the observing process (brown box). At present the following activities are excluded:

- Research and development into new observing and data handling technology
- Secondary use of the data, eg assessments (such as using data to make the Charting Progress II assessment), research using the data (eg research activities associated with the National Centre for Earth Observation), environmental services derived from the data (eg early warning, forecasts, analysis of trends etc). It is recognised that there may be some ambiguity here regarding what should be included (primary use) and what should be excluded (secondary use) – if in doubt include it and it can always be deleted later if considered beyond the scope of the costing exercise.

## 2.4 Cost categories

The different parts of the observing process, illustrated in Figure 1, have been separated as they have inherently different properties with respect to assigning costs to specific activities. The definition and implementation parts of the process are often of limited duration near the start of an activity (often identified as start-up costs). For estimation of expenditure in the definition and implementation parts of the process, the duration of activities and total expenditure will be key parameters. Using the definitions of observing the environment being developed by UK-EOF, the operational phases of data gathering and data handling will extend over many years (ongoing costs). The most appropriate costing method will be annual costs. For the policy, coordination, command and control process the most appropriate costing method will also be annual costs but it may not be possible to assign the cost to a particular observing activity.

For each part of the observing process, illustrated in Figure 1 and described in Section 2.2, a number of cost categories will apply. These are:

- Pay costs of personnel
- Capital items (platforms, equipment, instruments, laboratories)
- Outsourced services (including sub-contracts for consultancy)
- Maintenance costs, consumables
- Travel and subsistence
- Overheads
- Contributions in kind (eg voluntary sector).

Definitions of these cost categories are broadly similar from organisation to organisation (eg definitions used by NERC and Defra [Ref 6, 7, 8]), although they may vary in detail. For example, definitions relating to maintenance and consumable costs versus overheads may vary. It is recommended that organisations completing the cost information should use their standard definitions and there has been no attempt to harmonise definitions at a very detailed level. Organisations who do not have their own definitions may turn to [Ref 6, 7, 8] or Appendix B for guidance.

*The most important factor is to capture all relevant costs rather than worry unduly regarding categorization or splitting costs into cost categories.*

## **2.5 Existing information on observing the environment and related costs**

Appendix C provides information on costs within existing databases related to observing the environment. Information has been taken from the ERFF and UKDMOS databases, cost information provided by JNCC on habitats and species, the Scottish Government's information on marine monitoring and discussions with Environment Agency. These examples have provided useful checks on the level of information currently available and existing methods within UK-EOF partner organisations for assigning costs.

## **3. General issues considered**

### **3.1 Which observing activities should be included**

The cost estimates will be based around the ERFF Environmental Monitoring Database and the UK Directory of Marine Observing Systems (UKDMOS). The process of cost estimation and updating has been discussed with ERFF staff. The current databases will be used to gather cost data. The information returned from this exercise, including any new or amended activity lines will then be used to populate the redesigned ERFF database. It is intended that that the updated ERFF database will include marine data (currently stored separately in UKDMOS) and other new activity lines, eg satellite based monitoring and compliance monitoring.

Maintaining configurational control between the main databases and the cost estimates will be important. For example, where costs are provided for activities which have not yet been included in the ERFF or UKDMOS databases these will need to be clearly identified. Where updates to existing entries are made, these will also need to be identified. The aim is to overcome the current situation where various lists of activities and costs are in existence but it is difficult to identify direct correspondence between these.

### **3.2 What will be costed**

The aim will be to provide whole life cycle costs for each activity line (see Figure 1) including both start up costs, identified in Figure 1 as “Definition and planning” and “Implementation” and on-going annual costs, identified in Figure 1 as “Operations – data gathering and “Operations – data handling”.

The aim will also be to capture overarching “Policy, coordination, command and control costs” where these costs are not included in general overheads (see Appendix B for definitions of overheads). Examples of these costs include those associated with the activities of UK-EOF and coordination of monitoring activities in Defra.

### **3.3 Level of aggregation**

The current activity costs and forward looks over say 5-10 years should, ideally, be provided for each line recorded (or updated) in the ERFF and UKDMOS databases. However it is recognised that this may not be feasible for organisations carrying out a wide range of observing tasks, as part of an integrated activity. Some of the difficulties the Environment Agency would have with this methodology are summarised in Appendix C.6.

The level of aggregation should still ensure that the main environmental themes or clusters can be costed separately. It is suggested that for activities recorded in the ERFF database the costs may be provided at “topic area” level if further disaggregation is not feasible (ie air,

climate change, freshwater chemistry, freshwater ecology, geology and soil, hydrology, meteorology, terrestrial ecology, other). In the case of marine monitoring derived from UKDMOS, it is suggested that costs should be provided, as a minimum, at “project” level (ie Marine Environmental Change Network, Oceans 2025 Theme 10, UKMMAS – Clean and Safe Seas Evidence Group, UKMMAS – Healthy and Biologically Diverse Evidence Group, UKMMAS – Productive Seas Evidence Group). This will have implications for the design and presentation of costs in the revised ERFF database.

### 3.4 Annual snapshot versus cost profiles

To date most efforts at providing financial information about observing the environment have concentrated on providing an average annualised cost. In practice, with new activities incurring start up costs, intermittent surveys and replacement costs for major capital items such as ships and aircraft, there may be significant annual variability in costs. The observing process described in Section 2 also implies a cycle through activities. **Sufficient information on costs should be collected to allow expenditure related to start up costs and major refurbishments to be captured, as well as annual operations costs together with related dates over which costs are incurred.** This will allow cost profiles to be built up over the next 5-10 years.

### 3.5 Attribution of activities to observing the environment

Some major cost items may serve a number of purposes. For example ship cruises may include elements of observing, research and logistical support. Likewise data centres may be used for quality control, archiving and dissemination of observation data (included in the definition of the observing process) and archiving and dissemination of research results and related documents (outside the definition of the observing process). Those completing the cost information are asked to judge regarding the attribution of costs to observing. If in doubt the total costs should be noted in the comment column and a proportion of the figures assigned.

### 3.6 Comparison of costs and scale of activity

Providing cost information according to the agreed breakdown will improve the current estimate of total costs but cost comparisons, cost optimisation and, importantly, projections of future funding needs in the light of changing requirements also require improved information on the size/complexity of an observing activity, eg staff costs should include information on both costs and number of staff.

Organisations providing information on cost should be encouraged also to provide information on the scale and complexity of their observing activities. In the short term, this method may result in an additional burden for organisations but would provide the most complete estimate of costs and allow detailed cost comparisons and optimisations to be made.

### 3.7 Who should provide cost information?

In the first instance ERFF should direct enquiries regarding cost information to the contact person in the “Contact organisation” in the ERFF database and the “Responsible organisation” in UKDMOS.

It is understood that ERFF intends to work closely with the main organisations undertaking observing activities to obtain cost information.

### 3.8 Confidentiality of cost estimates

The issue of confidentiality of the cost inputs needs consideration. A number of UK-EOF members have already raised concerns about publishing detailed cost information. This leads to a number of issues regarding who should be able to see what information and at what level of aggregation, eg should detailed information remain confidential to the ERFF Secretariat, UK-EOF partners or made available in published reports and databases?

Those supplying the cost information will be asked to comment on confidentiality of the cost information provided.

### 3.9 General accounting guidelines

The following recommendations are made:

1. All costs should be estimated on the basis of full economic costs. Costs should include (but not necessarily disaggregate) pay costs of personnel, capital items, outsourced services, maintenance costs, consumables, travel and subsistence, overheads, Contributions in kind (eg voluntary sector) should be recorded separately. See Appendix B for detailed definitions.
2. Where appropriate, estimates of the actual volunteer time used in each scheme should be made. Standard 'costs' of the time depending on the level of skill the voluntary task involved and overheads should then be applied to provide a monetary estimate of the contribution of volunteers. See Appendix B for detailed information.
3. VAT should included where paid and not reclaimed.
4. Cost profiles should be on a “cash” basis and issues such as inflation and discount rates should be ignored at present.
5. If available, the actual costs should be provided. Otherwise, cost information may be presented in cost bands - ie: to give an idea of scale rather than to provide a very detailed tool for benchmarking each scheme. This will reduce the burden of providing the information and reduce the risks of breaching issues of confidentiality. It is recommended that costs should be provided in £0-10,000, £10,001-25,000, £25,001 - 50,000 bands and then in £50,000 steps to £1,000,000, thereafter in steps of £100, 000. It is

suggested that organisations with large and varied programmes should concentrate on the large activities, first.

6. Where appropriate, annual costs should be based on a financial year (ie April to March).
7. Where schemes are jointly funded percentage contributions from each funder should be provided.
8. All organizations providing cost information should avoid double counting.
9. The main cost figure entered by respondents is an “annualized cost”. If the activity is a one off, of finite duration the annualized cost should be calculated as: total cost/number of years. For example the cost of the definition and planning of the XXX Network is £1,000,000 and will last 4 years. The annualized cost will be £250,000. If the activity is repeated annually (ie regular operations) the current annual cost should be used. If the frequency of the activity is less than yearly, the annualized cost should be calculated as: cost of one complete activity/interval of the activity. For example, the XXX Survey takes place every 5 years. The cost of one complete survey is £25, 000. The annualized cost is £5,000.

A more detailed explanation of the suggested cost fields is listed below.

### **3.10 Cost fields in the database and explanatory notes**

The cost fields have three purposes:

- To provide an annualized cost.
- To enable cost profiles to be built up.
- To provide a breakdown of the cost calculation and assumptions. The aim is to ensure, as far as possible that all cost calculations are made on the same or a comparable basis.

ERFF will send each contact in each Lead organization an extract from the ERFF and UKDMOS databases as a spreadsheet. The spreadsheet will be pre-populated with existing information and will also include new fields to capture cost information throughout the life cycle of each activity. The guidance notes will ask the contact to check the pre-populated fields and update them if necessary. The guidance notes will also identify “mandatory” fields and “desirable” fields for the contact to complete. The contact will also be asked to fill in new activities, not captured to date by ERFF or UKDMOS. It is anticipated that ERFF staff will work with organizations to complete their cost information.

Each spreadsheet will contain 7 main blocks of information as follows:

- Information about the lead organization, the contact completing the database and level of confidentiality of the cost information

- General information about the projects or programmes associated with the lead organisation
- Information related to each part of the observing process relevant to each project or programme:
  - Definition and planning
  - Implementation
  - Operations – data gathering
  - Operations – data handling
  - Policy, coordination, command and control.

Lead organisation	Project	Definition and planning	Implementation	Operations – data gathering	Operations – data handling	Policy, coordination, command and control

The fields in each main block are discussed below with further definitions and explanations. PP indicates information that will generally be pre-populated by ERFF but may be amended by the contact. M indicates mandatory information and D indicates desirable information.

If costs cannot be disaggregated at the level of programmes/project lines in the ERFF and UKDMOS databases then aggregated costs associated with a number of lines may be provided.

Information about the organisation completing the information		
PP	Lead organisation	The organisation which has filled in the cost information for the project. Generally the request for cost information will be sent to the “Contact organisation” in the ERFF database or “Responsible organisation” in UKDMOS.
PP	Contact	The person completing the cost information for the project.
PP	Telephone	The telephone number of the person completing the cost information for the project
PP	Email	The email address of the person completing the cost information for the project
M	Confidentiality of cost information	Yes/No tick box Yes indicates cost information is confidential No indicates cost information can be publicly released
M	Confidentiality caveats	If the cost information is confidential, this text box allows the respondent to specify the restrictions on the cost information



<b>Project overview</b>		
PP	Project title	This field should correspond to the "Project title" field in the ERFF database or the "Observing programme" field in UKDMOS If the activity is not included in either database then a new title should be chosen.
PP	Cross reference to ERFF or UKDMOS	Either ERFF ID number or UKDMOS EDIOS programme id This field will help with traceability to existing databases to ensure what is being costed is the same as what is described within the databases If the activity is not included in either database then the contact should insert "new"
PP	Area	Either "Topic Area" from ERFF database or "Project" from UKDMOS.
PP	Contact person	The "owner" of the project who may be different from the person filling in the financial information
PP	Telephone	The "owner" of the project who may be different from the person filling in the financial information
PP	Email	The "owner" of the project who may be different from the person filling in the financial information
<b>Information related to definition and planning part of observing process (The boxes are repeated for each part of the observing process)</b>		
PP	Status	Choose the description which fits best. <ul style="list-style-type: none"> <li>• Closed</li> <li>• Ongoing long term (5years +)</li> <li>• Ongoing medium term (2-5 years)</li> <li>• Ongoing short term (&lt; 2 years)</li> <li>• Continuing pending funding decision</li> <li>• Proposed but unsure</li> </ul>
PP	Start year (yyyy)	The year this particular part of activity started
PP	End year (yyyy)	This field should be completed if this particular part of the activity is known to be a finite duration (eg definition and planning will generally have an end date).
PP	Brief description	General description of the particular part of the activity being costed. The information may be taken from description fields in the ERFF and UKDMOS databases, if appropriate.
M	Size and complexity	Additional information should be provided regarding the size and complexity of this part of the activity, eg number of sites, aircraft flight hours, ship cruise days, number of staff (full time equivalents).
PP	Frequency of interval of activity	The aim in this field is to capture the interval between repeat activities, if this is greater than one year. For example a survey may be carried out every 5, 10 years. The definition and planning phase may be repeated periodically before a major refurbishment etc

M	Annualised cost (excluding contributions in kind)	<p>If the activity is a one off, of finite duration the annualized cost should be calculated as: total cost/number of years. For example the cost of the definition and planning of the XXX Network is £1,000,000 and will last 4 years. The annualized cost will be £250,000.</p> <p>If the activity is repeated annually (ie regular operations) the current annualized cost should be used.</p> <p>If the frequency of the activity is less than yearly, the annualized cost should be calculated as: cost of one complete activity/interval of the activity. For example, the XXX Survey takes place every 5 years. The cost of one complete survey is £25, 000. The annualized cost is £5,000.</p> <p>The cost information should be presented as an actual cost or if actual costs are difficult to provide, then within the following bands: £0-10,000, £10,001-25,000, £25001-50,000, £50, 001-100,000. Thereafter in £50,000 bands to £1,000,000. Above £1,000,000 bands of £100,000 are acceptable.</p> <p>The cost information should be provided at Full Economic Costs and include:</p> <ul style="list-style-type: none"> <li>• Pay costs of personnel</li> <li>• Capital items (platforms, equipment, instruments, laboratories)</li> <li>• Outsourced services (including sub-contracts for consultancy)</li> <li>• Maintenance costs, consumables</li> <li>• Travel and subsistence</li> <li>• Overheads</li> <li>• VAT if applicable and not refundable</li> </ul> <p>Further definitions are given in Appendix B of this report.</p> <p>Contributions in kind (eg voluntary sector) should be recorded separately and NOT included in this annualized cost figure.</p>
M	Annualised estimate for contributions in kind (If applicable)	<p>This field should record, for example, the contribution of the voluntary sector.</p> <p>Further definitions are given in Appendix B.</p> <p>The costs included here should be IN ADDITION to those above.</p>
<b>The following fields are intended to ensure all relevant costs have been included and to provide quantitative information, if possible</b>		
<i>Qualitative information</i>		
M	Cost categories	Yes/no tick box to indicate if the cost categories used are as suggested in Appendix B.
M	Alternative cost categories	If the cost categories vary significantly from that in Appendix B, this text box allows the respondent to describe the cost categories used
<i>Quantitative breakdown (if available)</i>		
D	Cost of personnel (annualised)	Direct costs of employment (see Appendix B)
D	Cost of capital items (annualised over procurement period)	This field will record the expenditure on capital items (see Appendix B)
D	Cost of outsourced services (annualised)	See Appendix B.

D	Cost of maintenance, consumables (annualised)	Major cost items here are likely to be items such as ship time, aircraft time, costs associated in maintaining laboratories (see Appendix B). There may be some differences in accounting procedures for different organizations regarding what is included here and in overheads or outsourced services
D	Cost of travel and subsistence (annualised)	See Appendix B.
D	Cost of overheads (annualised)	See Appendix B.
M (if included)	Basis for calculation of contribution in kind	For volunteers the cost should be based on number of volunteers X time per volunteer X cost per unit time X (1+overhead) Costs rates and overheads should be based on a reasonable estimate given the level of skill and typical overheads rates, if services were to be procured professionally (see Appendix B).
<b>Who does what</b>		
PP	Organizations funding the activity	Names of organisations (including the private sector)
M	Percentage of costs provided by each funder	
PP	Organizations carrying out the activity	Names of organizations
M	Percentage of activity carried out by each organisation	
<b>Additional information</b>		
D	Anticipated changes in costs	Brief description of how costs may evolve over time
D	Comment	Any notes to help clarify entries or assumptions.

## A Inputs to the study

Documents and databases used in the study:

[Ref 1]: *"UK-Environmental Observation Framework"*, final draft of ERFF Report 05

[Ref 2]: ERFF UK Environmental Monitoring Database version 1

[Ref 3]: UKDMOS (UK Directory of Marine Observing Systems) <http://www.ukdmos.org/>

[Ref 4]: *"Strategic Analysis of UK Environmental Monitoring Activity for ERFF"*, Final Report ADAS, October 2006

[Ref 5] *"ERFF Environmental Monitoring Workshop"*, Central Science Laboratory, York, 6 September 2006

[Ref 6]: *"Calculations of Full Economic Costs"*, NERC Extranet

[Ref 7]: *"NERC Funding Streams, Definitions and Guidance"*, Version 1.3, May 2008

[Ref 8]: Defra Research Proposal (SID3)

[Ref 9]: *"The Environmental Change Biodiversity Network Business Case"*, Final Draft, ADAS, May 2008

[Ref 10]: *"Environmental Monitoring Workshop"*, CSL, York, Report of ERFF, 6 September 2006

[Ref 11]: Environmental-Knowledge Transfer <http://www.environmental-ktn.com>

[Ref 12]: *"Overview of surveillance schemes in the UK [extracted 2008-04-04]"*, Spreadsheet of surveillance schemes for habitats and species provided by Lawrence Wey, JNCC

[Ref 13] *"Providing sampling that measures the success criteria for UK BAP species and habitats"*, BRIG Surveillance Paper, 2007

[Ref 14]: *"Report of the Advisory Group on Marine and Coastal Strategy (AGMACS) Science Stream"*

[Ref 15]: *"UK Marine Monitoring and Assessment Strategy (UKMMAS) Stakeholder Workshop, Delegates' Pack"*, 13-14 September 2007, Marks Tey Hotel

[Ref 16]: *HBDSEG Efficiencies V3\_261107*, Record of efficiencies made through the UKMMAS process

[Ref 17]: *UKMMAS Requirements - Annual Costs 2007-2017 - Sources of Information*

[Ref 18]: *"A Review of Marine Monitoring: towards a National Strategy"*, A report prepared for Defra by The Marine Pollution Monitoring Management Group, Final Draft, Version 9, February 2003

Annual reports, eg BAS, EA, JNCC, Met Office

Discussions were held with and information received from:

- Beth Greenaway, Andrea Leedale, Gemma Truelove, ERFF
- Doug Wilson, Richard Walmsley, Mandy Prior, Environment Agency
- Jane Hawkridge, Lawrence Way, JNCC
- Alan Rodger, BAS
- John Rea, Defra
- Martyn Cox, Scottish Government
- Roger Proctor, HBDSEG Member covering oceanic processes, POL
- David Cotton, Marine Environment Data and Information Network
- Mike Waldock, Chair of Clean and Safe Seas Evidence Group, CEFAS
- A meeting of the UK-EOF Management Group, 19 June 2008
- Contract review meeting 26/06/08, Beth Greenaway, Andrea Leedale, ERFF; Nadine Smith, Defra; Doug Wilson, EA
- Contract review meeting 12/08/08, Beth Greenaway, Gemma Truelove, ERFF
- An assessment with Richard Walmsley of using the proposed guidelines in the Environment Agency, 29/08/08
- A final contract review meeting 04/09/08, Beth Greenaway, Gemma Truelove, ERFF

## **B Financial guidelines for cost categories**

### **B.1 Introduction**

Organisations who do not have their own methods for estimating the size of their investments in observing our environment can use the following definitions which are in line with NERC and Defra standards.

### **B.2 Pay costs of personnel**

This category should include the **annual costs of personnel working directly on the project or programme**, including salary, National Insurance and superannuation. Pay calculations on the basis of average pay costs for the grades of staff working on the programme are acceptable. If staff work part-time on the programme, then annual costs should be allocated pro rata, on the basis of 215 working days per year.

### **B.3 Capital items (platforms, equipment, instruments, laboratories)**

This category covers the procurement of all capital items. Once procured the ongoing running and maintenance costs will fall under one of the other funding categories (either outsourced services, maintenance or overheads). Some illustrative examples of typical capital investments include:

- Replacement / major upgrade of building stock such as laboratories, bases and monitoring sites
- Replacement / major upgrade of ships and aircraft
- Major IT procurement exercises (eg high performance computing, cluster computers)
- Additions / replacements to the equipment pools
- Laboratory equipment
- Vehicles purchased for field based research.

### **B.4 Outsourced services (including sub-contracts for consultancy)**

In some cases activities may be outsourced to outside agencies or the private sector.

## B.5 Maintenance costs, consumables

Maintenance costs could include items such as running cost of scientific infrastructure (eg maintenance costs for ships, mariners salary costs on the ships, servicing of equipment). In general these are costs **directly attributable to the observing activity**. For some organisations these cost may be included either as outsourced services or overheads. **The important issue is to include costs somewhere, if applicable and not to double count; rather than worry unduly about the cost category.**

Consumables are for example office and scientific laboratory supplies, (e.g. glassware, chemicals) which are purchased from third parties and replaced regularly. Consumables may also include fuel for vehicles including ships and aircraft.

## B.6 Travel and subsistence

These are annual travel and subsistence costs incurred by personnel working directly on the observing activity (ie the travel and subsistence costs associated with staff in the “pay of personnel” cost category).

## B.7 Overheads

Overheads **may** cover the direct costs of the use of services and facilities that underpin the observing activities, if these are not including in the outsourced services and maintenance categories above.

Overheads **shall** include indirect costs which cannot readily be uniquely assigned to a particular observing activity, but nonetheless contribute to the overall costs of the organisation carrying out the observing activity. These may include:

- Financial services such as accounting, tendering, marketing
- Personnel services
- Estate costs
- General staff facilities such as health and safety, training, welfare
- Departmental services such as administration, library, secretarial, printing
- Staff management and cover for maternity and long term sickness benefit.

The indirect costs should be calculated for discrete areas of activity if appropriate (ie different costs for different sites) and allocated to projects on the basis of one or more cost drivers such as square metres (for attributing the costs of laboratory or other large facilities) or time of direct staff (for contributing all other indirect costs). Salary/pay costs should not be used as a driver for indirect costs.

For universities and public sector establishments, overheads represent part of the full economic costs of the observing activity proposal. Our investment in observing the environment should include full economic costs.

## **B.8 Contributions in kind (eg voluntary sector).**

Contributions in kind arise from two sources:

- An observing programme receives contributions from other organisations, at no cost to the main observing programme. For example, the POL Coastal Observatory is funded mainly by NERC. NERC costs can be accurately recorded by staff running the Observatory. The Observatory also receives “contributions in kind” from other organisations such as CEFAS, University of Bangor, University of Liverpool. NERC personnel can make an estimate for the value of contributions in kind but the entry will need to be checked for double counting and/or accuracy by ERFF staff once all the returns have been made.
- Some programmes, particularly in the biodiversity area, are carried out by members of the public or voluntary organisations. It is suggested that an attempt is made to calculate the total value of volunteer effort for each programme annually, either for the most recent year or averaged over all years since the activity commenced. JNCC currently uses calculations based on £35.00 per hour for skilled surveyors and £11.04 per hour (twice minimum wage) for less difficult surveys. A typical overhead of ~100% can be added. The calculation used to derive annual figures should be described, eg number of volunteers per year (N), time per volunteer per year in hours (T), hourly rate used (HR) and overheads (O%) added. The total contribution per year is therefore  $N \times T \times HR \times (1+O\%/100)$ .

## **B.9 Ineligible costs**

The following are excluded from eligible costs:

- interest charges;
- hire purchase interest and any associated service charges;
- profit earned by a subsidiary or by an associated undertaking on work subcontracted under the programme;
- Contingency allowances expressed as an arbitrary percentage overall addition to eligible costs.



## C Existing cost information

### C.1 Introduction

This appendix provides a brief commentary on the review, carried out as part of this study, of existing information on observing the environment and costs.

### C.2 ERFF UK Environmental Monitoring Database

The final report on the strategic analysis of UK environmental monitoring activity for ERFF carried out by ADAS [Ref 4] and related ERFF UK Environmental Monitoring Database version 1 [Ref 2] contain some information on costs and size and complexity of monitoring. It was recognised, from the outset, that database does not capture all relevant activities (eg marine monitoring, satellite based Earth observation and compliance monitoring were excluded). In terms of capturing the whole observing process defined in Section 2, emphasis was on the operations –data gathering part of the process.

The review of the final report and related database carried out at a ERFF workshop [Ref 5] made a number of comments indicating better cost information is required:

- *“The cost/benefit analysis of monitoring could be developed and improved.”*
- *“It would be useful to rework...with spend as the metric instead of number of projects..”*
- *...reported extent of lack of funding security by survey organisations is alarming.”*
- *“Surprising reliance on voluntary sector in some topic areas.”*
- *..it was very useful to have a first stab at putting a cost figure on the totality of monitoring (ie that covered by the report.”*
- *“Expenditure is very low (are these figures reliable?)*
- *“Surprise at the high number of relatively low cost activities.”*
- *“The wide distribution of costs and benefits makes it difficult to assess and demonstrate value. As a result monitoring is undervalued..”*
- *“Data analysis, curation, interpretation and management is not always adequately funded – value of monitoring is therefore not fully realised or protected.”*

Looking in more detail at the information provided in the existing database:

- The “Brief description” field provides general information on what is monitored, how it is monitored, including in many instances some idea of the scale of the activity in terms of, for example, number of sites, sample points etc.

- The database also captures costs associated with some activities, using full economic costs and excluding VAT. Three methods of estimating costs are offered as alternatives:
  - Current annual costs of monitoring.
  - Estimate of current total cost of monitoring to date. This is from the start date and includes periods when there was no data collection. The information has been used to produce an average annual cost and is suggested for activities with fluctuating costs.
  - Approximate total cost of monitoring in the last 10 years. It is suggested that the total cost of monitoring over a 10 year period suits activities where monitoring is infrequent but of very long duration. Again information can be used to produce an annual cost.
- What exactly has been included in each cost estimate is unclear. For example, there is no attempt to ascertain the number of staff or grades of staff involved in the monitoring activity. There is also no estimate of the complexity of the activity, or the balance of resources between different cost categories.
- There is an attempt to provide a forward look in terms of amount of funds secured from April 2006 (date of database) and the status of future funding (not secured/ secured but amount unknown/ anticipated amount).
- The ERF database does not have costs associated with each entry. There is insufficient information in the database to fill in the missing costs, eg by clustering similar activities, attributing “standard costs” on the basis of information already in the database and hence estimating missing costs on a pro rata basis.

### C.3 UKDMOS and UKMMAS

UKDMOS is the United Kingdom Directory of the Marine Observing Systems, a searchable metadata database of marine monitoring conducted by UK organisations. It is complementary to the ERF database which excluded marine monitoring. UKDMOS contains metadata on parameter groups measured, frequency, start dates and other fields which can be searched spatially using GIS. UKDMOS is for the wide marine community and specifically a key output for the UK Marine Monitoring and Assessment Strategy (UKMMAS). It contains 228 high level entries which are then further subdivided, eg the UK Met Office Marine Automatic Weather Station Network (MAWS) has 22 entries associated with individual stations, the entry for the National Tide and Sea Level Facility lists 45 stations.

The database contains an excellent description of monitoring activities but no cost information. It was not developed with costs in mind. Further information would be required to start estimating costs.

Some costs have been estimated for observing the marine environment as part of UKMMAS activities (see [Ref 15-18]) but it is difficult to link these cost estimates directly to the

information in UKDMOS, to assess what has been included in terms of cost categories or the completeness of the information in terms a specific activities or elements of the observing process. UKDMOS makes no attempt to provide a forward look regarding what might be required to meet the needs of, for example, the Marine Strategy. Arguably if there is a better estimate of current costs, linked to the activities identified in UKDMOS, then it will be easier to extrapolate to future requirements.

## C.4 Surveillance schemes for habitats and species

JNCC has produced a surveillance schemes worksheet which contains information on the current surveillance effort for all UK species and habitats [Ref 12]. It has been established in coordination with the ERFF UK Environmental Monitoring Database. The worksheet aims to provide an overview of the existing and proposed surveillance mechanisms covering a wide range of taxa and habitats. This provides an insight on the extent of the current effort and provides insight on how and where improvements can be made to cover future surveillance needs.

The worksheet can be viewed in different ways using a filtering system and clicking on the heading for each column to obtain the drop down menu of groupings. This is most useful to select schemes according to what (taxonomic groups, habitats) they cover. Looking in more detail at the entries:

**Group.** Schemes are listed in alphabetical order and individually categorised under taxonomic groupings for species (Amphibians and Reptiles, Birds, Fish, Fungi, Invertebrates, Mammals, Plants), or Habitats or a Multi taxa group for surveys that cover a range of species groups and habitats e.g. common standards monitoring. Where a scheme covers more than one taxonomic group e.g. birds and mammals, then the scheme is listed under both taxonomic groups, in order to cover specific information for that group. Costs are only included once, unless there is a reason to cost the different elements of a scheme separately.

**Current or proposed scheme.** Information is included on whether the scheme is operating currently or is proposed for the future.

**Survey title and organisations involved.** Schemes are listed in the spreadsheet in alphabetical order, using the name of the survey that is most commonly used, in its correct format. The lead organisation or organisations are named i.e. those that run the survey and may provide funding. Organisations that fund the survey but are not directly involved in running it are also included.

**Cost banding of the survey scheme.** Total annual costs of each scheme have been calculated. The figures are based on known costs, or have been estimated, based on average costs for running surveillance schemes for one or more species using volunteer networks. Actual scheme costs may be subject to commercial confidentiality and the information is being held at JNCC. In the table the costs have been incorporated into cost bands, £0-25,000, £25,000 - 50,000 and then in £50,000 steps, to provide an idea of the level of cost without giving specific information on individual schemes. For periodic surveys annual estimates have been derived by dividing the cost of the survey by the number of years between surveys.

**Proportional split of funding.** The actual contribution made to each scheme from the public sector and from NGOs is also held confidentially at JNCC. In this table the percentage contribution from each sector is indicated.

**Calculating the value of volunteer effort.** The total value of volunteer effort for each scheme annually, either for the most recent year or averaged over all years since the survey commenced is also provided. The value is based on calculations of £35.00 per hour for skilled surveyors and £11.04 per hour (twice minimum wage) for less difficult surveys. The calculation used to derive annual figures is described for each scheme.

**Description of scheme.** This includes a summary description of survey design, methods used and coverage achieved e.g. number of 1km squares covered each year, number of visits in a year, time of year, walked transects, quadrats, nest box counts, equipment used etc. to provide a biologist with a good overview of the purposes of the survey and number of samples.

**Survey Frequency.** This provides information on how often the survey is carried out e.g. annual or periodic systematic survey, or continuous or periodic ad hoc recording etc.

**Species or habitat coverage.** This column indicates number and name of species, BAP or Annex I habitat covered. Where large numbers of species are covered (e.g. invertebrate recording schemes) then numbers within different groups are specified e.g. x species of Diptera, Coleoptera etc.

**Detection Scales.** This indicates the spatial scale at which change can be detected, from broadest to most local e.g. the survey may only deliver change at the UK level, or sample size may be sufficient to assess country level trends for all or some countries, or sample sizes may be sufficient to detect change at regional, habitat or Environmental Zone level.

The list does not contain information on databases i.e. National Biodiversity Network Gateway (NBN), Biodiversity Action Reporting System (BARS), indicator information etc., because these are methods of information dissemination or analysis and not actual surveys. These are, however, recognised as essential components of the surveillance framework.

Information is used directly by JNCC to look at options for meeting new requirements. [Ref 13], for example, looks at how to meet Biodiversity Action Plan priority species and habitat sampling needs by comparing what existing schemes deliver and how to enhance them to meet the need. The document shows that having a good idea of current costs means that estimates of additional costs can be made with reasonable confidence and trade-offs to optimise monitoring in the face of budget constraints can be made.

## C.5 Scottish Marine Monitoring

The Scottish Executive's AGMACS has collated a list of annual marine monitoring in Scotland [Ref 14]. Activities are grouped according to organisation carrying out the work. Personal communication with Scottish Government confirms that it is possible for many of these separate lines of activity (or groups of activity) to have their costs identified. Full

economic cost with ship costs estimated separately are possible. If costs can be developed in this way then sufficient detail should be available to analyse costs by organisation or type of activities eg mapping to UKMMAS Evidence Groups should be feasible.

## C.6 Environment Agency

The study looked specifically through the activity lines attributed to Environment Agency in the current ERFF and UKDMOS databases and the feasibility of attributing costs at the level of activity (programme/project) line. A number of issues were highlighted by Environment Agency staff:

- The activity lines include some large scale, long term activities together with much smaller, short term investigative activities.
- The EA broadly divides its activities into four categories:
  - International – ie required by law under European Directives
  - UK – ie agreed by Member States on a voluntary basis, but not required by law, eg OSPAR
  - National – ie agreed for England and Wales as part of EA's terms of reference
  - Operational – local activities to meet local needs.

The EA uses a hierarchical and highly integrated model to design its monitoring activities. Any specific data collection task will have a “primary purpose” – usually linked to an “International” requirement and will also include “embedded” monitoring. So a particular sample point will generally cover a number of purposes. These multipurpose monitoring tasks make it extremely difficult to disaggregate costs at the level of ERFF/UKDMOS programme/project lines. The level of granularity becomes meaningless from the perspective of cost attribution. It is also difficult to describe the “scale” of a particular programme line accurately (eg if 100 sample points cover 4 programme/project lines, is the scale 25 points per line; 100 points per lines; or 100 points for the primary purpose and zero for the embedded monitoring?).

Trying to attribute costs at the level of ERFF/UKDMOS programme/project lines may be very misleading for planning purposes, eg removing programme/project lines may not reduce costs for the agency. Likewise adding programme lines may not necessarily increase costs. This very non-linear relationship is difficult to model using the current databases.

Diagrammatically the issue is illustrated below:

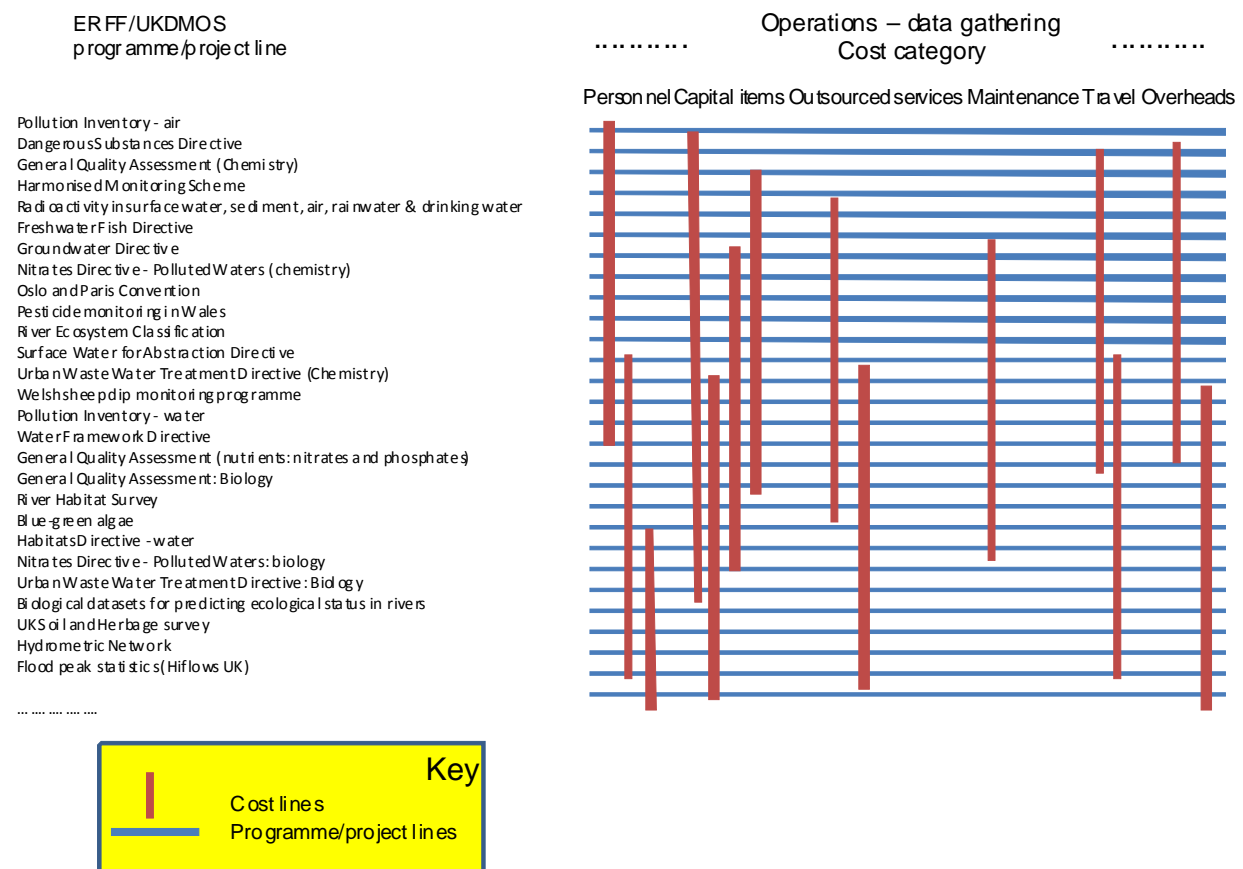


Figure 2: An illustration of programme/project lines and cost lines at Environment Agency

Discussion with the Environment agency concluded that disaggregation of costs at programme/project level is very difficult, may be meaningless, or, even worse, may lead to misleading conclusions regarding costs of future monitoring or potential cost savings.

It is recommended that the programme lines in the ERFF/UKDMOS databases are thoroughly reviewed and revised. Individual short term activities should be replaced by a general line item for local operational activities.

Costs of activities should be aggregated to avoid misleading conclusions. Activities which share monitoring sites, visits etc should be grouped together for costing purposes.