



EXPLORING RESPONSES TO RAPID CLIMATE CHANGE IN WALES

**Report on the Rapid Climate Change
Project Workshop
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Summary

The Rapid Climate Change Project is a one-year ESRC-funded research project to investigate adaptive capacity in the UK to extreme climatic change. The aim of the project is to examine how organisations and networks in the rural sector might respond to the stresses involved under rapid changing circumstances, such as a hypothetical sudden climactic cooling in Europe introduced because of a state change in the North Atlantic ocean circulation.

As well as establishing a theoretical and methodological framework for assessing the institutional constraints and opportunities that shape adaptive behaviour to rapid climate change in the UK, the project aims to provide a space to think through the implications of different climate change scenarios for local, regional and national stakeholders. The project leader is Dr Mark Pelling, a human geographer with expertise in social adaptation to climate change.

The first stage of the project, the construction of a framework, is now complete. The framework identifies opportunities to expand the understanding of adaptation by drawing on theories of social learning, social capital and organisational development. The second stage of the project involves work with decision-makers to test and refine the framework through a set of workshops on rapid climate change and the rural sector. As part of this, a one-day workshop was held in Cardiff, focussing on the capacity of Welsh public bodies to respond to high impact/low probability environmental event.

The workshop explored possible responses to a fast cooling of the Welsh climate, and compared this with mainstream climate warming scenarios, as well as past events in Wales which required a significant policy response. Discussion closed with an examination of the role of informal networks in the Welsh polity. This report draws together the material presented at the workshop in conjunction with the responses of those present, as well as additional background information drawn from other project documents. Final research outputs will be available from June 2004.

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Workshop Rationale

The workshop was hosted by the Environment Agency Wales in Cardiff. As one region of the Environment Agency of England and Wales, the Environment Agency Wales holds an important role in connecting Welsh policy circles with national and international policy on climate change. Additionally, it is an important policy actor within rural Wales in its own right, with long experience of working with other public bodies to resolve rural crises. Invitations to attend the workshop were made to staff of the Environment Agency, the Welsh Assembly Government and other Assembly Sponsored Public Bodies (ASPBs) and public bodies, including the Countryside Council for Wales, the Welsh Tourist Board, the Welsh Development Association, the Forestry Commission, the National Trust and the Welsh Local Government Association. Participants were invited to take part in order to explore the role of the wider network represented by the Assembly Sponsored Public Bodies (ASPBs) and other organisations in addressing the potential consequences of climate change for rural Wales.

Motivation for taking part

Those attending varied in their reasons for doing so. These ranged from a brief to inform others about different climate change scenarios and to foster communication between organisations (W6)¹, to an interest in the interactions between environment and society (W2) and the links between climate change and sustainable development (W5). Within the Welsh Assembly Government, climate change is being taken seriously, but it is just one of many policy issues which fall with the Welsh Assembly's remit. In addition, the UK

¹ References of this form refer to statements that rely on or are supported by comments made by individuals present at the workshop. They are used in order that workshop participants can check for themselves that their input to the research is being used without distortion, without forfeiting anonymity. Quotes rely on notes made in the meeting, and should not be considered verbatim. However, all those quoted have the opportunity to correct remarks ascribed to them.

government takes the lead for many climate change policy issues on behalf of the devolved governments (W4). Thus the workshop provided an opportunity to raise the profile of climate change in general within the Welsh Assembly Government and ASPB network, as well as explore the extreme scenario represented by climate cooling.

From the researchers' point of view, the workshop forms an important research activity alongside interviews, compiling secondary data and literature review. It presents an important opportunity to ground-truth theory, establishing whether processes highlighted by theory have much importance in practice. As such, it was emphasised at the beginning of both sessions of the workshop that the discussion during the day was considered as research data. In return, a commitment was made by the research team to circulate this report to workshop invitees for comment before using it for anything else, and to ensure that data arising from the workshop is anonymous.

The workshop as research

The expected research outputs which will draw on the experience of the workshop include this report and various academic papers. The report will be used as a working document within the research project, and will be available to research participants, as well as being placed in the ESRC data archives. There are no plans to publish it any further.

Finally, it is worth emphasising that this research comprises a social science investigation into the response of policy and management systems to climate change. It is designed to further understanding of the social capacity to respond to environmental stress, rather than move forward the physical science of climate change. The need for such research was explicitly recognised by some workshop participants (W5, W9), as was the idea that the research has wider implications for any disaster (W6).

Therefore although knowledge drawn from the physical sciences was used to establish a hypothetical cooling scenario for use in the project, it is acknowledged that this represents an unlikely series of events within the next 100 years. However, this is what makes it interesting social research, because an unlikely, extreme scenario is expected to draw forth more understanding of generic adaptive capacity with organisations, networks and policy systems, than those scenarios for which contingency plans are in place.

Workshop Programme

The workshop comprised a day-long meeting in two discrete three-hour sections. It was designed to allow participants to join or leave, as they needed, with a mixture of presentation, discussion and case study analysis. Although a programme was circulated in advance, the intention was to respond to the interest of those present and adapt the agenda to emphasise those topics that appeared of most interest. The resulting running order was as follows:

- 9:30 Coffee & Tea available
- 10:00 – 13:00 Part I – Exploring climate change in Wales
 Introductions
 Setting the scene: Adaptation and mitigation to climate change
 Presentation: warming and cooling scenarios
 Discussion: Sectoral consequences of climate change
- 13:00 Lunch
- 13:30 – 16:30 Part II– Responding to rapid climate change in Wales
 Plenary: Comparing the consequences of cooling and warming
 Case study analysis: Analogues of the policy impact of climate change
 Discussion: Adaptive capacity and ‘the grapevine’
- 16:30 Finish

Capacity for adaptation and mitigation to climate change

The Rapid Climate Change Project is engaged in developing a conceptual and methodological framework to address the issues that are faced in thinking about and taking action on adaptation and adaptive capacity. Adaptation to climate change refers to the changes in a system (e.g. an agro-ecosystem, or a society) that arise in response to shifts in the climate. In climate change policy and research, it is usually distinguished from mitigation, which is action to prevent or reduce climate change through greenhouse gas emissions. Adaptation is usually used in the sense of changes that enable conservation or improvement in respect of quality indicators (e.g. production, sustainable human/environment interaction, or quality of life), in contrast to mere degradation. Adaptive capacity refers to the ability of a given system to adapt to known or unknown stressors.

Adaptation and mitigation

While climate change mitigation is well established in public and policy consciousness, adaptation is still being mainstreamed into policymaking. In Wales, for example, there is a clear commitment to greenhouse gas emission in Welsh Assembly policy documentation. While Wales’ contribution to meeting of the UK’s greenhouse gas emission reduction targets is very small on the international scale (W2), the issue has become connected with sustainable development (a core Welsh policy issue). It is also a marker that Wales is doing its share, and a challenge to bigger greenhouse contributors to do likewise (W5).

It is less easy to see clear evidence of adaptation to climate change as a strand within the Welsh Assembly Government climate change policy. But this may be because the UK government takes the lead for many climate change policy issues on behalf of the devolved administrations (W4). On the other hand, the direct effects of rapid climate change will be keenly felt on the

ground, and so local actors will need to adapt and the Welsh Assembly and ASPBs could have a key role in facilitating this.

Types of adaptation

There are many different types of adaptation, and an important distinction is between anticipatory and reactive adaptation (or proactive and reactive policy – W10). Given the focus on rapid climate change, the project concentrates on the former, looking at the organisational and cultural elements that might help build adaptive capacity before climate change hits hard.

Another important distinction is between generic and specific adaptation. That is adaptive capacity can be considered in terms of responses to particular risks, as well as in terms of more generic capacity – the characteristics of a system which can be said to enable it to adapt to a wide range of interacting stressors. This opens the question of whether there is a trade-off between generic capacity and capacity to deal with specific risks, or the two types of adaptation are complementary?

In order to explore the tensions between generic and specific adaptation, the focus of this workshop was not about particular adaptive strategies per se. It was designed to examine how adaptive responses arise from the formal and informal institutional settings in which policymakers operate. Participants were invited to comment from two perspectives: first that of a manager responding to policy, information and the actions of others and secondly as an actor with some scope to change the way adaptive responses are defined or enacted. This fits with the focus of the project on the opportunities and difficulties presented by the conjunction of managed and unmanaged spaces in policymaking and management.

Adaptation and unmanaged spaces

A key research question for the project is the extent to which this more generic form of capacity is located within relationships located in less managed spaces? That is what opportunities for learning and communication arise from the informal networks that interpenetrate the formal structures of public life. In much of the academic literature, this 'shadow system' is treated as either too complex to adequately describe or a source of corruption and inefficiency. However, there is a range of evidence within management studies that shadow networks are not only potentially beneficial, but that they form an absolutely crucial part of any effective organisation. Studying the shadow system, and in conjunction with the formal organisational structures it lies alongside, therefore offers an opportunity to better understand adaptive capacity and the potential of the UK rural sector to successfully adapt to rapid climate change and other extreme circumstances.

Rapid climate change – warming and cooling scenarios

In terms of the geological climate record, the last 10,000 years have been relatively stable (W5), but there is now considerable evidence that the global climate is changing rapidly. There is still some debate about the role of human agency in this, but there is an increasingly strong consensus that there is an anthropogenic component to climate warming. This is bolstered by the close fit between models that include human greenhouse gas emissions, and

existing climate records. The 1990s were not only the hottest decade this century, but the paleoenvironmental evidence shows that they were probably the hottest for the last 10,000 years.

Defining 'rapid' climate change

Nevertheless, from a social science standpoint, rapid climate change is difficult to define, because of the long timescales involved in climate change processes relative to the human timescale. Climate change over several decades can be considered extremely rapid in geological terms, and yet still exceed policy and management horizons by a considerable margin. There is no consensus amongst the climate research and policy communities on what constitutes rapid climate change, and the IPCC definition is fairly tautological, defining rapid climate change in terms of changes that are abrupt, unexpected or rapid. The difficulty is tying this to particular timescales and physical sets of circumstances.

Therefore, within this project, we shall define rapid climate change in terms of the worldviews and expectations underpinning the policy and management systems that we are interested in. That is, rapid climate change is a counterintuitive shift in climate, falling outside of established planning boundaries and therefore potentially requiring an active response. It is thus a relative term, coming into existence when the scope of any analysis is set and changing as the boundaries of the system being analysed are redrawn.

Given that climate change has yet to be integrated in policymaking across the board (for example, many project costings and land use evaluations are developed using present prices, under an assumption of no change in climate - W5), even mainstream global warming is rapid for many systems under our definition. Global cooling, should it occur relatively soon, receives less policy attention and potentially involves faster physical processes, and is therefore even more in line with the project definition.

Two scenarios

In order to highlight the challenge that rapid climate cooling holds for policy makers, two scenarios for the future of the Welsh climate were compared in the workshop. The slides from that presentation can be found in Appendix 1.. The first scenario was based on a mainstream 'high emissions' model; that is, a widely accepted model of the future of the global climate, assuming that greenhouse emission continue at a high rate. The second was based on a 'reasonable' hypothetical version of climate cooling induced by a switch in circulation patterns in the North Atlantic sometime in the middle of this century.

It should be noted that although the two scenarios were presented side by side for purposes of comparison, this by no means assumes that they are equally likely. The scientific consensus, backed up by extensive research, is that anthropogenic climate warming is currently taking place (W1), and that the models underlying the warming scenario here represent the best available knowledge of current and future climate trends. At present, much less study of THC climate cooling has taken place, but the consensus is that it is very unlikely in the near term, and less over a policy priority over the next 100 years than warming.

Mainstream warming scenario

The warming scenario suggests a steady rise in average temperature over the next 70-80 years. The result is a climate which is ~ 1°C-3°C warmer overall, with drier summers but greater overall precipitation. Comparing Cardiff in 2080 with present-day cities along the Western European seaboard, this gives a climate like present-day La Rochelle or Biarritz² in terms of temperature, but significantly wetter than either during the winter and drier during the summer. Extreme weather is likely to increase, along with the general variability of the climate.

Rapid cooling scenario

The cooling scenario follows from a change in the circulation pattern in the North Atlantic. At present, the Atlantic seaboard of Europe enjoys a 'heat subsidy' from the tropics, carried in by the Gulf Stream. This circulation depends on a return flow of colder, polar waters. The paleological record shows that this pattern of circulation is one of two stable states in the North Atlantic, and that there is a history of switching from one to the other and back again. A shutdown of the present circulation pattern could be induced by the introduction of vast amounts of fresh water in the Arctic Sea, through a combination of the melting of the Arctic ice-cap, increased precipitation over the North Atlantic region and an increased flow of river water from Siberia as the permafrost there melts.

Under the cooling scenario, a 2° C rise in temperature would be followed by a 4°C drop sometime during the middle of the 21st century. This is analogous to a Welsh climate similar to SW France before the shutdown, and like N Scotland or S Norway afterwards. The models on which this scenario is based are not as well developed as for the warming scenario, but they suggest strongly that seasonality might increase with more ice and snow and winter. Extreme winters (like the winter of 1963, with snow on the ground from Christmas until Easter) could become as frequent as 1 in every 7 years.

Comparison

In order to substantiate the scenarios and enable a comparison in terms of the Welsh rural sector, workshop participants were asked to suggest possible implications of warming and cooling for the aspects of the Welsh rural sector relevant to their personal responsibilities (What's going to happen in terms of what crosses your desk?). The collective picture that emerged is presented in table 1 below:

Table 1: Possible implications of warming and cooling scenarios for the Welsh rural sector.

Climate Warming Scenario	Climate Cooling Scenario
<u>Climactic effects</u> Increased rainfall and flooding over winter Higher temperatures overall Drier, hotter summers	Increased flooding in spring due to snow melt Lower aggregate temperature Cooler Significantly colder winters

² This comparison is for the purposes of illustration only.

Similar to S France (Atlantic Coast) or North Spain	1 in 7 winters 'extreme' Similar to N Scotland or S Norway
<u>Rural development</u> Diversification opportunities Increased rural population	New opportunities for secondary employment Rural de-population Transport disrupted Less access to services during winter
<u>Health</u> Increased respiratory disease in (wet) winter New diseases Heat stress Pollution effects?	Increased respiratory disease in (cold) winter
<u>Agriculture</u> Soil loss due to flooding New pests and diseases (overwintering possible) Late summer grazing reduced – may be compensated by increased grass production overall More difficult to use the land effectively Crop diversification possible, especially on the coasts. But soil quality mitigates against this	Soil loss due to flooding Reduction in stock or capital spending on winter housing. Loss of winter growing season – less grazing implies less protein production
<u>Forestry</u> Timber productivity up while quality down Use of trees for water management?	Timber productivity down while quality up Pressure on forestry management More forestry on marginal rural land?
<u>Biodiversity</u> Links between habitats important for biodiversity as climate changes Loss of sphagnum moss Pollution effects?	Links between habitats important for biodiversity as climate changes More active management of species migration needed than under warming scenario Eco-restoration possible?
<u>Tourism</u> Generally beneficial in terms of volume No extended winter season Fares well in comparison to competitor destinations Storm and flood damage to facilities Loss of 'Green Wales' image	Tourist volume decreased overall Possibility of development of winter sports trade Seaside market in decline
<u>Other industries</u> Less trouble with water supplies than	Shellfish production crashes

in England	(temperature sensitive) Possible loss of 'footloose' industries
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There are a number of similarities between the two scenarios. In the most general terms, both point to a combination of long-term stresses and short-term shocks during a transition to a new climatic state. Both also demonstrate strong seasonal variation in their effects on tourism and agriculture. Furthermore, the workshop suggested that under both scenarios, there would be increased erosion, negative health effects and challenges in conserving biodiversity, as well as new opportunities for rural livelihood diversification.

The differences between the scenarios can be seen in terms of the direction of several trends (eg timber quality vs. production, tourist volume and shifts in the urban/rural population ratio). Warming is more gradual, with a longer lead in time, and offers much less variation in mean temperature than cooling (which encapsulates further warming first). The effect of cooling on the agricultural industry is more likely to be negative, whereas warming may increase opportunities. Finally, there are some scenario-specific effects, such as the loss of shellfish fisheries under cooling.

Political and social challenge

However, while there are some significant differences between the two scenarios, the rationale for the project and this workshop lies in the differences between the two scenarios in terms of the political challenge they present. It has taken decades to establish a serious policy response to climate warming, but policymakers and the public are finally moving out of a period of denial (W1). There was a clear awareness at the meeting though that there still remains much work to be done in terms of informing farmers (W2) and the public on the consequences of climate change, and in gathering public support for policy changes:

“Regulation only happens when there is active consensus for it”
(W7).

However climate warming is now accepted at least in theory and is beginning to have an effect on practice.

Climate cooling, on the other hand is a more difficult policy issue, and there was some evidence within the workshop that it is still actively denied (W5), rather than merely an issue which has not been much considered.

“People don’t want to talk about cooling. Full stop.” (W9)

Two reasons for this were suggested at the workshop. The first is that there is a resistance to discussing cooling, because:

“There’s a danger we could lose people on warming.” (W1).

That is, that visible policy attention to cooling could generate confusion, a loss of confidence in scientific statements and erode public support for adaptive policy with respect to warming, which requires concerted effort and is the most likely outcome under present knowledge. The second is that cooling would be a much deeper crisis than warming, with significant effects:

“In terms of cooling, the images are mind blowing. With a global population over 6 bn, it would be an absolute crisis. We’re looking at an anarchic response.” (W9).

“Large-scale rapid climate problems could increase public costs whilst decreasing public consumption. Both would be a drag on the economy, and thus make adaptation harder” (W8)

Responding coherently to the problems presented by warming has pushed the global scientific political system to its limits (and perhaps beyond) over the last couple of decades. The question is whether this has increased capacity or whether there is less room for manoeuvre if events take a different turn to what has been expected.

Learning from experience: Analogues of rapid climate change

In order to explore how the Welsh rural sector responds to crisis, a range of possible analogue events for rapid climate change were discussed at the workshop. Individual participants spent some time analysing an example of their choice as a case study. The list of possible analogues included.

- Foot and mouth disease (FMD) outbreak in 2001
- Pesticides and birds of prey
- Fuel protests
- Changes to EU policy
- Oil crisis
- Aberfan disaster
- Sea Empress oil spill
- Towyn floods
- Economic recession
- Climate warming
- BSE

Each participant was asked to reflect on what could be learnt from their case study in terms of understanding the capacity of Welsh policy makers and implementers to cope with adversity. A range of themes were aired and the workshop organisers noted that:

- Effective action has been possible in many cases
- Spatial patterns (hotspots) are important in events taking place over a wide scale
- Theory often leads experience
- An initial period of denial is quite common
- Belief systems both affect and are affected by large scale events

Further analysis of the case studies has drawn out several additional themes, and these are outlined below.

Temporal Scales

It was conspicuous that the case studies which were developed focussed on past events with a very high short-term impact, and the discussion and written comments focused on reactive adaptation during disaster response. Analogues such as economic recession, EU policy changes and BSE were not considered at all, and participants seemed to surface fewer lessons on proactive rather than reactive adaptation.

It might well be that the nature of the workshop at this point directed participants' attention to short-term high impact responses, but these are less immediately useful for understanding rapid climate change involving cooling, where a decade might be required to be clear that annual changes are significant, and where even short-term shocks are most likely to be apparent over a season rather than weeks or days as with many of the events chosen for case studies.

However, that is not to say that lessons about longer-term impacts of rapid climate change cannot be learnt from past events. Of the two most developed case studies in the workshop, FMD and the Sea Empress oil spill, the crisis developed quickly with no lead-in period (W1), but there were long term impacts:

"The post FMD changes to livelihoods are still continuing." (W2)

"There was a heavy focus on the immediate incident...{concerning the Sea Empress}" (W9).

"Contingency plans focussed just on the oil spill. After three weeks "We'll go now", when there were another 15 months of clean up and 2 years of further study." (W9)

Although the response to FMD was said to be effective (W7), it is not clear whether this includes the long-term, and in the case of the Sea Empress:

"There was no response to ecological, human health and socio-economic impacts" (W9).

A general point which could be drawn from the case studies is therefore that long-term responses to crisis are harder to pin down and enact in a satisfactory fashion, although this may just be because of the nature of the particular examples which were selected. Another explanation could be the attention thresholds incentivised by the policy system. That is, the short-term nature of the media response to crises (W6) may have a significant effect on where policy-led adaptation is directed through its steering of public opinion. The difference between the fire-fighting response this evokes and a long-term strategic view is illustrated by the quote:

"How you operate in sustainable mode is very different to peak fluctuations, when you take whatever measures you can." (W9)

Conditioned responses

A prominent feature in many of the case studies was the conditioning of responses to many crises, especially through prior experience. The latter was a feature of both FMD and the Sea Empress, where the contingency plans in place detracted from the initial response:

"At first we just thought we'll do 1967. Our contingency plans were based on these, but not very good in practice. There wasn't enough thought." (W1)

"The plans to deal with the Sea Empress were based on the previous similar event, but things are never the same the second time around." (W9)

On the other hand, contingency plans and prior experience can enable rapid action:

“We knew that there could be a problem, and so there was a concerted emergency response.” (W5)

“In the petrol strike, actions were effective, because of experience.” (W9)

As well as previous experience, public expectations can shape policy priorities. That is, the role of the media and public opinion not only influences the attention span of the policy system, but can affect priorities within a response:

“Media and public attention will drive you into particular actions. For example, with the Sea Empress, the biggest problem was probably public health risk from inhalation of volatiles. But most funds went to the environmental impact.” (W7)

This means that an important part of formulating a response to events is the management of public expectations:

“The oil spill showed the importance of a well-educated media, and getting the right messages to the media. Not just soundbites.” (W6)

“The Sea Empress shows the importance of initial response, sometime we need to sell counterintuitive ideas.” (W7).

This in turn sometimes requires a need to meet public opinion rather than change:

“Need to balance emotional and practical response (Sea Empress)” (W6)

The possibility of managing public expectations has important implications for the discussion on whether a public policy response to the risk of climate cooling is compatible with the effort to inform the public of the consequences of climate warming or not:

“You need a clear message, but it can be a sophisticated message. There’s no reason not to tell people about the risk of climate cooling as well as climate warming.” (W9)

Technical Fixes

Even when the priorities arising from an event are understood and have public support, it is sometimes difficult to formulate an effective response. From the case studies, one could say that it is clear that technical fixes are sometimes possible, but that the complexity of some problems defeat easy answers:

“Sorting out the loss of birds of prey in the 1950s and 1960s had a straightforward technical fix: substitute pesticides. That took time, but we have them back now.” (W5)

“The sort of global bio-decline we’re seeing now is very different. There is no effective response, because there’s no easy option.” (W5)

Whether a technical solution is even available can be a matter of chance. For example, dealing with the ozone hole is an example of a global problem which was amenable to a technical solution. However, if bromine instead of chlorine compounds had been used by industry in the first place, ozone loss would have been much faster and it is possible that things would have got much worse before the problem was even detected.

Above all, making decisions about priorities requires good information in the first place:

“One of the difficulties with the Sea Empress was the lack of baseline data to assess impacts.” (W9).

Expanding the breadth of the response:

Finally, an important theme, which ran through many of the case study analyses, was the importance of consultation and accommodation between different perspectives, something that is backed up by the academic literature on high quality, high reliability organisations. The claim is that systems that incorporate a diversity of perspectives are more resilient, because they have access to a greater number of options in the face of change. In terms of the policy community in Wales, this emphasises the:

“Importance of good links within and between agencies – informal as well as formal.” (W6)

At the sharp end of a crisis, bringing different perspectives together is not always possible, but it can develop, as demonstrated by FMD:

“Some experts weren’t involved at first, but as the meetings went on, more people got involved. We began to develop mutual respect, even where we didn’t agree, so we got better at making better decisions. Eventually, a balanced system of decision making evolved with more consideration of the points of view of others.” (W1)

“There was a comprehensive collaboration to solve FMD, based on recognition of danger, but it was slow initially.” (W7)

“Local Authorities resisted and came in late.” (W1)

It is clear from the workshop that consideration of different perspectives and the wider needs of those concerned has currency in Wales, and that this goes beyond lip service to participation:

“There are tight national planning guidelines about flood plains so there is less flexibility for appropriate planning. Environment Agency policy was no inappropriate development in flood plains. But now we work with local communities much more. After the floods in Towyn there was a move away from the blanket banning of flood plan development to negotiating locally. This required public bodies and local groups to move into a negotiating stance and is the best example of local/central communication. Around Towyn, it’s not a matter of no development, but what development should we be having. That is maybe we need to look at managing risks, rather than blind regulation.” (W5)

The ubiquity of the term participation through the public and private sector in the UK is an indicator of the value that managers and policymakers currently place on bringing the resources locked within different perspectives to bear on a variety of problems. The claim is that it can help address several of the issues identified in this section, bolstering public and media support for particular actions, selecting between technical fixes and more thoroughly testing different potential responses.

Experience and effective responses

While the case studies showed bringing different perspectives together in Wales is both effective and possible, the question in terms of rapid climate change is whether there is sufficient formal and informal expertise to do so, within the social and political conditions that severe rapid climate change would bring? Some consideration to this is given below, but the real difficulty is that the key issue with any of these analogues is that:

“There is nothing like rapid climate cooling in terms of scale, other than the rapid warming which is already underway.” (W7)

This is not to say that nothing can be learnt from analogous events, but that any such analysis is partial and limited by significant dissimilarities to the sorts of extreme events of interest to this project. However, any such exercise will surface only those lessons which the analyst is able to articulate. What many of these case studies demonstrate is that events sometimes exceed the expectations of those responsible for responding to them, at which time more general forms of adaptive capacity become more important.

Exploring adaptive capacity for rapid climate change in Wales

The role of this project is not to provide an assessment of the adaptive capacity of the Welsh rural sector to rapid climate change, but rather to engage with policymakers and managers who would be involved in formulating adaptive responses, in order to develop a framework for such assessment. At present the priority is to show the relevance of a number of considerations when working with adaptive capacity and to begin to understand how these are tied together in practice, and the language and thinking that they translate to at different organisational scales. This section highlights some of the important themes that resonate with the concerns of the project.

Adaptation and the rural sector

Following the case studies of analogues, participants were invited to discuss the implications of what could be learnt from the case studies about the capacity of the rural sector in Wales to adapt to climate change. Much of this of course, depends on the condition of the sector, as much as on the exact nature of the stressor. Experience from around the world has shown that the effects of environmental stress are much attenuated by the social and economic factors. This is equally true of rural Wales, something that the consideration of the FMD crisis highlighted:

“The key here was the effect on top of an already depressed structure (the rural economy). It was the straw that broke the camel’s back.” (W10)

A particular feature of the rural sector in Wales that might be relevant is the prevalence of pastoralism (W3). Given the poor soils, even under warming this is unlikely to change much, and under cooling it is expected to be resilient (W3). But I remember concerns expressed about the need to overwinter cattle etc.

However, even under current conditions (where the main rural stressors are economic and political in addition, overlaid with the after-effects of the FMD

outbreak), there is an expectation that rural (i.e. agricultural) diversification (W6) will provide greater resilience to shocks. The argument being that while the trend in agriculture over the last 50 years is specialisation, a broad based agriculture is more flexible.

The most important factors for changing farmer's practices were said to be cost and tradition (W5, W3), but for the rural economy as a whole, the political context is very important. Devolution in Wales has opened up the opportunity for specifically Welsh solutions, offering a degree of flexibility not possible for policy that blankets the UK as a whole:

"The Assembly is pushing the advantages of regions (for development etc) vs the centre because of the advantages of scale. We're working with other regions across Europe on this agenda." (W5).

That is not to say that Wales is entirely free to make its own way. At the European scale, the effects of last year's CAP reforms were thought to be significant, with a positive effect:

"CAP reform is dominant over environment at present." (W3)

"CAP reform is likely to mean that adaptive capacity will increase, because it incentivises stock numbers to fall. Lower stock numbers means more resilience." (W3)

Thus one can see that adaptive capacity and adaptation are embedded in context. How rural Wales adapts to climate change depends on the social, cultural and political circumstances in which Welsh actors find themselves.

Planning horizons

In terms of actions already in place to deal with climate change, the Welsh Assembly has a climate change strategy, and it is due for review this year. Clearly, integrating climate change into policy is an important way of increasing the capacity to deal with it as it occurs, but there are difficulties with doing so given the timescale over which it occurs. The commonplace that policy cycles are too short to deal adequately with environmental changes was surfaced at the workshop:

"We're encouraged to look ahead in terms of policy. But rather than 10 years we should be looking 100, 1000, 10 000 years ahead." (W5)

"Lots of policymakers are working with policies with respect to the status quo." (W11)

This is particularly important in terms of mainstreaming climate change considerations into forward planning, because changes in the climate will affect the costs and benefits of schemes currently under consideration. For example,

"They're assessing the Severn Barrage scheme on today's prices. Even though it has a 50-100 year lifespan." (W5)

Rapid climate change and the possibility of counter-intuitive changes make this even more difficult:

"Climate change of any kind is a challenge. We need a dynamic, rather than a static policymaking process {i.e. one which deals

with conditions as they change}. For example: *How do we manage Snowdonia in terms of the type of habitat that will be available in 2050? Who is going to say?* (W11)

Thus forward thinking over the scale of the scenarios presented in the workshop demonstrates some real difficulties inherent in the uncertainties working with events which exceed policy horizons, but which nevertheless effect the incentives that are assumed in order to formulate current policy. One effect is a recognition that all policy is uncertain and involves an element of risk. For example:

“Uncertainty is a big issue, there is little certainty in advice. It is necessary to take some risk when taking decisions.” (W1)

There was some evidence that risk taking in policy terms was difficult in Wales:

“The downside here is the second through the gate phenomenon – Few LA s want to take the initiative.” (W11).

“The risk culture here is different – there’s lots of inertia. The Welsh Assembly Government is more risk averse compared to DEFRA. We have paralysis by analysis.” (W9)

Squaring the needs of the present with the possible needs of the future is in theory at the heart of Welsh policymaking, with the prominence that sustainable development enjoys with the Welsh constitution. However the practical difficulties in doing so demonstrates that every policy system has its own boundary of awareness. The question is under what circumstances efforts should be made to extend these, and what the consequences are of doing so.

Risk assessment and types of adaptation

The uncertainties inherent in working with long-term, low-probability, high-impact events surfaced an important project theme – the payoff between specific and generic adaptive capacities. That is, whether resources are put into formulating specific responses to future risks, or whether there are strategies that increase the capacity of organisations and policymakers to respond to a range of known and unknown risks. No clear consensus emerged from the workshop on the balance between the two forms, although both were recognised as important.

So on one hand, specific risk assessment and contingency planning were mentioned throughout the meeting:

“There is no substitute for having thought things through.” (W7)

“Need to have good contingency plans and to use them.” (W6)

“The whole thing is about risk assessment.” (W1)

“Good plans of how to adapt are essential.” (W1)

On the other hand the value of flexibility and the dangers of over specification of responses were recognised too:

“So there is a need to shift social values, to move beyond regulation.” {if people are going to become more flexible and resilient} (W7)

“We are regulators – in doing so we restrict flexibility. For example, agri-environmental schemes. These are good for the environment but the rules involved can cause farmers to lose flexibility and this is a reason why farmers may not be attracted to the scheme.” (W2)

“We need to get the risk assessments right, but also to look at the whole spectrum of risk. The way to respond to uncertainty is to use a range of scenarios.” (W1)

“To respond effectively to a crisis or major change, we often have to adopt an holistic approach which recognises the wide range of interrelationships.” (W10)

“You can make yourself adaptable in both directions.” (W1)

“There’s a potential loss of credibility in rolling out plans for things that don’t happen.” (W9)

The theoretical development phase of the Rapid Climate Change Project established that there may be trade-offs to be made between specific adaptations (made in the expectation of particular future risks), and a more generic adaptive capacity, which is designed to prepare for unknown risks. At this stage of the research it is not possible to present much evidence that this is the case, or to point to any form of action that has been instrumental in building generic adaptive capacity.

Public understanding of rapid climate change

The last comment above illustrates an important theme of the workshop: public awareness of climate change and the implications for adaptive capacity. It is unreasonable to expect policy to be enacted if there is no awareness of the priorities behind it, and there are many aspects of the Welsh rural sector which are not amenable to any policy influence other than the ‘drip by drip’ socialisation of ideas. Thus

“Societies need to face what they’re doing.” (W1)

“If you want a public response to a threat, you need to give a message. A simple message.” (W7)

“The agricultural industry is getting mixed messages about the risks involved.” (W2)

The power and effect of the media have already been noted above in the discussion of past crises, but the media issue was frequently raised with respect to climate change too. It was seen as both a potential threat and a potential resource.

“The whole spectrum of the media is influential.” (W1)

“There’s a need to develop better links with media and communicate better with them and the public.” (W6)

“There’s the whole thing of balance. If they get someone on who says that climate change is a problem, then they have to have someone else to say it isn’t.” (W1)

One significant consequence of the media/public awareness/policy nexus is that sharp crises get more attention, because they’re more newsworthy:

“We need more crises before we see any kind of dramatic movement in policy.” (W9)

Highlighting the role of knowledge and information resonates with a theme within the Rapid Climate Change Project to do with systems of learning and change. A strong link between power and knowledge is supposed, not in the sense that they are equivalent commodities, but rather that power relations affect the relationships through which knowledge is developed and vice-versa. Different individuals, organisations and communities recognise different aspects of the ‘facts’ according to their own history and character, to the extent that they can be said to live in different worlds. The issue is what happens when these worlds come into contact with one another around significant issues.

Adaptation and informal networks

The final part of the workshop was directed to what the theoretical part of the project constructs as a major locus for assembling and reassembling adaptive capacity. That is, the nexus between order and chaos where formal, canonical organisations meet informal networks. This contrasts with an approach to governance that situates formal structures in a role of regulatory controllers of informal behaviour, and the only possible locus of policy intervention.

The theoretical development within the project posits that informal institutions are neither so complex that they can be treated as random noise, nor a inevitable source of corruption and inefficiency. Instead, following several new lines of work in the organisational literature, the shadow system which lies below the surface of any organisation is seen as the site of much of the day-to-day work that constitutes the existence of an organisation. If that were not the case, work to rule would not be an industrial action. Thus informal spaces are seen as a potential resource as well as a potential source of problems for working with adaptive capacity and the question is how to position or optimise individual and management responsibilities in relation to it.

Workshop participants were asked to reflect on informal networks in Wales and their role in enabling adaptation. As this is the first workshop of the series the aim was to establish the existence of informal networks and that they play a role in adaptive action, rather than assessing the positives and negatives of any such role. Evidence of a significant network, with some characterisation of it and examples of the grapevine in action, all emerged during the workshops

Existence: Informal networks in Wales

One of the aims of the workshop was to establish the existence and importance of networks in Wales. Evidence for this includes remarks such as:

“There’s a hell of a grapevine. It’s much more effective than the official structures.” (W11).

“The grapevine is more important than the formal network.” (W5)

"These all required rapid communication, not just between chief executives of different agencies, but also between those at the coalface – at all levels." (W1)

"The bottom line is not structures, but relationships." (W6)

"There is a threshold to getting people to deal with things. Sometimes it's a phone call – 'Just thought I'd let you know'." (W9)

That informal networks play a role in Welsh policy circles was evident not only within the content of the workshop, but was evident in organising the workshop:

"There were strange reactions amongst colleagues and CCW to this workshop. The invitations went out quite late, but the jungle drum started up immediately. Word went from CCW to English Nature to the Environment agency in Bristol., and back to the Environment Agency in Cardiff." (W14).

Characterising the Welsh "grapevine"

As well as existence, evidence emerged of reasons why the grapevine exists in the form it does. These include scale:

"Wales is small in size, so there is a small community, who can get to know each other because they do meet regularly." (W5)

"Lots of people in Wales stay in Wales. Hence networks persist for longer." (W11)

intentional policy effort:

"The SD scheme requires public bodies to work together. After four or five years, this has really begun to affect how organisations work." (W11)

"The ASPB's were led to understand that communication is important, driven by a sense that Wales needs to find its own solutions to problems." (W7)

"For example, all the economists in the Environment Agency are in Bristol, we don't have any here. Therefore we rely on non-EA economists when we need them – from the universities etc. It's the whole Team Wales concept, which the Assembly has been pushing." (W5)

and Welsh political culture:

"Decision making politicians are approachable {in the WA}" (W7)

"Can get Local Authorities involved. We could get them all into one room if we needed to." (W1)

Informal networks and policy

A number of examples of the grapevine in action in facilitating the formulation and implementation of policy were given:

"With FMD, there was a need {because of the scale and speed of the crisis} to short-circuit normal decision making process to

make decisions that were deemed to be important. For example, slaughter on suspicion.” (W1)

“The Green Seas partnership was very successful. The number of blue flag beaches went from 2 to 33. It was a step change in the quality of what we had.” (W10).

“There was a Welsh initiative on health and the environment. The grapevine was very successful in bringing people together on a relatively informal basis. It was remarkably successful, but now we have formal structures.” (W7)

“The air quality forum. That happened quite informally, and now we have our own mobile lab for monitoring air quality. Informal networking enabled a speedier decision.” (???)

Conclusions: Weighing up the grapevine

This part of the workshop provided evidence for the existence and nature of a loose network in the Welsh polity as well as examples of the use of networking in bringing policy about. This has its benefits and can be tied to general resilience:

“Duplication in the informal network means it will work if formal channels fail.” (W5)

“There is overlap, people will cover for each other during a crisis.” (W7)

However, while the project does not take the line that networking is inherently counter to the public interest, there are of course concerns that activity within informal networks is less accountable and transparent than formal procedures.

“There is the risk of nepotism, but the grapevine works at certain scales.” (????)

As one workshop participant put it:

“A benevolent dictatorship is benevolent as long as the dictator is.” (W9)

This is paralleled by concerns raised about the position of outsiders to the network:

“What happens if you’re not in the grapevine?” (W6).

“The negatives include the exclusion of new people.” (W9)

This is somewhat balanced by the organisational contacts that individuals have, which demonstrates the importance of the interaction between formal and informal systems:

“Large organisations with good contacts can overcome exclusion, but it is more difficult for newcomers.” (W5)

In conclusion the workshop indicated some important themes to follow up on in terms of informal and formal networks. These include:

- Scale and size
- Cultural institutions
- Inclusion and exclusion

Further Research

This report represents an interim phase of the research: an opportunity for those invited to the workshop to reflect on the knowledge that emerged on the day, and for the project team to propose interpretations of the information gathered. We invite comment in terms of both the accuracy of the portrayal and the conclusions we draw from it, which we will use to redraft the report as the most balanced representation of these issues we can achieve. This therefore represents a significant part of the data that the research is designed to collect, alongside output from other research processes in place.

The Cardiff workshop is merely the first of several workshops, with further events planned at DEFRA and with established farmers' groups in Wales (the Welsh machinery rings and a dairy farmer's discussion group). In addition, a set of interviews with several workshop participants and other key informants are anticipated, and will feed into the project as a whole alongside the workshop data.

Additional material and resources

There is a range of additional material available relevant to climate change and the rural sector in Wales. Most can be found on the National Assembly for Wales (www.wales.gov.uk) or DEFRA (www.defra.gov.uk) websites.

This includes:

- Farrar, J. & Vaze, P. (2000). **Wales: Changing climate, challenging choices - A scoping study of climate change impacts in Wales**. Commissioned Report, National Assembly for Wales, Cardiff.
- GNAW (2001). **Climate change Wales: Learning to live differently**. Report, The National Assembly for Wales, Cardiff.
- GNAW (2001). **Farming for the future: A new direction for farming in Wales**. Report, Government of the National Assembly for Wales, Cardiff.
- Hulme et al (2002). **Climate Change Scenarios for the United Kingdom. The UKCIP02 Scientific Report**. Tyndall Centre for Climate Change Research, School of Environmental Sciences, University of East Anglia, Norwich, UK. 120pp.
- National Trust (2001). **Valuing our environment: The economic impact of the environment in Wales**. Study report, National Trust, Cardiff.
- MAFF (2000). **Climate change and agriculture in the United Kingdom** Ministry for Agriculture, Fisheries and Food, London.
- DEFRA (2001). **National appraisal of assets at risk from flooding and coastal erosion, including the potential impact of climate change**. Final Report, Department for Environment, Food and Rural Affairs, London.
- Willows, R.J. & Connell, R.K. (2003). **Climate Adaptation: Risk uncertainty and decision-making**. UKCIP Technical Report, UKCIP, London.

Relevant work with a more international perspective includes:

- IPCC (2001). **Climate change 2001: Impacts, adaptation, and vulnerability**. Cambridge, Cambridge University Press.
- Abildtrup, J. & Gylling, M. (2001). **Climate change and regulation of agricultural land use: A literature survey on adaptation options and policy measures**. Literature Review, Danish Institute of Agricultural and Fisheries Economics, Farm Management and Production Systems Division, Denmark.

Appendix 1 – Presentation on climate warming and cooling scenarios

Welsh climate in the 21st century

(UKCIP98 predictions for 2080 – 250km x 250 km grid size)

- greater warmth all year round by 1.1-2.9 °C
- more precipitation in winter by 7-24 %
- less precipitation in summer by 7-14 %
- greater annual precipitation by 2-9 %
- a rise of sea level of 18-79 cm
- a higher mean windspeed by 1-4 %
- more evapotranspiration by 13-27 %
- more variability from year to year the number of extreme years will increase
- more frequent and more rain in violent storms intense storms
- more drought years by 10 %
- more very severe gales by 10 %

Wales - Changing climate, Challenging choices, Summary report February 2000. The National Assembly for Wales

Cooling scenarios for Wales/Central England

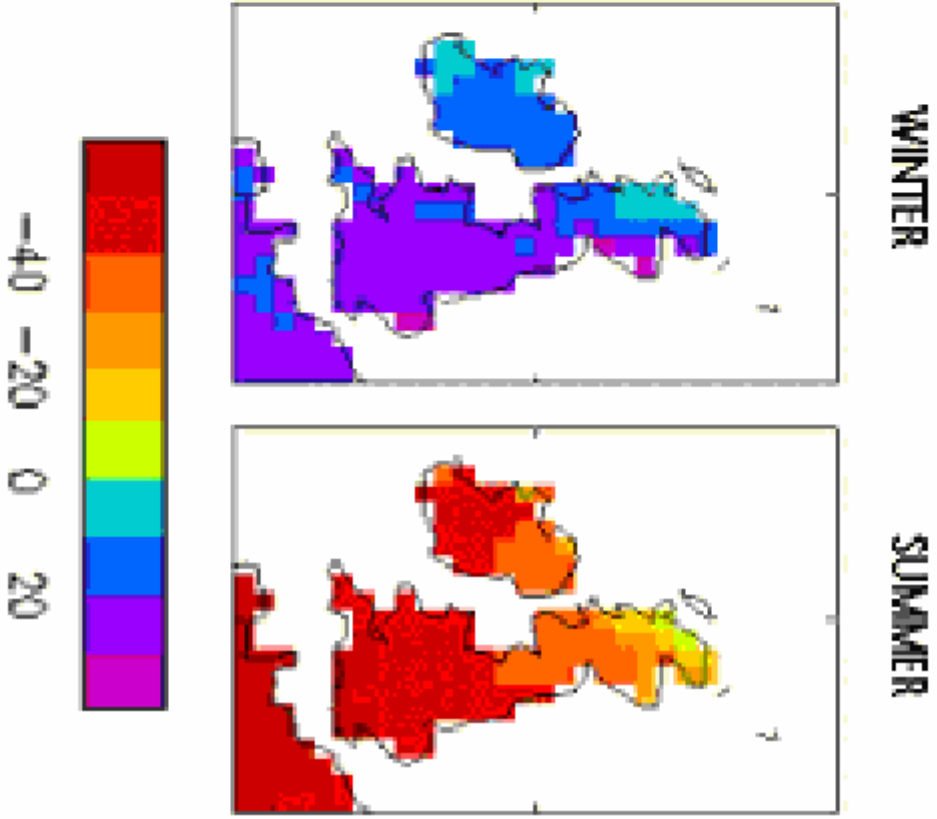
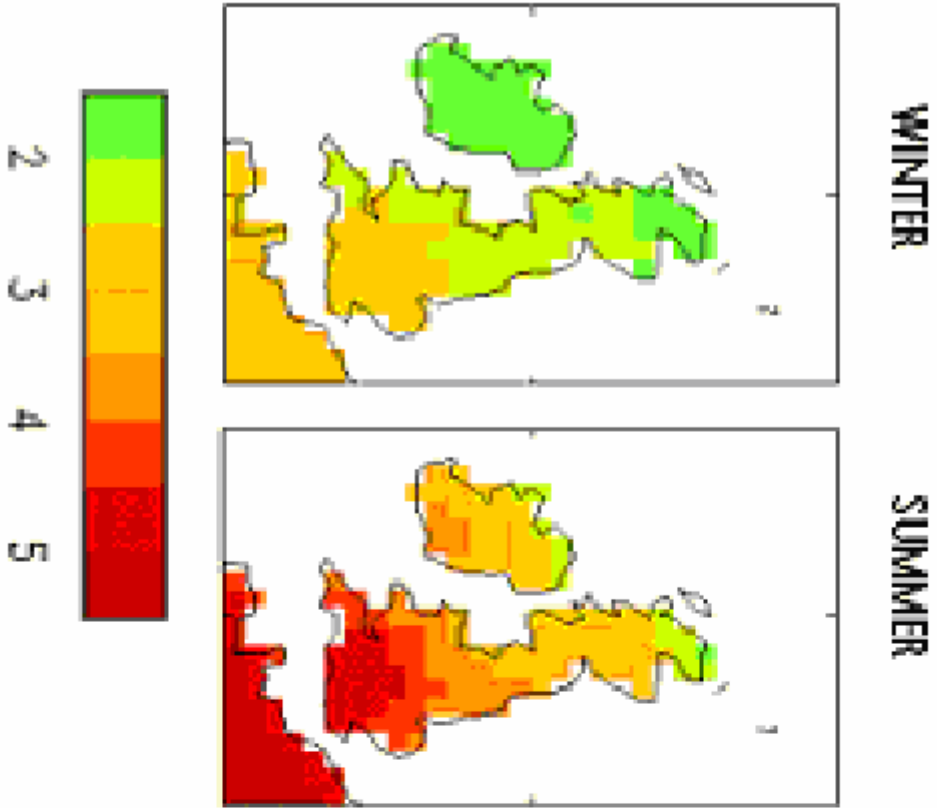
'Reasonable' mid-21st century scenario – a 2°C rise in mean temperature followed by a ~4°C cooling.

	max temp	mean temp	min temp
modern (Cardiff)	16	10	4
future pre-shut down	18	12	6
future cooling	14	8	2

- Still believed to be low probability, high impact in next 100 yr – but THC is weakening.
- Future pre-shut down scenario similar to SW France.
- Cooling scenario similar to N. Scotland/S. Norway.
- The above *mean* cooling scenario is as cold as the coldest *single year* in 17th C Little Ice Age.
 - Could take place within 10 years after shutdown.
- Probably a more disproportional temperature reduction in winter – i.e stronger seasonality – with more ice and snow days.
- Reduction in growing season
- Dislocation of sectors in more frequent exceptionally cold years (eg. 1963 winter becomes a one in seven occurrence)

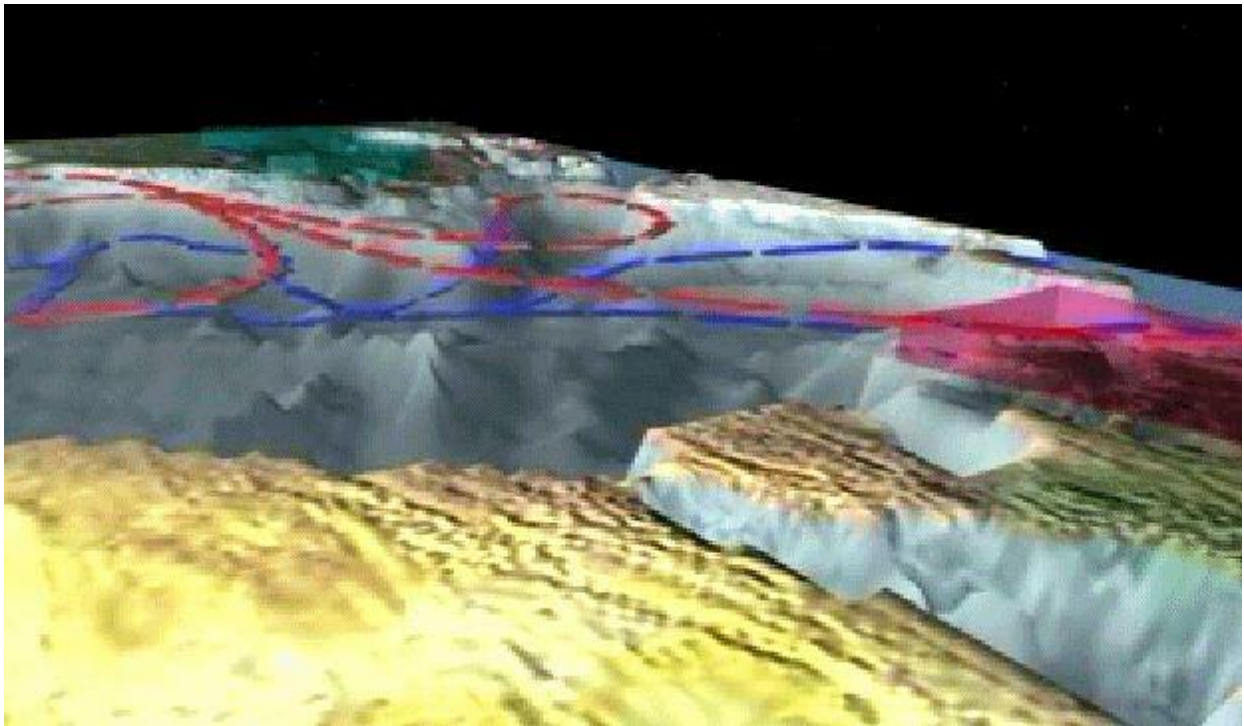
Wood, R.A et al (2003). **Phil. Trans. Roy Soc. Lond. A.**, **361**, 1961-1975
BBC Horizon, **The Big Chill**, 2003.

www.worldclimate.com

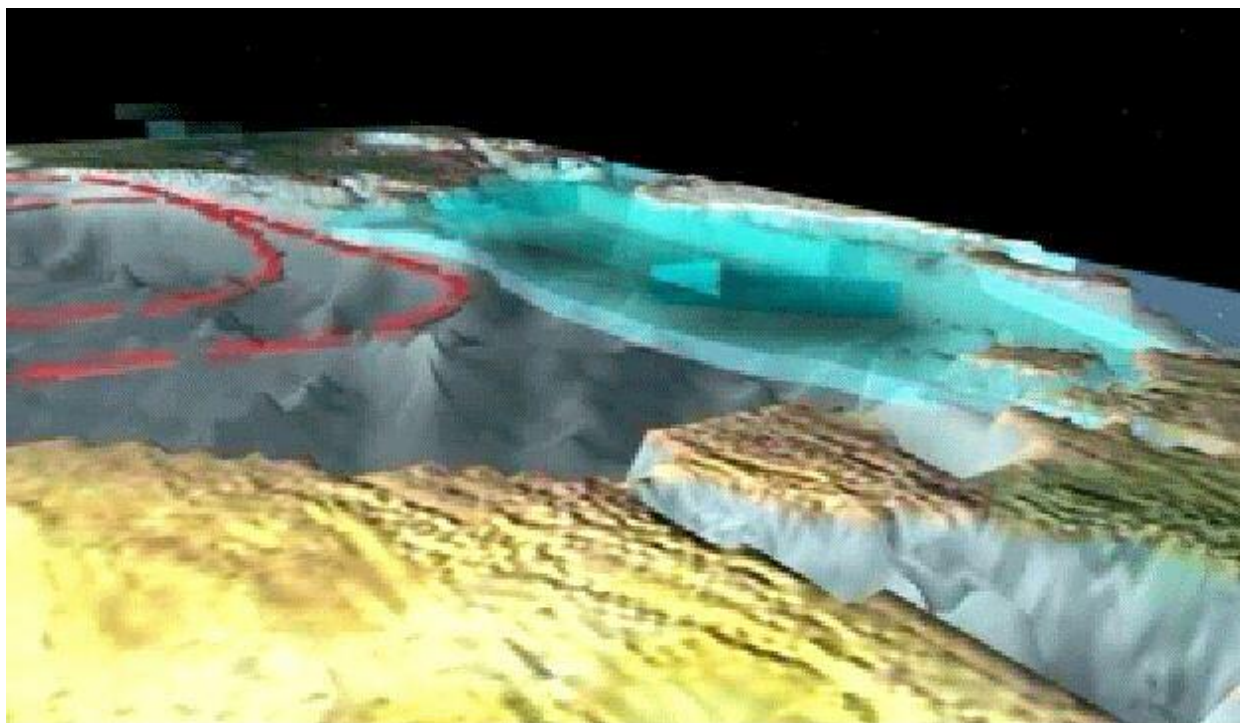


Thermohaline circulation

Normal state – as it is now



Abnormal state – as it will be in 2080?



Change in annual temperature 30 years after a collapse of the thermohaline circulation

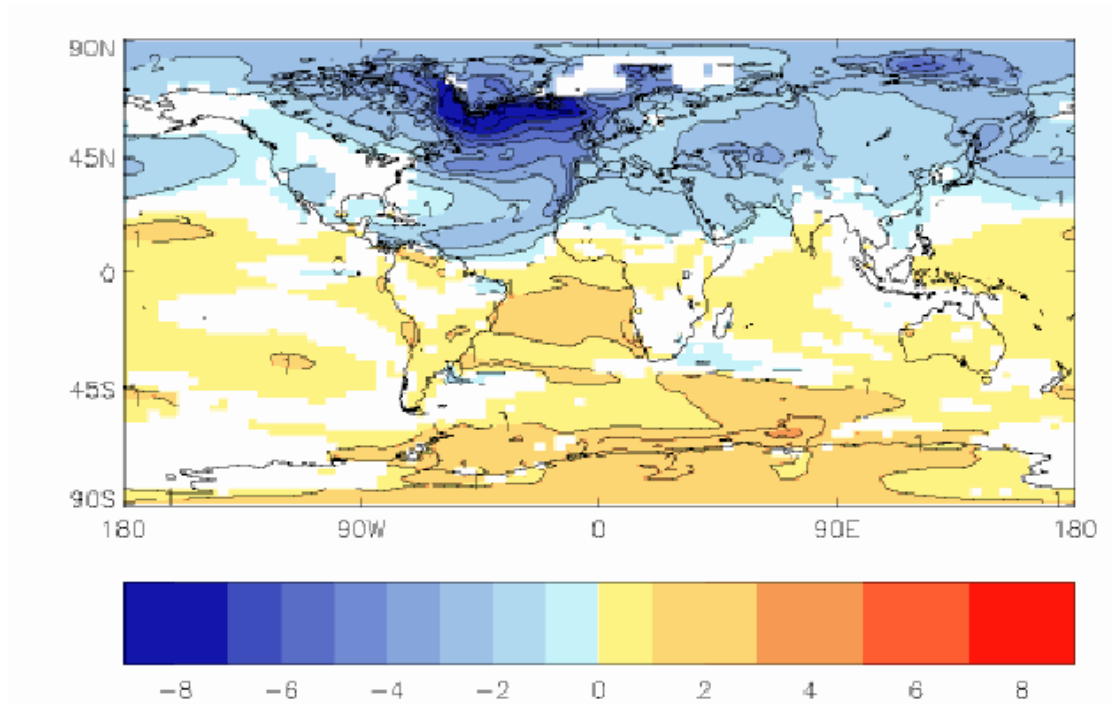


Figure courtesy of Michael Vellinga, Hadley Centre. (from web-site)