

ADAPTING OUR WAYS:
MANAGING SCOTLAND'S CLIMATE RISK:
a response to the Scottish Government

Summary

Climate change represents a hugely complex cross-cutting issue over many areas of government and society. Government Ministers and decision-makers need to be acutely aware that a decision in one area may have a contradictory consequence for mitigation and adaptation to climate change.

- We recommend that the concept of adaptation proofing could be introduced and all new policies should be tested against this to ensure that the impact of policies do not conflict with adaptation strategies or result in adverse unintended consequences.*
- The Scottish Government must ensure that it engages with society to make clear the urgency of action. Timescale is crucial and early signals and statements of intent are necessary in order to plan and implement adaptation measures.*
- In order to develop an effective adaptation strategy, the Scottish Government must first identify the risks and potential impacts of climate change before determining what should be done to address them. We are sceptical about the approach in the consultation document, which we suggest is the reverse of the appropriate planning sequence.*
- There is a need for a comprehensive evidence-base, associated with a multi-disciplinary group of experts who can reason through potential threats and impacts of climate change and the way in which effects will trickle down through society.*
- A major constraint on public understanding is the widespread misapprehension that science always gives unambiguous and definite answers. The development of Curriculum for Excellence, which has the potential to create more flexible approaches, should be exploited to take these issues into account in the later stages of school education.*

Introduction

1 A small Royal Society of Edinburgh (RSE) expert working group, led by the General Secretary, Professor Geoffrey Boulton, has met to provide a response to the consultation on *Adapting Our Ways: Managing Scotland's Climate Risk*. The RSE welcomes the opportunity to comment on the framework for adaptation and the seriousness with which the Scottish Government takes this issue. The working group would be pleased to meet with Ministers and civil servants managing the consultation process, as well as Parliamentarians, if this is thought helpful. We first address broad, contextual issues before addressing some of the detailed questions set out in the consultation document.

Background

2 The impact of climate change on the Earth and its inhabitants is one of the major issues, and possibly the most important issue of the age. It also presents unprecedented political challenges. The most recent data show that global carbon emissions rates now lie outside the most pessimistic scenarios of the Inter-Governmental Panel on Climate Change (IPCC). This makes it almost certain that the CO₂ equivalent greenhouse gas concentration in the atmosphere will rise above 450–500ppm. If climate models are largely correct, this implies that “dangerous climate change” (regarded as likely at concentrations in excess of 450ppm) is inevitable with serious consequences for society.

3 For example, a number of studies¹ have itemised the potential impacts of climate change on flooding in Scotland. The most important findings from these are:

- An increase in winter rainfall (especially in the north and west) is likely to increase the risk of flooding by the 2050s. For some river basins the 1 in 50 year flood could become the 1 in 30 year flood. The standards of protection currently provided by flood defences in many urban areas will decline.
- Localised summer storms are likely to intensify urban flood risk. Urban drainage systems are only designed for a 1 in 30 year event, and such events (similar to that which affected the east end of Glasgow in 2002) are likely to become both more intense and more frequent. In terms of changing flood risk, this is likely to be the most significant impact of future climate change.

- Projected sea-level rise will increase coastal flood risk, although to a lesser extent than in other parts of the UK. More important are potential changes in the frequency of storm surges (elevated sea-levels caused by major storms – e.g. the January 2005 storm in the Outer Hebrides which resulted in 5 fatalities) which can locally add 1–2 m to predicted tidal levels.

4 In its response earlier this year to the Scottish Government's proposals for a Climate Change Bill the RSE argued that adaptation should have at least as great a priority in policy development and government planning as mitigation. We therefore commend the Scottish Government for its timely commitment to develop a climate change adaptation framework and the opportunity the current proposals present for public debate of the issues. Hitherto, the focus on discussions about policy has been on the mitigation of climate change. The Society's Energy Report was in part inspired by this imperative.

5 Given this backdrop, the Society's next major inquiry will utilise increasingly detailed regional assessments and forecasts of climate change that identify potential impacts, to discuss the adaptations that are likely to be required, identify possible policy responses and the timescales on which such responses might need to be developed. A major report from the RSE could play an important role in ensuring that the necessary issues are addressed in Scotland. This would involve identifying both direct impacts in Scotland and the indirect impacts that will occur as a consequence of events elsewhere; the timescales on which impacts could occur; the engineering, environmental, biological, economic, land use, legal and planning issues for businesses, communities, citizens and for Government and all its agencies; and also for the process of governance.

6 The capacity of government to implement non-trivial changes, particularly where great uncertainty or long timescales are involved, depends fundamentally on public acquiescence and engagement. An important part of the RSE project will therefore be to engage in deliberative dialogue with the public through processes such as public seminars, citizens' juries, media-based activities etc. The stimulation of public debate will also create an environment receptive to the conclusions of the report and a political response.

¹ Werritty A, Black A R, Duck R W, Finlinson W, Thurston N, Shackley S and Crichton D, *Climate Change: Flooding Occurrences Review*, (2002) Central Research Unit, Scottish Executive. Werritty A with Chatterton J (2004) *Future Flooding Scotland, Foresight Flood and Coastal Defence Project*, Office of Science and Technology, Department of Trade and Industry.

Uncertainties in climate science

- 7 A major constraint on public understanding is the widespread misapprehension that science always gives unambiguous and definite answers. The misapprehension is both understandable and unfortunate. Understandable – because the science taught in school is about things we understand very well. Unfortunate – because many innovations in science lie at or beyond the frontiers of what is currently known, which makes it more difficult to define and forecast risks. The consequence is that schooling in science often does not prepare students for the “real world” of science they will meet in later life. For example, they and their parents are confused by conflicting views about global warming, and by the cacophony of conflicting certainties and crude characterisations propounded in the media. Part of the challenge for science education should be to familiarise young people with the concept of uncertainty and the fact that much scientific understanding is provisional, without corroding their confidence in the scientific process. In Scotland, the development of the new *Curriculum for Excellence*, which has the potential to create more flexible approaches, should be exploited to take these issues into account in the later stages of school education. The intention is to develop cross-cutting, interdisciplinary themes; to address applications and explore real-world relevance; and focus on active learning in open-ended investigations, together with discussion, debate and critical thinking. The phasing of these processes is critical, however².
- 8 Although there is a great deal of uncertainty surrounding the potential effects and impacts of climate change, it seems inevitable that impacts will occur over the coming decades. Even if the human CO₂ emissions were to cease now, the long residence time of CO₂ in the atmosphere and the slow warming rate of the oceans would ensure that climate change driven by anthropogenic CO₂ would continue. However, the current proposals lack the sense of urgency that the possible threats to Scotland would justify. The Scottish Government needs to ensure it engages with the public to make clear the urgency of action. This imperative must be understood and accepted by citizens if the difficult adaptation measures that may need to be introduced are to be publicly acceptable and politically achievable.

It is for this reason that the RSE intends to engage in deliberative dialogue with the public in parallel with its inquiry into impacts and possible adaptations. However, it is not only citizens that need to be informed and engaged. Full consideration needs to be given to potential threats to Scotland’s business and industry sectors to allow them to adapt to changes. Timescale is a major factor as business and industry will clearly need early signals and statements of intent from government in order to plan and implement measures to adapt. This will require a step-change in implementing a coordinated and deliberate approach on the part of government. The Scottish Climate Change Impacts Partnership (SCCIP) has an important role in this regard by increasing awareness and preparedness of organisations to meet the challenges and opportunities of the unavoidable consequences of climate change.

An Adaptation Process

- 9 Whilst we accept that the Scottish Government should set out overarching strategic principles and priorities, the process by which an adaptation strategy is informed and developed is critical. Without a robust process along the lines proposed below, severe curbs will be placed on Scotland’s ability to manage its climate risk. The Government’s proposals, at present, do not appear to recognise that in order to develop an effective adaptation strategy, it must first identify the risks and potential impacts of climate change before determining what should be done to address them. The sequence of questions that should be asked are (1) what are the major threats to Scotland, (2) what do these threats mean for the safety of the people, infrastructure and economy of Scotland, (3) which large scale patterns of organisation and planning are needed to ensure current safety levels in future? We are sceptical about the approach in the consultation document, which we suggest is the reverse of the appropriate planning sequence.

Role for Expert Foresighting Group in Process

- 10 There is a need for a comprehensive evidence-base, associated with a multi-disciplinary group of experts who can reason through potential threats and impacts of climate change and the way in which effects will trickle down through society, infrastructure and industry.

² See RSE responses to *Curriculum for Excellence* – draft experiences and outcomes for numeracy, mathematics and science (April 2008), *Curriculum for Excellence* – draft experiences and outcomes for Literacy and English, for Expressive Arts and for Social Studies (June 2008), and DIUS on *A Vision for Science and Society* (October 2008) http://www.royalsoced.org.uk/govt_responses/2008_files.htm

Given the diversity of threats posed by climate change, such a group would, by necessity, have to be wide-ranging in composition and have “real world” expertise. It could perhaps build upon the expertise contained within the SCCIP, and the expertise within similar EU groups. A key role of the expert group would be to assist in interpreting the research that is being carried out on climate change related topics. There is much work of this nature being undertaken throughout Scotland and the expert group could help ensure that the most effective response is taken at the most appropriate level, as well as determining the degree of resilience needed, and the need for more research. It could also play a crucial role in the monitoring and evaluation of policy responses and actions taken. This will be necessary to ensure that policy responses are working in practice, and will enable them to be amended or discontinued if they do not have the desired or expected effect.

- 11** In terms of implications for infrastructure and contingency planning it will be important to determine the performance capability of the civil response to the future consequences of climate change. One way of doing this would be to look at how such services have coped with recent extreme weather events. Such an exercise could fall within the scope of the expert group. Although it should be recognised that such events may not be a harbinger or an indicator of the scale of what is to come.

Allocation of responsibilities

- 12** The administrative boundaries by which Government manages its business can result in lack of policy connectivity and policy contradiction. Climate change represents a hugely complex cross-cutting issue over many areas of government and society. Moreover, many government decisions have emissions implications (e.g. abolishing bridge tolls). Government Ministers and decision-makers need to be acutely aware that a decision in one area may have a contradictory consequence for mitigation and adaptation to climate change. We suggest that the concept of adaptation proofing could be introduced and all new policies should be tested against this to ensure that the impact of policies do not conflict with adaptation strategies or result in adverse unintended consequences. The concept of rural proofing is already widely applied in central government and local government in Scotland and this might be taken

as a model of the approach. The expert group which we suggest above could proof policies as part of its monitoring and evaluation functions.

- 13** Mitigation and adapting to climate change represents a huge challenge economically, both internationally and domestically, and in this sense it is crucial that national government provides leadership and commitment. There is a need for an overarching national framework coupled with delivery at local levels. At present we are concerned that the proposals as drafted will put too great an onus on communities themselves to meet the challenges posed by climate change. We recognise and accept that vulnerability to risk of major catastrophe is increased by reliance on an overly-centralised, ‘tightly coupled’ economic infrastructure. Hence, the role of government should be to empower local authorities and communities to take adaptation measures at their levels. At these levels there is greater knowledge of local needs and such an approach would be more effective at creating increased ownership among the local stakeholders as well as improving accountability. However, the cost of undertaking resilience work balanced against the risk of impact occurring has to be borne in mind by central government. Central government will also need to support communities that are unable to adapt by themselves.
- 14** The focus of the current consultation has been on communities, particularly in rural areas. The implications of climate change on urban areas and what is being done by urban authorities is not dealt with adequately. Although the area of Scotland is mostly rural, approximately three quarters of the population live in urban areas. Glasgow, the largest urban area in Scotland was subject to flash floods in 2002 with the east end most adversely affected. Such events are likely to become more intense and more frequent in future. The expert group which we have suggested should be given support to collect data to enable it to undertake case studies of real administrative districts, such as Glasgow, in order to identify potential risks and measures which could be adopted to minimise impacts. The Scottish Government through the SCCIP, with assistance from the expert group in identifying good practice and knowledge of adaptation, has a crucial role in disseminating and making such knowledge available.

RESPONSES TO SPECIFIC QUESTIONS

1 Do you think what we have outlined in paragraph 4.10 constitutes the correct understanding of climate adaptation?

The last sentence in Para 4.10 is a tautology: paraphrasing, it says ‘adaptation is a process of adaptation’.

It is also inappropriate to say that ‘the environments (missing an apostrophe) ability to continue to provide vital services will be put at risk’ (p.14, para 4.10).

The environment is not an agent for service provision. We have devised a way of life which is causing environmental degradation and increasing the vulnerability of many species, including ourselves, to significant harm. This means that we would wish to conserve the ecosystems of Scotland so that they continue to provide the ‘ecosystem services’ that we have relied upon, that we currently rely upon, and that it is essential that we can continue to rely upon into the future.

If we are to have the kind of difficult, but effective, debate needed to re-direct social organisation and economic life away from well-worn assumptions about perpetually increasing consumption, cheap energy, and unlimited resources, then government documents need to spell out very clearly the risks to buildings, water, food and energy supplies which we are likely to face. There also needs to be a clear articulation of the responsibilities of different sectors (central and local government, public services, businesses, and civil society) for limiting the damage, and ameliorating the impacts.

2 Do you think what we have outlined in paragraph 4.11 constitutes the correct understanding of a well-adapting Scotland?

Paragraph 4.11 is vague and gives little sense that government will take the lead. It could be strengthened by an explicit statement that adaptation is centrally concerned with ensuring that the impacts of climate change do not exacerbate existing social, environmental, economic and health inequalities.

In terms of an adaptive Scotland, there are opportunities as well as challenges. This important facet is not recognised in the current proposals.

3 Do you think we have identified the correct strategic principles for promoting a sustainable approach to climate adaptation?

This is a complex area. The identification of strategic principles does not take into account the possibility that society may conclude that other principles should take precedence. The cross-sectoral nature of the issues is a paramount consideration and the

consequences of decisions have to be borne in mind by decision-makers. The concept of a climate change proofing test is important in this regard.

At this point we would emphasise our earlier statement about the process of developing a sustainable approach to climate change. As a first and essential step, it is necessary to identify the threats and risks, and determine how they will be addressed. The expert grouping that we propose would have a critical role in identifying the risks to Scotland and advising government.

Proposals for additional principles

- In line with comment on Q 2, an additional principle could specify minimising the adverse circumstances faced by the most disadvantaged, and avoiding exacerbating inequalities of health and welfare.
- A principle should be concerned with proactive, current responses to long term risks – e.g. in relation to planning and building infrastructure and the requirement for appropriate standards.
- A principle should refer to the well-being of Scotland’s ecosystems and concern for the ‘ecosystem’ services that they provide, (i.e. the four groups of services identified in The Millennium Ecosystem Assessment: **provisioning services** – food, fresh water, wood and fibre, fuel, ...; **regulating services** – flood regulation, water purification, disease regulation, carbon sequestration, ...; **cultural services** – recreational, educational, spiritual, aesthetic, ...; and **supporting services** – nutrient cycling, soil formation, primary production, ...).

4 Do you think we have identified the correct strategic priority actions for Government to promote a sustainable approach to climate adaptation?

- Education is not the sole responsibility of the formal education sector, just as children and young people are not the only groups who need to change their assumptions about ways of life. The focus needs to be on educating all age groups about the impacts of climate change, and ensuring that people understand why adaptation measures are necessary. In this regard, a great deal of informal education takes place within the family. For example, there is much evidence that the relationship between grandparents and grandchildren is one where mutual education takes place more readily than between parents and children. Greater wisdom and concern for the future often comes with age, and as the number of retired people grows, and more of them engage in education and community activity, we have more opportunities to encourage cross-generational engagement in informal education.

- The public sector should be the starting point, with (for example) ‘capacity building’ training and education, tailored to different occupational groups and orientated to changes needed in work practices and service provision.
- The public sector is also the key to priority actions in relation to workplaces, public buildings and infrastructure, travel and transport use, procurement contracts, energy supply, energy efficiency, recycling, and food and water use.

The key point is that the Government should commit itself, as a priority, to leading by example.

5 Do you think these are the most pressing challenges for organisations responding to critical weather events?

Adapting to climate change is not restricted to responding to weather events, the challenge is responding to impacts whatever they might be. We reiterate at this point the need to identify and assess the risks. The Association of British Insurers and the insurance industry as a whole can play an important role due to its detailed system of assessing extreme weather risks.

6 What do you think are the most pressing challenges for organisations planning for critical weather events? (paragraph 6.4)

Our comments here relate primarily to the economic, environmental and business policies pursued by government, and the need to recognise the risks of continuing to allow the concentration and centralisation of resources and organisations. The points are derived from social science research on organisations and risk.

Vulnerability to risk of major catastrophe is increased by reliance on an overly-centralised, rationalised, ‘tightly coupled’ economic infrastructure. The increasing scale of organisations in itself means that any disaster affecting one organisation will have much greater initial impact and the subsequent fall-out is likely to be worse. The current financial turmoil (October 2008) is a prime example of this. The concentration of economic resources, dangerous materials and populations, and centralised energy supply, as well as a highly rationalised, global supply chain for food, all increase social vulnerability.

The priority therefore should be to ensure that business and economic policies work to incentivise decentralised, locally-controlled, networked solutions to agriculture, food and water supply, energy supply, transport and management of hazardous materials.

Networks are less likely to magnify failure or accidents, and more likely to adapt flexibly, coherently

and continue to function after the failure of one part. A critical part of such networks is their democratic governance and public accountability.

7 Do you think we have identified the right role for the Scottish Government in supporting climate adaptation in Scotland?

We have commented on aspects of this issue above. The Scottish Government needs to be committed, take a lead role and act as an enabler in supporting climate change adaptation. In addition, the Government needs to act with integrity, which means being willing to debate the tension, if not contradictions, between policies promoting economic growth and those promoting sustainable societies. Economic growth assumes increasing consumption, increasing productivity by further exploiting natural resources, cutting costs by further rationalisation, and so on. This is not commensurable with sustainable ways of life nor with the well-being of Scotland’s ecosystems and the ecosystem services that they provide. More innovative, courageous and creative thinking is needed.

Cost-cutting, short-term efficiency measures by industry, and public bodies risk increasing our vulnerability to disasters associated with climate change. Cost-cutting can translate for instance into lower standards of safety, fewer inspections of hazardous sites and materials, lower building standards, and acceptance of increased risk of accidents. To avoid this, the Government has a duty to use its powers of regulation to protect the long term public interest from the pressures for short-term public or private gain.

As we have already proposed, assessments of major areas of vulnerability, and priority action, also need to be made by independent bodies, which are above suspicion and which have appropriate public accountability.

8 Which key audience groups/ organisations/ bodies do you think the Scottish Government should be communicating with about climate adaptation? (paragraph 6.19)

In addition to those sectors discussed, government plays an important part in educating, and involving, all members of the public in facing up to the changes taking place. It is important to explain, in non-patronising ways, the kinds of practical actions that can be taken by anyone to assist in adapting to climate change. This is also a way of responding to the attendant fears and anxieties. Resilience requires mutual respect and building better trust between different sectors of society.

A more strategic approach to public engagement is required that cuts across the administrative boundaries that Government creates in managing its business. Many current debates on major issues such as energy, food security and climate change, are held in isolation from one another, and can both underestimate the complexity of the issues and at the same time miss simpler underlying principles.

One critical facet of an adaptation framework is that the evidence base for actions (be they policies or practices) needs to be researched, collated, synthesised and communicated. The Scottish Institutions (such as SAC, SCRI, MI, SEPA and SNH) need to be challenged to produce the evidence and to engage in appropriate knowledge exchange/knowledge transfer activities that will assist in the educational activities outlined above.

Additional Information and References

This submission represents the views of an expert Working Group of Fellows and non-Fellows.

In responding to this consultation the Society would like to draw attention to the following Royal Society of Edinburgh responses which are of relevance to this subject:

- The Royal Society of Edinburgh's response to the Scottish Parliament Rural Affairs and Environment Committee's Inquiry on *Flooding and Flood Management* (December 2007)
- The Royal Society of Edinburgh's response to Learning and Teaching Scotland on *Curriculum for Excellence – draft experiences and outcomes for numeracy, mathematics and science* (April 2008)
- The Royal Society of Edinburgh's response to the Scottish Government's *Proposals for a Scottish Climate Change Bill* (April 2008)
- The Royal Society of Edinburgh's response to Learning and Teaching Scotland on *Curriculum for Excellence – draft experiences and outcomes for Literacy and English, for Expressive Arts and for Social Studies* (June 2008)
- The Royal Society of Edinburgh's response to the Department for Innovation, Universities & Skills *A Vision for Science and Society* (October 2008)

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