

A COORDINATED AGENDA FOR MARINE, ENVIRONMENT AND RURAL AFFAIRS SCIENCE (CAMERAS) (2011-2016)

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1. Background

The Coordinated Agenda “proposes that each public body supporting science relevant to the Scottish Government’s policies related to Marine, Environment and Rural Affairs will use this Coordinated Agenda (CAMERAS) to help align their scientific activities to avoid duplication and promote collaboration between the organisations”.

The Royal Botanic Garden Edinburgh (RBGE) is one of the public bodies in Scotland that undertakes science relevant to the environment and therefore welcomes the opportunity to take part in the consultation on the *Coordinated Agenda* and would have been equally willing to have helped contribute to its development.

2. The Royal Botanic Garden Edinburgh

The RBGE is a Non Departmental Public Body, managed under a Board of Trustees, with a remit defined by the National Heritage Act (Scotland) 1985. As one of the world’s most long established and highly regarded botanic gardens, the RBGE is both a popular educational visitor attraction and an internationally renowned research institute. This enables RBGE to support the Scottish Government’s focus on creating a more successful country by contributing to no fewer than eight of the National Outcomes (as set out in RBGE’s Business Plan).

RBGE is one of Scotland’s most internationally facing institutions, holding in its National Collections preserved reference specimens of plants from over 160 countries and living plant germplasm from 165 countries. As one of the world’s four leading research botanic gardens (the others being Missouri Botanical Garden, New York Botanical Garden and the Royal Botanic Gardens, Kew) these international resources mean that the RBGE is looked to for support by many countries around the world. Consequently, RBGE has some level of direct engagement with scientists in about 90 countries and active research collaborations in over 40 countries including strategically important economies such as China and the Middle East.

RBGE also contributes to the education and training of professional plant scientists and horticulturalists and to public engagement in scientific issues, particularly the closely coupled issues of biodiversity loss and climate change. Whilst education and public engagement are not addressed in the

Coordinated Agenda, they are an important component of the RBGE's contribution to the *Scottish Science Strategy* which places emphasis on Scotland on the world stage. The *Scottish Science Strategy's* focus on 'developing individuals' is also strongly supported by RBGE which, through a variety of strategic alliances, contributes to the development of Scotland's human capital through the widest programme of education and life-long learning of any Botanic Garden. This includes:

- the primary and secondary school curriculum,
- tertiary education through HND and BSc courses in Horticulture and two MSc courses (*Plant Biodiversity and Taxonomy* with the University of Edinburgh and *Art, Space and Nature* with Edinburgh College of Art). A Masters in *Architecture and Horticulture* is under discussion,
- a PhD programme in partnership with most of Scotland's established universities and
- an extensive adult education programme.

The *Scottish Science Strategy* focuses on making science relevant, a concept central to the development of the £15.7M John Hope Gateway which will enhance RBGE's capacity to engage with the public on major issues of the day including. Unlike traditional science centres, the RBGE offers public outreach in the heart of research institute and direct engagement with practising scientists and other professionals. This will build on considerable experience of scientific engagement. Since the inception of the Edinburgh International Science Festival, RBGE had been largest individual venue attracting almost half of all participants in the Festival.

3. The Coordinated Agenda for Marine, Environment and Rural Affairs Science

General Comments:

The key message of the *Coordinated Agenda* is that working in partnership is good. However, the subtleties of the document are much harder to understand because it is written in impenetrable jargon.

Almost everything the RBGE does is done in partnership with other organisations. The RBGE therefore welcomes anything that leads to closer coordination and cooperation. However, in practice much will depend on how the "alignment and direction" referred to in the *Coordinated Agenda* are achieved. It is to be hoped that the emphasis will be on supporting scientific excellence and not on organisational change for its own sake. The *Coordinated Agenda* says little about operational matters.

The close proximity of a wide range of excellent universities and research institutes in Scotland gives the country a natural competitive advantage in collaboration. In the recent past one of the most effect mechanisms for promoting scientific collaboration between institutions was the Flexible Fund which regrettably is no longer available.

The diversity of organisations, individuals and interests addressed through the *Coordinated Agenda* could be very much broader. The paper focuses too narrowly on the contribution of the MRPs when there are many other relevant players who can contribute to these issues in Scotland including, for example, the national collections (Museums, Galleries, Archives and RCAHMS all have relevant collections, expertise and communication networks), existing networks such as the Edinburgh Centre for Rural Research (and all of its member organisations), the art and architecture communities (who are closely engaged with issues such as climate change) and the business community.

Another general point that is climate change and biodiversity are not confined to the countryside. The implied exclusion of urban Scotland makes no scientific sense whatever its logic in relation to the realities of organisational boundaries and portfolios in the Scottish Government. If this exclusion is unintended it would be worth making it clear that urban contexts are included.

Answers to Specific Questions:

Headline Themes

1. Do you agree that the two broad categories of “Local Responses to Global Change” and “Optimising the Potential of Scotland’s Natural Assets” are helpful in providing an overlying structure to the Co-ordinated Agenda?

The first yes, the second no. The local dimensions of global change are both more difficult to predict (at present) and more immediate in their impact than regional responses. Research at RBGE is increasingly oriented towards how a wide range of organisms (from fungi to lower and higher plants) are responding to climate change. Joint research with the University of York uses the bioclimatic envelope approach to model the future ranges of important plant species (such as bamboos in China). The herbarium at RBGE provides underlying data on plant distributions that could be used to develop a detailed, species level model of the response of plant species and communities to future climate change.

It is not clear what “Optimising the Potential of Scotland’s Natural Assets” means.

2. Are the descriptions of these set out in Section 3 (and Annex 3) comprehensive?

The first yes, the second no (see above).

3. Do these cover the major policy challenges where science can contribute as you see them?

No. The *Coordinated Agenda* is too selective in its scientific focus. The importance of the Convention on Biological Diversity (CBD) and subsidiary policy initiatives such as the Global Strategy for Plant Conservation (GSPC) is a conspicuous gap. As a result the links to the *Scottish Biodiversity Strategy* are not made. There are other gaps: science can and should contribute to a much wider range of major

policy challenges concerned with education, health and social inclusion.

4. Are they likely to remain broadly relevant over the longer time horizon (well beyond the 2016 focus of this Coordinated Agenda)?

It is clear that global environmental change will be the defining issue of the century ahead. We are uncertain about “Optimising the Potential of Scotland’s Natural Assets” because we are not clear what this means.

5. Do you agree with the description of support for the National Capability Theme set out in Section 3 (and Annex 3)?

Broadly, yes.

6. What facilities, resources and data do you think are important for Scotland to maintain?

There is a need to establish and maintain at least a minimal level of taxonomic expertise across the range of organisms that make up the biodiversity of Scotland otherwise it will be impossible to monitor the effects of global change. However, in some important groups of organisms, including fungi, algae and lower plants (bryophytes and pteridophytes) there is a significant lack of human capital (as a recent report by the House of Lords Science and Technology Select Committee has pointed out).

For similar reasons, in relation to monitoring environmental change, detecting alien invasive species and in protecting threatened species, there is a need to digitise and mobilise information held in static, non-computerised archives such as the National Herbarium at the RBGE. Digital images of herbarium specimens could be used to develop on-line systems for identification, to provide data for modelling climate change and to compensate, in part, for the limited human resource of taxonomic expertise. Investment in the National Archives of Scotland has enabled digital images of over 15 million records to be captured as part of “ScotlandsPeople”. Capturing images of the RBGE’s 3 million herbarium specimens, which record the distribution of plant species in Scotland over the past three centuries, to create “ScotlandsPlants” is a smaller task but with great relevance to future scientific needs.

Cryptogamic plants and fungi provide particularly sensitive barometers of environmental change and should be at the heart of new monitoring programmes, to be associated with long term environmental monitoring sites.

7. Are there other resources that Scotland needs to acquire to support future policy development?

Given the high levels of uncertainty about the extent and pace of global climate change as it will affect Scotland and the world, there is need to retain a strong basic science base in the environmental and biodiversity sciences and to develop the scientists of the future through

innovative programmes designed to attract young scientists to pursue PhD level research within Scotland.

Policy Issues

8. Have we correctly identified the key policy issues and the associated scientific opportunities in Section 3?

No, there are significant gaps: biodiversity policy, educational policy and health policy being the most conspicuous.

9. Are there additional issues that should be included?

Biodiversity, education, health, social equality.

10. What do you think will be the most important influences on Scotland's future in the Marine, Environment, Rural Affairs and related areas?

- Climate change and its impacts on biodiversity, on agricultural systems and on every aspect of human existence.
- The need to move to a low-carbon economy and the need to engage with the public in order to achieve this transformation.
- The need to increase investment in science and education as an investment in the future economic success of Scotland.

11. Why do you think these are important?

12. Are there other scientific opportunities which should be highlighted?

Many. For example, the emerging technology of DNA fingerprinting has a strong focus in Scotland (the chair of the consortium for plant barcoding is at RBGE) and the potential to provide powerful diagnostic tools for the identification of native or alien species in the future.

The Science

13. What existing areas of Scottish based scientific expertise should be maintained to contribute evidence to key policy issues?

A broad range of scientific expertise needs to be maintained to contribute to the wide range of evolving policy issues. Investment in physical or virtual centres of excellence could help to ensure alignment of expertise with policy.

14. How clear is the relationship between the scientific areas and the key policy issues?

Not very clear.

15. In which areas of science can we continue to make use of expertise supported elsewhere e.g. at the UK, EU and international levels?

Very few if any. Science itself is international and the existence of expertise elsewhere is of great benefit to Scotland but is unlikely to choose to focus on scientific questions framed with reference to Scotland.

16. In the time frame for CAMERAS (2011-2016) what new emerging areas of science are likely to mature and become available for more general use or application?

- DNA barcoding for species identification.
- Virtual on-line herbaria for species identification.
- Models for the impact of climate change on biodiversity at local as well as regional levels
- Models for adaptation and/or mitigation in response to climate change

17. Do we have the expertise available to be able to use these new opportunities?

In part, though continued investment is essential, especially in the development of PhD studentships with an interdisciplinary, future-oriented focus.

18. In which areas does Scotland need to be self reliant?

Scientific self-reliance is a fundamental key to economic success. We need to be self-reliant in the biodiversity sciences and in the capacity to monitor and model the particular circumstances and impacts of global change on Scotland at a local level.

Delivery

19. Knowledge Exchange is essential for scientific activity to achieve impact. Do you agree that KE should be an explicit and integral aspect of the delivery of this Coordinated Agenda.

It should be an integral part of all science.

20. How can we continue to improve the integration of evidence from a diverse range of sources into forms that are accessible to end users?

The development of on-line resources is an important component of the solution but public audience and end-users need to be able to interact directly with practicing scientists.

21. How can we reconcile the requirement for science to be responsive and flexible to short term demands while at the same time ensuring that longer term strategic research continues to progress our knowledge and understanding?

By investing in and supporting long-standing institutional centres of excellence that provide the base within which individual scientists can respond to specific, shorter term needs.

Through funding mechanisms like the Flexible Fund that allow multidisciplinary teams to form quickly around topics requiring the rapid generation of new knowledge.

22. How can we ensure that the 2 way flow of knowledge from science to policy and from policy to the academic community is optimised?

By opening up the debate so that it is not restricted to narrow panels of commissioned experts but instead is open to wider participation from

the scientific community and beyond. The question suggests that “science”, “policy” and the “academic community” are three different things. Ideally the interaction should simply be between people. Organisations such as the Royal Society of Edinburgh provided an excellent platform for such open dialogue and the sharing of knowledge. It is noticeable that their meetings attract a broad cross section of active and retired people from many different walks of life.

23. Are there alternative structures/systems or new approaches/organisations that could enhance these flows?

Yes. Many. Seminars, conferences and workshops are routinely employed to share experiences. Consortia and virtual institutions of many kinds can create centres of excellence to focus on any specific topic. The Scottish Biodiversity Forum provides an excellent example of a networking activity that attracts hundreds of people from the professional and voluntary sectors who come together to support the Scottish Biodiversity Strategy and the Scottish Biodiversity Committee.

24. Are there science delivery models which could provide examples of good practice for Scotland to follow?

There are already many models of good practice to be found in Scotland.

General Comments

25. We would also welcome any other general comments you may have on any of the issues raised in this document.