

SEPA's Response to the Consultation on Science in Support of Marine, Environment, Rural Affairs and Related Policies of the Scottish Government – A Coordinated Agenda for Marine, Environment and Rural Affairs Science (CAMERAS) (2011 – 2016)

Headline Themes

Question 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?

Yes/~~No~~

Comments

The two broad categories cover the major issues identified by SEPA and they should be broad enough to cover most, if not all, eventualities over the next 30 years. Climate change has correctly been singled out as a major global driver, but some consideration should also be given to other global trends, both those already identified (e.g. biodiversity decline) and those yet to be identified.

SEPA is surprised by the lack of reference to quality of life and human health issues under these themes. There is growing recognition of the link between the environment and human health, both in terms of pollution leading to poor health (e.g. asthma) and also in a poor quality local environment leading to health and societal problems.

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

Yes/No

Comments

The second Headline Theme (Optimising the Potential of Scotland's Natural Assets) does not appear to recognise Scotland's people as part of its natural assets and yet making full and effective use of this resource (through education, training and development and 'green jobs'). This is clearly crucial to delivering sustainable economic growth, particularly in view of our demographic transition (there are more people in Scotland over the age of 65 years than there are under 18 years) and the increasing concerns regarding the influence (both beneficial and detrimental) of the environment on human health.

The third Headline Theme (Support for Nationally Important Rural, Environmental and Marine Capability and Resource) does not appear to cover adequately the good governance of science and research activities and the interaction and collaboration between partner organisations. The UK Government Office for Science (formerly the Office of Science and Innovation) aims to maintain and improve the quality and use of science across government departments and there is perhaps something to be learned from their [Science Review Programme](#). This type of assessment and review could usefully be extended to include the statutory duties and environmental monitoring and assessment conducted by Scotland's science providers (regulators).

Regarding “Local Responses to Global Change”, it is important to identify who is responsible for assessing which areas of land could be brought into more intensive agricultural use (to increase our output) as a result of climate change, and who will advise land-owners and farmers accordingly.

Regarding “Optimising the Potential of Scotland’s Natural Assets”, we need to ensure that we maintain and, if possible, enhance our global standing in the development and deployment of marine renewable energy schemes. It needs to be acknowledged that at present, although some progress is being made, we are not progressing rapidly enough.

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

Yes/No

Comments:

The economy of Scotland and the wellbeing of its people are inextricably linked to and contingent upon the quality of Scotland’s environment (e.g. ecosystem services and biodiversity). More directly, the success of Scotland plc relies on it valuing and protecting our built and natural environment.

CAMERAS aligns broadly with the Strategic Objectives and [National Outcomes](#) in the Scottish Government’s National Performance Framework. However, it appears to focus on marine and rural communities rather than on the urban environment where most of Scotland’s people live.

Furthermore, whilst covering some of the main policy challenges, CAMERAS does not adequately address the significant influence of the environment on some outcomes, notably: (a) “We live in well-designed, sustainable places where we are able to access the amenities and services we need”; (b) “We live longer, healthier lives”; (c) “We value and enjoy our built environment..... and protect it and enhance it for future generations”; (d) “We are better educated, more skilled and more successful....”; and (e) “We reduce the local and global environmental impact of our consumption and production”.

Human Health and Better Quality of Life are poorly covered. Health is only referred to under food policy and then only under health inequalities. Bearing in mind that RERAD is currently running an Environment and Health research programme, this subject should be given more emphasis. SEPA would expect to see more formal links being made with other strategic initiatives such as [Good Places Better Health](#).

Scotland has some world-renowned science and research providers and this provides a very significant stimulus for education, training and development, and employment of its people. Scotland recognises the need for science and innovation to ‘kick-start’ and promote its economy and, to this end, it is vital that we continue to provide interesting and exciting opportunities in environmental science and research.

A key policy challenge is to ensure that our responses to issues are both holistic and integrated. By having two major themes, this framework does reduce the likelihood of single issue responses. SEPA suggests that we identify the key questions and issues under these themes recognising that any such framework will inevitably be incomplete and that we can add new issues if required.

SEPA recognises and wishes to highlight the potential tension between EU drivers for uniform environmental standards (e.g. ecological status in surface waters) and the need to set local or regional priorities to enable sustainable economic growth. There is a strong argument for providing regional flexibility for prioritising action supported by more flexible funding support from the EU.

It is important to recognise the potential benefits of more joined-up thinking and working in the various fields of environmental science, policy and regulation. For example, there is considerable benefit in joining up work on renewable energy with the science surrounding its impacts on soil, climate, agriculture, and food and looking at the bigger picture in a more holistic way rather than focusing solely or primarily on targets for reducing GHG emissions (albeit very important). The impacts of land use change are also very important and it is unclear to what extent and how these would be covered by the headline theme on Local Responses to Global Change.

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

Yes/~~No~~

These two headline themes will clearly extend beyond 2016, although the areas of focus under them will inevitably change over time. It is essential to use these two themes to promote holistic and integrated thinking and formulation of solutions.

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

Yes/~~No~~

Comments

SEPA is encouraged by the emphasis given to “Support for Nationally Important Rural, Environmental and Marine Capability and Resource”. In relation to this, the headline theme on “Optimising the Potential of Scotland’s Natural Assets” refers very briefly to carbon storage and food production; it would be helpful to elaborate on these two topics.

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

Comments

It is essential that Scotland maintains and develops its science and research capacity if it is to provide the robust scientific and targeted advice required to optimise the use and potential of the nation’s natural assets and respond efficiently and effectively to unforeseen environmental events such as oil spills and BSE. Scotland has a number of excellent science and research providers with the potential to understand the myriad of complex processes and interactions taking place in the environment and thereby, through robust evidence, inform better environmental assessment and regulation.

It is essential that Scotland's science providers and regulatory bodies work more closely together and that they focus more on cross-cutting projects which link 'concept to coalface', and thereby provide excellent support to regulatory activities. A key element of this will be to ensure early and joint identification by relevant stakeholders of the key questions, the key areas and the key data sets that underpin this approach – and that this is then clearly linked to defined outputs.

The Scottish Government recognises that science is vital for Scotland's future and will help to deliver essential improvements in public services, identify strategic growth opportunities for business, attract inward investment and jobs, and find answers to global issues which impact our daily lives ([Science for Scotland](#)).

Long-term data records are an essential resource in helping us to understand and respond to climate change and loss of biodiversity. These records help us to assess and understand current trends and place these in the context of longer term changes. Such data sets can only be maintained with a "national capability" type funding; one which recognises that a whole set of Scottish scientific organisations need to be seen as vital stakeholders in any discussion about the future development of capabilities. For example, it is essential that Scotland maintains a national monitoring network for water, air and soil and that the information (in an appropriate format) can be obtained freely and readily by all those who need it.

It may be timely to review the current state of Scotland's national capability and confirm its fitness for purpose in the context of CAMERAS and the Scottish Government's National Performance Framework; and also in relation to similar or overlapping capabilities for global scientific issues that may be accessible on a UK, European or global basis.

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

Yes/~~No~~

Comments

There is a growing need to develop robust models to inform and promote communication and interaction between scientists and policy makers and thereby encourage the transfer of science into policy.

There is also an urgent need to extend this to development of communication models with the general public, to help increase their engagement with and trust of science in its broadest sense.

Policy Issues

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

Yes/No

Comments

Some of the key policy issues and associated scientific opportunities have been correctly identified. However, there is a distinct lack of focus on biodiversity and human health.

The key policy issues align well with the Scottish Government's overall agenda. It is particularly pleasing to see this consultation document beginning to address issues of how the science is delivered, as well as considering the development of science topics in their own right. The focus on integration, both in terms of multidisciplinary work and in integrating the timeline of science and research, is also very welcome.

The process used to deliver science and transfer it into policy and operations is critical to its success. This will allow CAMERAS to be flexible to problems and issues that emerge, whilst creating a framework around which different organisations can engage.

The issues of data ownership and access have not been addressed and yet there would be merit in doing so. Many science and research projects could have been improved had the scientists had better access to environmental data held by other organisations. Intellectual Property Rights and the "trading account" model that some organisations operate are both barriers to good cooperative working.

Another issue that warrants more investigation is that of "providing the right solution for the right problem". There is a need for information to be available in an appropriate form at a number of levels so that the proper detail and focus can be applied to a particular problem.

Question 9 - Are there additional issues that should be included?

Yes/~~No~~

Comments

A number of additional issues should be included, most notably the influence of the environment on human health and well-being, the built environment, and the role of science in stimulating a successful, science-led economy (including the economic value that investment in Scottish science itself adds).

SEPA recognises the need for information on environmental status. It also recognises the need for complementary information (similar format) on economic and social status. All three aspects (environmental, economic, and social status) need to be considered together if we are to provide a reasonable assessment and overview of sustainable development in Scotland.

There is a need to ensure (via a well-defined process) that the combination of activities covered by CAMERAS contributes fully and effectively to sustainable development. Although individual activities may not contribute much in isolation (e.g. they may have a purely economic or social focus), there should be a mechanism for promoting a balanced and integrated assessment of economic, social and environmental issues. The programme appears to be very focused on economic issues and lacks commensurate consideration of social and environmental issues.

It would be useful to define more precisely (possibly via focused research) what is meant by "sustainable" at a local, national and global level and what is meant by

“balancing economic, social and environmental impacts”. For example, how does one assess what balance is desirable?

The assigning of ‘value’ to our natural assets requires that we develop a full descriptive understanding of the services that these assets provide (these include ecosystem services, environmental benefits, and societal and economic values; both use and non-use values should be considered). The document does not appear to address this matter. This point also applies to the issues raised in relation to assigning ‘values’ to good places and ‘costs’ to poor environments.

Regarding the question on page 14 of the consultation document “How can science make a contribution towards reducing the levels of inequality and disadvantage amongst Scotland’s people?”: Clearly, we do need more “good places” and we should aim to use science through legislation and regulations (e.g. WFD (CAR), Flooding Bill) to deliver these. Social change (attitudes and behaviours) is also needed and we all need to work together to help Scotland’s people appreciate, use and value Scotland’s environment. Litter is a rather trite example but is one that serves to illustrate the difference between peoples’ attitude and behaviour in ‘socially deprived’ areas and that in ‘wealthy suburbs’.

Regarding economic growth, there do not appear to be any targets covering the proportion of Scottish GDP that is generated from private investment. Scotland would benefit considerably from more private and environmentally-sustainable wealth creation. Scotland has lost most of its manufacturing capacity in recent decades and this shortfall is not being adequately addressed at present.

Finally, in relation to climate change, but also in other areas of environmental change, a clear distinction and emphasis on science priorities related to the twin areas of adaptation and mitigation would be useful – particularly in the policy context.

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

Comments

There are many important influences, including energy, ocean acidification, biodiversity loss, demographic change and climate change. Waste management will also be a crucial factor affecting the sustainable use of land and the wider environment. It is worth referring to the work of the Environmental Research Funders’ Forum ([ERFF](#)) which has produced a prioritised list of the dimensions of uncertainty affecting or likely to affect the UK environment.

The consultation document mentions “commercial fish stocks”. However, it does not mention aquaculture and yet aquaculture is a ‘lifeline’ for many rural communities and it can be (and needs to be) both environmentally and economically sustainable. Furthermore, the Scottish Aquaculture Research Forum ([SARF](#)) appears to represent a good example of a well-integrated and holistic programme of research that serves the needs of the industry, protects the environment (and helps to optimise its potential), and promotes economic growth and the well-being of rural communities.

Air quality and atmospheric deposition have a significant influence on human health and terrestrial biodiversity. We feel that these issues should be given greater prominence in this document. The importance of biodiversity and ecology to the

economy was highlighted recently in the [ENDS 30th anniversary lecture](#) by Sir John Harman.

Question 11 - Why do you think these are important?

Comments

These factors are important because of their wide-ranging and cross-cutting nature and their potential to impact across all sectors especially the economy.

Question 12 - Are there other scientific opportunities which should be highlighted?

Yes/No

Comments

The massive global investment in nanotechnology and nano-materials will continue to have significant implications for Scotland's economy as well as presenting uncertainties and concerns over the fate, behaviour and effects of such substances in the environment. [REACH](#) will also have significant implications for the future of Scotland's economy in terms of promoting the innovative capability and competitiveness of the chemicals industry and helping to protect human health and the environment through better and earlier identification, assessment and management of the intrinsic properties of chemical substances.

The Science

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

Comments

Genetics, biotechnology and nanotechnology are significant pillars on which to build Scotland's economy (see response to Question 16).

Much of the science in SEPA is conducted to enable us to report on the state of Scotland's environment and to support sustainable development through appropriate regulation. This work is essential in providing the evidence base for sustainable economic growth. Maintenance and indeed further development of such baseline "state of the environment" science is crucial to underpinning our wider understanding of pressures, pathways and impacts relating to environmental change.

In an ecosystem services management model the appropriate valuation of such services will facilitate regional prioritisation of measures to support both economic growth and optimisation of Scotland's natural assets. This model should be developed further under CAMERAS to ensure that NDPBs and SG science work at the same speed and in the same direction for distinctly Scottish needs.

We should consider the scope for science to support the Scottish rural economy through innovative surveillance and monitoring that engages the public (e.g. local flood forecasting; environmental pressures and impacts; evidence for climate change).

Government funding (or stronger direction within CAMERAS) of a more extensive long-term environmental change network is necessary if we are to gather relevant evidence (long-term trend data; ECN) of climate change in Scotland and influence change at the global level.

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

Comments

This relationship is very strong in some areas and less strong in others. There are no particular areas which serve as good generic exemplars.

Question 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?

Comments

Scotland should focus its research investment on issues that are uniquely Scottish (e.g. the significance of peat bogs for carbon balance) and draw on EU and international partnerships to address the broader issues. Such collaboration is exemplified by the [LWEC](#) (Living With Environmental Change) and [SKEP](#) (Scientific Knowledge for Environmental Protection) partnerships.

While it is necessary and relevant to interpret scientific information in a Scottish context, SEPA also recognises and wishes to highlight the importance of influencing the wider EU policy context for sustainable development. SEPA has been actively and effectively involved in work at an EU level for several years and this has helped to ensure that Scottish economic needs are duly considered and accounted for.

Question 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?

Comments

There continues to be enormous global investment in nano-technology and biotechnology and both of these fields have the potential to contribute to the sustained and sustainable growth of Scotland's economy. Nano-materials are being developed at a rapid rate and their application to renewable energy (in areas such as coatings to improve photovoltaic cells) is already progressing well in other countries. Renewable energy technology itself is also advancing with the use of piezoceramics and biomimicry having the most potential for application and uptake within Scotland. However, transmission and decentralised utilities are critical factors affecting the development and viability of renewable energy generation and supply in Scotland.

The concept of ecosystem services and the valuation of public goods and services delivered by the wider environment is still as yet a relatively undeveloped area of science. How fast and how well accepted this area of science becomes will be important for a better understanding of the costs and benefits of options for environmental management.

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

Yes/No

Comments

Scotland has a flourishing renewable energy sector and has considerable experience and expertise in the generation of energy from first generation technologies (e.g. wind farms and basic biomass plants). However, it does not have the same level of experience and expertise in the next generation of technologies (e.g. algal bio-fuels and piezoceramics) so needs to invest in these areas in order to realise their potential.

On the ecosystem services front, research pooling could enable Scotland to tackle key areas, but we need to further develop expertise around identification, allocation and valuation of flows of goods and services, geographically, temporally and between different areas of the economy and society.

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

Comments

Scotland needs to maintain and develop a broad and balanced programme of science and research activities so that it can respond efficiently and effectively to urgent pressures, anticipate future challenges and opportunities, and provide the technical infrastructure necessary for innovation and economic development. Scotland should focus on developing its scientific expertise and capacity in areas of particular significance to the country such as unique aspects of soil and peatland research.

At the same time, Scotland needs to continue to develop the basic production and supply of graduates in the various scientific disciplines. Whilst only a few of these will go on to contribute actively to the research agenda in Scotland, it is essential to increase the number of science graduates in Scotland and the level of scientific understanding of the general public as well.

Delivery

Question 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?

Yes/~~No~~

Comments

Absolutely. Clear and efficient knowledge exchange is essential to ensuring sound science is encapsulated in good policies. This exchange needs to be two-way, so that both parties understand the skills and demands of each other.

Question 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?

Comments

Scotland's Main Research Providers (MRPs) are well recognised throughout Europe and yet their work is often quite remote and uncoupled from that of staff involved in environmental regulation. Too often, the "down stream" end user of research activities is more of an afterthought, than an integral part of the project definition in the first place. CAMERAS can provide an excellent opportunity to bridge this gap and help align the work of the main research providers with that of the policy community, regulators and others. To this end, SEPA warmly welcomes CAMERAS and fully supports its aims and objectives. The NERC [Earth Observation Framework](#) provides a good example of a well-integrated and aligned environmental surveillance programme.

More time is needed and clear, concise advice, with a well defined set of objectives, outputs and end destination is essential. We also need to improve our integrated information systems and our use of metadata, such as the EU Shared Environmental Information System (SEIS). More data needs to be translated into appropriate information and advice at all levels.

Question 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?

Comments

We need to develop and deliver a balanced science programme, one that recognises the importance of long-term surveillance (e.g. climate change assessment) and strives to integrate this with statutory duties (e.g. EQS compliance and classification) and with monitoring and assessment in response to new and emerging issues (e.g. nanomaterials). We need much greater clarity as to which parts of the Scottish science community are delivering which elements – both to avoid overlap and to ensure integration and knowledge sharing.

Good workload (project) planning and management are crucial. There is a need to have a business plan with some flexibility that enables issues and studies to be progressed at relatively short notice whilst at the same time allowing the more strategic long-term focus to be maintained.

Question 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?

Comments

Much has been achieved in the last 10 years or so to promote and optimise communication and the flow of knowledge between science, policy and the academic community. However, SEPA believes that there is still much more that can and should be done to improve this situation. For example, a combination of fellowships, road-shows, talks and shared data systems would help to promote communication and collaboration and ensure that relevant information is more accessible and readily exchanged between all relevant parties and stakeholders.

SEPA supports shared research fellowships and secondments which enable staff to move from one 'zone' to another and thereby strength awareness, relationships and collaboration.

There is a need for end-users (e.g. environmental regulators) to engage with the academic community and policy makers fully and effectively at all relevant stages of the process. It is important that the end-users (environmental regulators, land managers, policy developers, etc.) understand and work with the capabilities, skills and timescales of the various research providers in the wider scientific community across Scotland (where ever they sit, in whichever institution, organisation or university and how ever they are funded). In return, it is important that the various potential research providers understand and work with the constraints on the end-users (e.g. time-scales for the development and implementation of legislation) - and that they work to produce the operational tools needed to deliver a better more integrated environmental protection system.

SEPA has had variable success in engaging with the Scottish Government science and research programmes in the past. We feel that we, like others across the whole spectrum can and need to do better, We are keen to build on areas and partnerships where there have been successes, and to establish new mechanisms to create a more evenly engaged programme for the future.

For various reasons (most notably, difficult timescales), SEPA's engagement in the development of the RERAD Research Strategy for 2007-12 was rather limited. In hindsight, SEPA believes that more of the science (e.g. tools, techniques and concepts) required to implement the Water Framework Directive could have been delivered through the RERAD programme had SEPA been more closely involved in the programme from the outset. There is clearly a need for transparent discussion on the short and long-term research and science needs, and an effective method for agreeing who delivers what for whom.

Finally, we consider that there is also a need to consider how and when to include the general public in any discussion of flow of information from science policy to academia and vice-versa.

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

Yes/No

Comments

SEPA delivers excellent laboratory and analytical services and these could usefully be shared with other science and research providers, thereby promoting the robustness and rigour of underlying data that provide the foundation for the setting and testing of scientific hypotheses.

It would be helpful if the requirements and expectations of public sector organisations (workers) to consider and support the business needs and objectives of other public and private sector organisations (workers) could be more clearly defined, monitored and reviewed. The Scottish Government's "Single Purpose" and "National Performance Framework" are very helpful in this respect.

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

Yes/No

Comments

Scotland has a number of excellent science based organisations yet the nature and extent of cooperation and mutual support is poor. The Scottish Government should put in place measures to address this, particularly with respect to the remit, roles, and responsibilities of local authorities, NDPBs, Agencies, the Main Research Providers, Universities and the Scottish Government itself.

Pooling of research and teaching expertise, cooperative working arrangements, data and capacity sharing – these are all areas that should be developed further. We need to identify and remove potential barriers to collaboration - be they ideological, technical, geographical, scientific, financial or whatever.

General

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

Comments

SEPA welcomes this opportunity to strengthen its links with other NDPBs and Scottish Government funded science and research organisations. It also recognises the paramount importance of ensuring that our research agendas and programmes are dove-tailed efficiently and effectively to meet the Government's policy objectives. To this end, SEPA recognises and welcomes the prospect of aligning future research projects and seconding staff between organisations to promote much-needed coordination, collaboration and synergy in science and research.

"Change" will come through future generations, so Scotland needs to ensure that science (in its broadest sense to include engineering, environmental and social science) and the science evidence base, is recognised as one of the foundations for sustainable development. It needs to be addressed at all levels of education, through appropriate curricula, and crucially to include the general public as one of the key target audiences to promote acceptability and trust.