

## CHAPTER 10

### CROSS-SECTORAL DOMAINS

#### Introduction

This chapter explores the complex inter-relationships between different responses to climate change across different sectors. It does not use the standard format for individual domain reports, but is more descriptive and discursive in style.

The reports on individual domains concentrate on those issues most pertinent to their particular sector. Even in these individual reports there is a recognition of the way that impacts interact across different domains, particularly where adaptation strategies for one domain clearly have implications for another domain. Nevertheless, it was recognised that the Scoping Study should acknowledge cross-sectoral aspects of impacts and adaptation responses. It was seen as important to examine potential adaptation responses across domains. In discussion with the project steering group three contrasting localities were chosen in which to investigate such responses. These were:

- an urban setting (the city of Bristol);
- a rural setting (the Tamar Valley on the borders of Devon and Cornwall);
- a coastal setting (the coastline of Dorset).

All three localities had the advantage of having an inter-agency or cross-departmental body that could address issues such as climate change. The city of Bristol has a Sustainable City team with responsibility for the cross-cutting agenda of sustainable development. Part of the Tamar Valley is an Area of Outstanding Natural Beauty, which has a partnership committee to assist in its strategic management. The Dorset Coastal Forum was set up to promote the sustainable management of the Dorset Coast.

Workshops were held in each of the localities. We are grateful to all those who gave their time to the workshops, which involved the participation of managers and decision-makers who had some experience of considering problems across sectors. We have used selected examples from each setting to examine how potential adaptation responses might impact across different sectors.

#### Urban Context: Public Open Space

The adaptation of public spaces in urban areas such as Bristol to new climatic conditions illustrates the interconnected nature of planning and design. In the warmer and sunnier conditions anticipated in the UKCIP02 scenarios, shade in public space will become increasingly necessary and hence planned and designed for. One such case is school play areas. Local Education Authorities and school

governing bodies have begun to put into their specifications for new schools the requirement of shaded external areas. Existing school layouts will have to be modified. The costs of these will need to be included in LEA and school budgets. National government, with concerns over increasing skin cancer and the consequent NHS bill, will legislate for such provision for those LEAs and schools who have not done so already.

Shade will be required in other public places in urban settings, for example, on streets. If one were to map the distribution of trees in Bristol today the relatively treeless areas would be in inner city areas such as St. Paul's and outer city, former local-authority housing estates, such as Knowle and Hartcliffe. This raises social deprivation and resource allocation issues.

Technical issues arise in inner city areas where narrow roads and pavements are restrictions on straightforward tree planting. New street and traffic layouts may be needed, which would require extra investment. In new developments it will be easier to incorporate sensible planting arrangements. In private developments local authorities will be able to specify in planning requirements that appropriate species of trees will be planted at appropriate densities and locations.

Shade will also be important in city centre areas in response to changing lifestyles. It is anticipated that outdoor living and street-activity will become a greater feature of life in the South West than at present. In future, Bristol may have to think of itself more like continental Europe with pavement cafes open until late at night. Tree-lined streets such as the Promenade in Cheltenham may become more evident in South West towns along with increased pedestrianisation. On the other hand it may be that new forms of shelter are also required to protect pedestrians (and possibly cyclists) from extreme rainfall events. Can shelter from both sun and rain be achieved through similar types of structures? and will these be predominantly natural? (ie. trees or other vegetation) or man-made structures? or both?

Planners will need to anticipate trends towards increased outdoor living ahead of changes in consumer behaviour. Such opportunities will bring their own problems such as law and order, changes in local bye-laws on the use of the pavement, and problems of noise disturbance at unsocial hours outside domestic windows left open to increase cooling and ventilation.

The choice of appropriate tree species to provide shade must be made in the prospect of milder, wetter winters, but warmer, drier summers. It will have to be considered whether the existing species of planes and limes will thrive in the new conditions. If not, tolerant species will need to be identified, cultivated and planted. The effect on the urban landscape of such new species will have to be considered, and it is possible that the decision will be made to continue with existing species, and accept a more demanding management regime (such as more intensive irrigation).

Tree planting strategies will also affect building foundations, especially in the new climatic conditions. Species with too high a water demand will cause subsidence. Indeed such existing tree species close to existing buildings may have to be removed. More trees *per se* will also mean more blocked drains and root damage to other features of the built environment. Nevertheless, trees will have secondary benefits in terms of absorbing pollution.

The fear of litigation may also be a spur for some institutions in adapting their environments to cope with new climatic conditions. It is possible that schools may encounter legal claims through failure to protect schoolchildren from the excesses of sunshine and heat, whilst local authorities may receive claims when existing and newly planted trees increase the damage to foundations. Bristol clays are particularly vulnerable in this respect.

Tree planting on the scale envisioned to provide adequate shade may create public places with an entirely different townscape, especially if non-native species are required. The planning of such schemes might use public meetings and exhibitions to explain the need for these changes and use the opportunity to raise awareness of climate change and the need for adaptation.

Although in the urban scenarios outlined above there is no single issue which demands priority attention, in combination they demonstrate the cross-cutting nature of adaptation responses to climate change.

## Coastal Context: New Fish Species

The second example comes from the coastal setting. Rises in sea temperature are already being noticed along Britain's coastline. As one fisherman pointed out '.....we are losing the seasons: last year sea temperatures didn't drop below 10 degrees.' Such changes are already creating a myriad of effects: ecological, economic and environmental. The knowledge of these effects does not just rest with experts and scientists. It is those who derive their livelihood from the sea and coastal waters who provide an important source of knowledge concerning changes to marine ecosystems and to the local coastal economies. Moreover, local people's knowledge is often not just restricted to their locality. Because they are linked into a wider network of knowledge through their trade and industry contacts those fishing the coastal waters of Britain have not only an extensive knowledge of British waters but are linked to marine fishing people all over the world.

The complexity of change in coastal ecosystems and the economic effects that follow from this can be illustrated by changes in fish stocks off the South West coast. For example, with warmer sea temperatures, Manila clams are now well established in the waters of Poole Harbour. The clams have thrived to the point where they are now actively displacing other species, including the economically important mussel population, through competition for limited food stocks. Fishermen have had to shift their

business from mussels to Manila clams. The Manila clam is only one of a number of new species that is displacing fish stocks well recognised on British dinner tables. Sea bass is replacing cod in our coastal waters, but not yet in our fish and chip shops.

Poole itself has benefited economically from such changes. The new types of shellfish that are being caught all round the British coasts are transported by lorry from various fishing ports to Poole. There may not yet be the demand in Britain for these new species, but in Spain there is a ready demand, particularly to supply the Friday meal tables in this Catholic country. So the lorries with their fish consignments are then shipped from Poole to Bilbao and distributed to fish suppliers, mainly in Southern Spain. This is a new opportunity that climate change has already created.

However, there are negative consequences from these new trading patterns. The previous fishing industry based on traditional species like cod, plaice and mussels was more environmentally friendly with regard to transport. That trade was based on boats coming into port and the catches being distributed throughout Britain by train and lorry. Now the transport is primarily based on land with fleets of lorries travelling in greater numbers and longer distances. CO<sub>2</sub> emissions are therefore much higher in aggregate. Indeed such has been the impact on previous modes of fish transport, that the rail spur in Poole Harbour is threatened with closure, and luxury apartments are being proposed to replace the existing harbour-side rail depot. Presumably the housing development is more attractive with the prospect of a balmy climate in coastal Dorset. If the railhead closure goes ahead then it will mean that even more lorries serve the needs of the port with a further increase in CO<sub>2</sub> emissions.

There are two other aspects to the tale of the Manila clams. First, scientists when initially asked about the presence of the clams in Poole Harbour advised the local fishermen that there was nothing to worry about as the waters were too cold for the clams to thrive. Clearly this advice was ill-founded: in fact the clams have flourished. With changing climate, experts may get it wrong again so making ordinary people sceptical of expert opinion, including views on climate change itself.

Second, the experience of new species moving into Poole Harbour and the surrounding coasts has made some local people wary of new species *per se*. We were told that the experience of the clams would make those responsible for the management of fishing around Poole Harbour hostile to the import of any new species. However, if we are to plan properly to ameliorate the consequences of climate change and to seize the opportunities, then we will probably need to be pro-active in the introduction of new species. We will certainly need decision-making fora where the benefits of such an approach can be debated, and institutions where appropriate action can then be taken. Ecological Luddism can be partly avoided by harnessing the knowledge of local people and allowing them to share their understanding of the complex interactions between man and nature.

## Rural Context: River Catchments

The third example is from a catchment basin, in this case the Tamar Valley. With a future rainfall regime which is wetter in winter and the prospect of more extreme weather events, higher run-off and more flash floods will occur. In the upper reaches of the Tamar catchment high run-off is already being experienced because of the lack of wooded areas and the intensity of stocking. With wetter and more extreme conditions higher failure rates of man-made and natural slopes are likely to occur. This will affect both the productivity of the land and disruption to the existing poor road system. In what is already an economically marginal area this will cause problems for farmers and certainly discourage tourists, a source of income for many in the area. With climate change it is likely that more spring crops will be grown in the catchment area, thus exposing the land for longer periods. Higher run-off and higher sediment load will result.

Reservoirs could be constructed to deal with higher run-off levels but at the moment South West Water has no plans for further construction of reservoirs. Afforestation, for example with oaks, is another possible solution to reduce higher runoff, but such planting will take a long time to mature to the point where it significantly reduces run-off. Therefore, it seems likely that other forms of riverine flood defence will need to be constructed in the lower reaches of the catchment.

The Tamar Valley was an important mining area in the 19<sup>th</sup> century. Mining debris is still strewn throughout the catchment but is stabilised to the present rainfall regime. The predicted increase in rainfall quantity and intensity will mobilise tips leading to slope stability failures. The spoil heaps of the South West have never received the attention that tips in South Wales have enjoyed since the Aberfan disaster in 1966. The present condition of the Cornish tips is uncertain and hence with even small changes in rainfall patterns slope failures are unpredictable.

These tips also contain highly toxic material such as arsenic. Toxic pollution of water supplies is likely to follow remobilisation of such material. During the period of mining and the immediate aftermath of the cessation of mining, quantities of similar material did move from the mining debris tips through the catchment to be deposited on the mudflats of the Tamar estuary. This will also be remobilised if run-off is sufficient to expose the toxic deposits. The problem will be exacerbated by increasing sea level and possibly increased storminess, which will raise the river level in the lower part of the catchment.

Increased sediment load from upstream and changing sea conditions will increase the need for dredging in the Tamar estuary. The increased sediment load will also have an effect on freshwater fish stocks in the Tamar. Salmon is the most important of these fish to be affected because of the part it plays in the local fishing and tourism economies.

## Conservation Philosophies and Strategies

There is one cross-sectoral adaptive response that was noted in all the workshops. This was a wish to hold onto precious, local natural features in spite of the changes in climate and which we termed the "Canute syndrome". This view was not universal, but there were instances where species, habitats and landscapes were regarded as too important to lose, particularly when they related to some sense of our identity as British or English.

For example, the Tamar Valley has important market gardening businesses, especially for strawberries. Due to its importance to the local economy it was suggested that genetically modified strawberries could be introduced to allow the industry to continue under the new climatic conditions. So genetic modification could make sure that we had Tamar Valley strawberries and cream, making genetic modification an agent of conservation rather than its usual image as an agent of undesirable change.

Some would want to preserve particular landscapes that are judged as important to our heritage. Landscape gardens such as those in the National Trust properties in the Tamar Valley could be one such English landscape. Under the changed climate what price would we be prepared to pay to keep these three hundred-year-old features? Would this be done through genetically modified species or irrigation? Landscape preservation on a much larger scale would need to be considered in the case of AONBs. Their very name tells us that they are places of outstanding natural beauty but what if nature changes? Do we preserve them as they are, or allow them to evolve with climate change? If we chose the former course, the countryside of the South West could come to be made up in part of islands of conservation. The cost implications of such strategies will need to be assessed. The economies of these localities are based mainly on tourism from people who visit just to see these beautiful landscapes. If attitudes do not change, the tourists will go away and the local economy devastated, but if they are preserved there may be significant cost to the rest of us.

One of the aspects the Tamar case illustrated is the need both to think in a holistic way; in this case about the whole catchment, and at times to abandon empiricist thinking in favour of intuitive modes of reasoning. For example the increased dredging in the Tamar estuary has been happening for sometime but it has been difficult to track definitely the source(s) of the increased sediment load. So nothing has been done about it as no one can be held responsible for it.

## Management through Partnerships

The complexity and diversity of the issues outlined above highlight the need for debates within inter-agency bodies to ensure that cross-sectoral issues such as these are recognised, understood and addressed. All of the groups that participated in the cross-sectoral workshops were part of some multi-agency partnership, either formal or informal, which

provided the context within which such issues could be addressed.

The Dorset Coastal Forum was established in 1995 to look at the long-term strategic issues facing the Dorset coast. The overriding aim of the Forum is to promote a sustainable approach to the management, use and development of Dorset's coastal zone, which will ensure that its inherent natural and cultural qualities are maintained and enhanced for the benefit of future generations.

The Dorset Coast Strategy has now been prepared on behalf of the Dorset Coastal Forum. It sets out a future for the coast, covering the coastline and inshore seas from Lyme Regis to Christchurch. As the first part of the strategy, 15 topic papers on activities along the Dorset coast were produced. The purpose of these documents was to encourage dialogue and consultation with Forum members and other interested parties, in order to produce a strategy based on consensus. The Forum is now involved in the process of implementing the actions contained within the Strategy.

Bristol City has a unit dedicated to Sustainable Development within its Department of Environment, Transport and Leisure. This new unit encompasses a range of services and facilities from the CREATE Centre to the Ecohome, from environmental quality to pollution control, and looks at Local Agenda 21 and its impact on Bristol's environment. The City Council is also the lead partner in the recently created Local Strategic Partnership which includes other agencies dealing with issues such as health (the Primary Care Trust), and crime and disorder (the local constabulary).

Many of the participants in the Tamar Valley workshop were part of another network in the form of the Tamar Valley AONB Partnership. This is a group of organisations working together to conserve and enhance the AONB. Members of the partnership include:

District Councils, County Councils, Country Land and Business Association, Countryside Agency, representatives of Parish and Town Councils, Rail Partnership, Wildlife Trust, Rivers Trust, Estuary Consultative Committee, English Heritage, DEFRA, NFU,

The partnership comprises two bodies: a Partnership Committee of bodies with a major AONB-wide interest; and an Advisory Forum to ensure widespread community involvement.

Together they seek to:

- Promote the AONB and the Management Plan to all constituent organisations and others.
- Co-ordinate work towards the vision for the AONB via the implementation of the Management Plan.
- Review and monitor progress of the Plan and its objectives.

- Consider, debate and recommend courses of action on the main issues relating to the AONB.
- Accommodate new requirements due to changes in AONB legislation.

This may seem an obviously sensible arrangement that needs no reporting, but, despite the fact that partnerships are increasingly popular in many initiatives, they have yet to be developed with a specific climate change agenda as part of its remit. Such partnerships may well be appropriate to address the cross-sectoral complexity of adaptation to climate change.

The Tennessee Valley Authority in the USA provides an example of holistic thinking that may provide the model for inter-agency institutions that could plan and design for the new climate of the South West. As the history of the TVA explains:

*'Right from the start, TVA established a unique problem-solving approach to fulfilling its mission-integrated resource management. Each issue TVA faced—whether it was power production, navigation, flood control, malaria prevention, reforestation, or erosion control—was studied in its broadest context. TVA weighed each issue in relation to the others. From this beginning, TVA has held fast to its strategy of integrated solutions, even as the issues changed over the years.'*