![UKEOF - ENVIRONMENTAL OBSERVATION FRAMEWORK]

# Environmental Monitoring Workshop:

# Challenges and New Approaches

# Workshop Report

**25th March 2015**

**Lancaster House Hotel, Lancaster**

# 1. Introduction

## 1.1 Background

The UK Environmental Observation Framework (UKEOF) delivered a workshop designed to facilitate discussion on potential new and innovative approaches to environmental monitoring, and inspire participants to challenge the *status quo* of current techniques.

UKEOF is a partnership of public sector organisations working collaboratively to maximise the value of the UK's environmental observations. This workshop was initiated by a Steering Group formed from representatives of the UKEOF Management Group organisations and chaired by SEPA.

## 1.2 Workshop Focus

Environmental monitoring networks are facing new environmental challenges, set against a backdrop of declining resources. Monitoring strategies require imaginative and radical review to ensure that we can continue to provide the evidence needed to protect and improve our environment. This workshop provided a platform for those who manage and are involved in the strategic direction of monitoring, particularly in the water environment, to share ideas and learn from the approaches taken by each other, and to encourage onward dissemination and collaboration both within and across delegate organisations.

## 1.3 Workshop Aims

The aims of the workshop were to:

- Share best practice, with a focus on risk based approaches
- Inspire participants to explore innovative approaches and technologies
- Challenge the *status quo* in a "safe space"
- Capture key principles to be considered in revision of monitoring networks

# 2. Summary of the Day

The workshop was held on 25th March 2015 at Lancaster House Hotel, upon the Lancaster University campus. The event was well attended with 43 participants and representation across the public sector and academia. The workshop agenda and list of attendees can be seen in Annex 1 and 2. Presentations from the day can be found on the [UKEOF website](). Feedback from attendees was positive and a summary can be seen in Annex 3.

# 3. Workshop Presentations

## 3.1 Louise Heathwaite: Opening address

The workshop began with a welcome from Professor Louise Heathwaite[1]. Louise described the Scottish CAMERAS initiative ([A Co-ordinated Agenda for Marine, Environment and Rural Affairs Science]()) which has a similar role to UKEOF, creating dialogue and collaboration to enhance delivery of evidence, with a focus on smart delivery to address complex issues. Louise

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[1] University of Lancaster and Chief Scientific Advisor to the Scottish Government Department of Rural Affairs, Food and Environment

emphasised the value of workshops such as this in encouraging "non-silo" thinking and collaboration across disciplines and organisations.

### 3.2 James Curran: Keynote talk

Professor James Curran[2] delivered the keynote talk.  James explored the future for environmental monitoring and highlighted some potentially key considerations:

- The environment is the foundation of a healthy society and prosperous economy, and our evidence-gathering must be clearly aimed at protecting the environment to enhance these core benefits.
- The interconnectedness of the environment and human and economic health needs to be repeatedly explained and demonstrated.
- Understanding that humans are part of their environment and cannot control it, but need intelligently to influence it for their own protection, is a major change in perception which is inevitably slow to spread; promoting this message may require us to help people with their local concerns, as part of building trust and credibility.
- For regulators, future success will depend on intelligence-gathering, predicting and preventing damaging environmental change and events, wise measurement and data-sharing.
- Regulators and scientists need to remain aware of the perceptions and priorities of citizens and concentrate on building trust.

### 3.3. Ian Davidson: Earth Observation monitoring at Defra

Ian Davidson[3] introduced the afternoon with a talk entitled *The Opportunities from Space*. Information on the new era of satellite-driven opportunities was given, such as Copernicus which is one of the EU's space flagship programmes, providing 8TB of new, free data every day. Ian described how Defra is keen to develop UK-level benefits, for example in areas of CAP disallowance, fisheries, air quality and flood management, and that new skills and a new culture will be required, with *in situ* reference monitoring remaining important.  Two UK portals exist for access to the data and the government is developing hub and spoke models to enhance sharing of services and knowledge.

## 4.  Break out session 1: *Devising a new water monitoring network*

The aim of this session was to encourage innovative thinking and ignore the constraints imposed by our legacy monitoring networks. Each group was asked to devise a new water monitoring network for an island roughly the size of Wales. Groups were given a short brief of factors to consider and questions to address (see Annex 4). Half of the groups were given relatively little economic constraint, similar to the likely situation within their organisation ten years ago. The other groups were financially constrained to approximately 50% of the funds that would have been available a decade ago. Key messages from the break out groups are provided below.

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[2] Chief Executive of the Scottish Environment Protection Agency
[3] Deputy Director of Sustainable Development, Noise and Nuisance & DCSA (Marine) at Defra

**4.1 Monitoring networks with constrained funding:**

- Initially the need to monitor at all should be questioned and, assuming that there is a need, monitoring should also assist engagement/education with the community as well as providing environmental data.
- Engagement, communication and ownership by the community is important, making water matter for all people but with a network fit for purpose. Communities should be encouraged to buy in to their environment, using the 'polluter pays principle' or by proving that specific actions do not cause damage.
- A model system approach could be employed, incorporating science and input from the community, with considerations of likely changes for the future.
- Initially, there should be a synthesis of current monitoring techniques with the aim to produce an adaptable, moving network (i.e. not fixed) which is informed by modelled data.
- Monitoring using citizen science methods can have value, particularly for qualitative data collection, for example, anglers, kayakers and potentially even private companies, such as those for ground water abstraction.
- Professional-led, quantitative data collection techniques would include remote sensing, satellite imagery and nutrient sensors.
- Data policy and access were highlighted as important considerations, with a focus on open source data but also acknowledgement that economic conditions can require payment for data.


**4.2 Monitoring networks without constrained funding:**

- The need to monitor at all should first be established, followed by the production of a coherent dialogue and vision for the network. General areas to consider include: environmental features to monitor; long-term baselines; research; evidence for action and to influence behaviour change; compliance/regulations to address; economic benefits; and public needs and concerns (e.g. hosepipe bans).
- Professionals, industries and citizen scientists should be involved as the beneficiaries of ecosystem services, with engagement from the beginning (i.e. during set-up of the network).
- Engagement with the community is important. Data should be shown to be serving a purpose with feedback disseminated to citizens.
- Monitoring targets should include: sea level change; water availability and quality; flood protection; ecosystem services; and economic benefits.
- Assessment could be proactive or risk-based and targeted (the latter being more valuable if funds were later constrained).
- Measurements should be made at an appropriate scale (temporal and spatial), with considerations of the scale of change and the pathways between pressures and responses.
- Prior information, such as remote sensing, should help decide which monitoring techniques to employ. Resulting methods could include sensors which do not require mains electricity; further remote sensing (e.g. unmanned aerial vehicles (UAVs)); and citizen science techniques.
- Spot assessments could be employed alongside permanent modelling methods.

Each group was also asked to assign relative importance to the size, frequency and accuracy of the monitoring network. All of the groups came to the conclusion that this would depend on numerous unknown factors and that, more importantly, the networks need to be flexible and adaptable.

**4.3 Summary of feedback:**

- Some areas were highlighted by both the constrained groups and the unconstrained groups, whereas others were only considered by one or the other – see table 1.
- All groups agreed that initially we need to question what we want our water catchments to look and feel like, and why we need to monitor them.
- Evidence, engagement and education are all important and likely to form a feedback loop between professionals and the community.
- Acknowledgement should first be made of the wider evidence base, with input into discussions of the monitoring methods to use.
- Data access, particularly open source, is important, and dissemination should feed back into the community.
- Monitoring networks should follow a triage (or tiered) assessment model of methods, based on an inverted pyramid, starting with wide intelligence gathering and the use of remote satellite methods and followed by citizen science involvement, rapid monitoring by professionals, and high quality assessments – see figure 1.

| Issue | Constrained group | Unconstrained group |
|---|---|---|
| Clear drivers and need for monitoring (NB was sign posted in brief) | √ | √ |
| Engagement of public | √ | √ |
| Need to influence behaviour (including education) | √ | √ |
| Modelling | √ | √ |
| Open access to data | √ | √ (?) |
| Tiered assessment with remote sensed and modelled data used to plan measurements on the ground | √ | √ |
| Baseline survey | | √ |
| Compliance | | √ |
| Match the expected scale of changes, and pathways | | √ |
| Ecosystem services | | √ |
| Research | | √ |
| Realising the economic value of data | √ | |
| Maintaining a responsive (i.e. not fixed) network | √ | |

**Table 1** Water monitoring network requirements highlighted by the groups with constrained funding and the groups with unconstrained funding; √ = considered important.

**Figure 2** Feedback from the groups advised that water monitoring networks follow a tiered assessment model of methods based on this inverted pyramid.
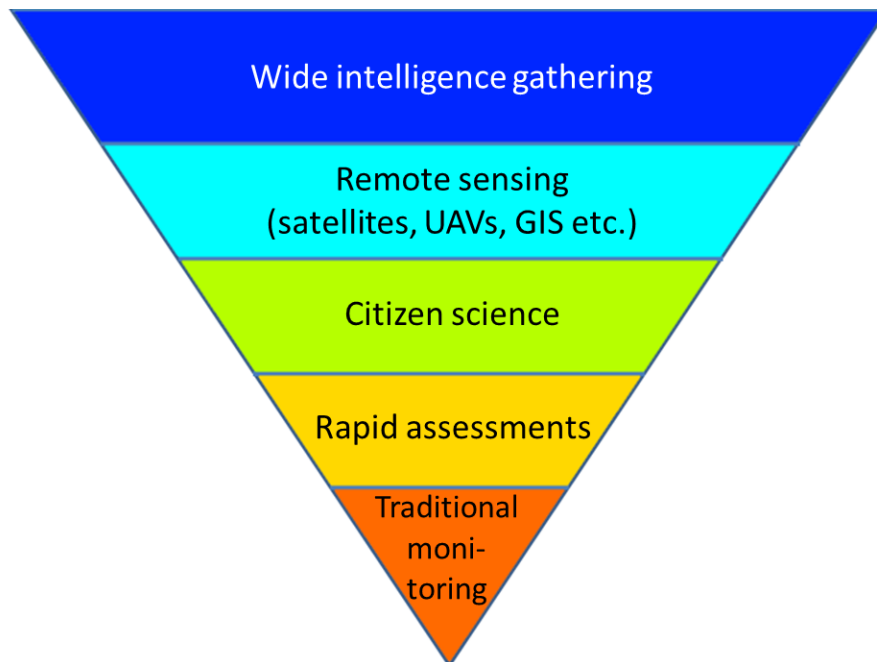


## 5. Break out session 2: *Potential issues around monitoring*

Delegates were split into four groups, each relating to a type of monitoring: triaged assessments, new technologies (e.g. sensors, eDNA), remote sensing (e.g. satellites, UAVs, GIS) and public engagement. Each group was asked to discuss the barriers to their type of monitoring, using a PEST (Political/legislative, Economic, Social, Technological) framework, and the possible solutions to these challenges.

Examples of barrier which are common across the groups include:

### 5.1 Political/legislative barriers

- Engaging and focusing politicians;
- A divergent political scene (e.g. Scotland/UK), co-ordinating different constitutions and budgets;
- Vested interests of individuals and organisations;
- Legal issues, including intellectual property rights, access to data, sites and licensing; and
- New governance required on novel technologies.

### 5.2 Economic barriers

- Reduced budgets – particularly for the introduction of new methods which could necessitate a large initial investment; and
- Proving the value of observations through impact – immediate benefits might be more appealing than long term benefits.

### 5.3 Social barriers

- Building trust between public and professional data collectors and analysers;
- Using the right language to engage people;
- Difficulties in sharing data and providing open access datasets;
- Appreciating the diversity of opinions and cultures amongst the public and organisations; and
- Culture within organisations, including a willingness and ability to collaborate and resistance to change (e.g. a tendency to continue collecting data for no apparent reason when other observations might be more useful).

### 5.4 Technological barriers

- Data format – different projects will require data in different formats;
- The cost of new technology;
- Skills needed for using the technology; and
- A lack of shared vision or no 'best practice' across or within organisations (potentially partly a social barrier).

## 6. Conclusions and next steps

The attendees were positive about the workshop and generally felt that they had gained useful insights or contacts from attending.

It was noted that similar points have been raised repeatedly in recent years, and there has been little resolution of the key issues. The group felt that if future workshops could be set a specific problem to be solved, progress would be more likely enabling us to take a step forward.

The urban environment was suggested as a worthwhile area on which to focus as it is not currently monitored sufficiently. Where risk-based approaches are used, care is needed to identify and monitor all risks e.g. solely monitoring traffic pollution on roads, when supermarket car parks could be the main hotspots.

Monitoring systems should consider current redundancies in their networks, particularly as budgets are likely to be further reduced. In 2010, SEPA reduced monitoring at river, coastal and estuarine sites in anticipation of future cuts to resources. Such a proactive approach can be difficult to implement but allows organisations to plan how monitoring networks can function in the future.

Key themes from the workshop:

- A lack of coordination at a national and international level.
  - For example, the EU currently collects data from many different sources; bringing them all together would allow more effective use of the data. Similarly, the UK's devolved authorities need to work together as the 'political' boundaries (e.g. between Scotland and England) do not make sense as monitoring boundaries.

- The culture of monitoring:
    - A major constraint to moving towards more innovative techniques and network design was felt to be cultural, with apprehension in making the step-change necessary to adopt new approaches.
- Evidence not data:
    - More use should be made of existing data to understand the environment. Rather than just collecting more data, investment should be made in making data open. This is only possible with agreed data standards and a shift in attitude amongst data-holding organisations.

## Environmental Monitoring Workshop: Challenges and New Approaches
### Wednesday 25th March 2015
Lancaster House Hotel, Green Lane, Ellel, Lancaster, LA1 4GJ

| Item | Time | Activity | Lead |
|---|---|---|---|
| | **09:00** | **Arrival and refreshments** | |
| 1 | 09:30 | Welcome and workshop aims | Nathan Critchlow-Watton (SEPA) |
| 2 | 09:35 | Welcome to Lancaster | Louise Heathwaite (Lancaster/CSA Scottish Gov) |
| 3 | 09:45 | Environmental monitoring – why we need to think big. | James Curran (SEPA) |
| 4 | 10:45 | First break out session: Devising a new water monitoring network | Group facilitators |
| 5 | 11:45 | Feedback from break out groups | George Ashby |
| | **12:15** | **Lunch** | |
| 6 | 13:15 | Defra EO talk | Ian Davidson (Defra) |
| 7 | 13:45 | Second break out session: Potential issues around monitoring | Group facilitators |
| 8 | 14:45 | Feedback from break out groups | George Ashby |
| 9 | 15:15 | Conclusions from the day | Nathan Critchlow-Watton (SEPA) |
| 10 | 15:30 | How can UKEOF help? | Doug Wilson (EA) |
| | **15:45** | **Close** | |

| Name | Organisation | Email |
|---|---|---|
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**Attendee List continued**

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| --- | --- | --- |
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**Workshop Feedback**

The figures below include results from 17 workshop attendees.

|  | Poor | Average | Fair | Good | Excellent |
|---|---|---|---|---|---|
| **Venue** |  |  |  | 47% | 53% |
| **General organisation** |  |  |  | 59% | 41% |
| **Relevance to your job** |  |  | 12% | 47% | 41% |
| **Opportunity for discussion** |  |  |  | 65% | 35% |
| **Devising a new network** |  |  | 53% | 41% | 6% |
| **Potential issues around monitoring** |  |  | 47% | 47% | 6% |
| **Feedback sessions** |  | 6% | 23% | 65% | 6% |

**What were you hoping to get out of the workshop?**
- Networking, sharing ideas and case studies of how to review monitoring programmes
- Insight into the Defra One Monitoring strategy
- Scope and approaches across UKEOF
- Solutions, e.g. utility of satellites

**Were your expectations met?**
25% of attendees who provided feedback noted that there expectations of the day were fully met, and 75% were partially met.

**Will you circulate information from the workshop within your organisation?**
94% of attendees noted that they would circulate information within their organisation.

**How will the information provided today be of use to your organisation?**
- Developing novel monitoring strategies
- Background to cost savings
- Opportunities for earth observations
- Considering communities in outcomes

**Could we have included anything else?**
The following ideas were noted:
- Agreed next steps
- Separate session on how to scale back and optimise design of a network
- Case studies
- Integration of the important questions highlighted at the beginning of the day

**General comments**

- Morning discussion was too open, could have had more focus, but good networking opportunity
- No time to discuss solutions after the PEST analysis of barriers
- Quiz group exercise was fun and useful, but hard for participants to think outside the box
- Might have been useful to have representatives from other fields (non-environmental)

**Annex 4**

Break out session 1 - guidance notes

You are asked to devise a new water monitoring network for an island roughly the size of Wales. You should consider multiple factors, including:

- *Agriculture, land use*
- *Hydrology*
- *Morphology*
- *Long term climate change*
- *Pollution*
- *Flooding*
- *Hydroelectric power extraction*
- *Tidal lagoons*
- *Remote parts of the island*
- 

You should also consider the following questions:

- *Why are you doing the monitoring? What are you trying to achieve?*
- *What relevant techniques have previously been tried and tested? Why did some not work?*
- *What techniques would you use in your network and how do you define/explain them?*
- *What are the likely technologies for the future?*
- *What is the role of good data design and transfer standards for your network?*
- *What would be the role of partnerships (industry, public, etc) and how would these collaborations work?*