



Responding to climate change:
inclusive and integrated coastal analysis □ □

Katrina Brown, Roger Few, Emma L. Tompkins

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Responding to climate change: inclusive and integrated coastal analysis

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Katrina Brown, Roger Few, Emma L. Tompkins
(University of East Anglia)

Mikis Tsimplis, Tarja Sortti
(University of Southampton)

Overview of project work and outcomes

Abstract

The research project '*Responding to climate change: inclusive and integrated coastal analysis*' examines the challenges for coastal decision-making in the UK in the context of potential climate change and sea level rise. Decisions and actions on how to adapt to climate changes by people and institutions living within or managing the coastal zone are shaped and constrained by a range of factors, including the resources available to decision-makers and the social, economic and political context in which decisions are made. The study aims to illuminate:

- decision processes relating to strategic long-term actions
- factors affecting adaptive capacity to address climate impacts
- the role of public participation in making decisions about coastal planning
- the role of institutional integration in strategic coastal management

Two areas of the UK were selected as case studies for this project: Christchurch Bay in the south of England, where work centred on issues connected with coastal defence; and the isles of Orkney off the north coast of Scotland, where work centred on the potential for disruption of transport systems. Together with more conventional methods of data gathering, the project team also formulated and implemented a novel deliberative methodology that has potential for further use both in research and practice on coastal management.

The key conclusion from the project is that strategic action on climate change adaptation in the coastal zone is likely to require new forms of decision-making process. Given the long time frames and major uncertainties surrounding climate change impacts, taking decisions and actions to combat the effects of sea level rise and climate alterations is by no means straight-forward. In this context, decision-making on adaptive strategies raises inherent trade-offs for society, related to competing priorities and local politics/power. These fundamental impediments require more sophisticated approaches to institutional integration and public inclusion.

Key objectives

- Advance understanding of the links between vulnerability and adaptive capacity in the coastal zone
- Identify constraints and opportunities for implementing sustainable coastal management policies in the context of climate change
- Provide recommendations on practice and policy for coastal decision-makers

Work undertaken

Following a review of national coastal management developments and of planning and legislative systems for coastal management, research centred on two case study sites in contrasting contexts: Christchurch Bay on the south coast of England and the Orkney

Islands in the north of Scotland. In Christchurch Bay investigation of stakeholder and institutional responses to potential climate change impacts has focused primarily on issues relating to coastal defence. In Orkney the project looked mainly at issues relating to future transportation (by sea, air and causeways – between the islands and between Orkney and the mainland), set in the context of existing challenges to the islands' long-term economic and demographic viability.

In both locations, data collection was based on in-depth interviews with stakeholders, including resident groups, community-based organisations, economic/recreational sectors, local authorities, regional authorities and public agencies, consultation of documents and observation of planning meetings. Following initial analyses of the findings, the project team then organised participatory research workshops with stakeholders to explore further perspectives on future coastal management. Utilising an experimental methodology, these workshops focused especially on questions of timing and scale of adaptive decision-making to long term climate risks.

Results

The case study research provides a rich body of material elucidating how issues of vulnerability and adaptation intersect with the realities of coastal decision-making for institutions and individuals in specific places. We argue that such detailed empirical work is vital to 'ground' conceptual discussions on climate change adaptation and to genuinely advance understanding of adaptive capacity in the coastal zone. The study yielded more insights on constraints to strategic coastal management than on examples of good practice and opportunity, but we propose some recommendations for more effective policy and decision-making.

Analysis of the findings reveals a complex picture of differential vulnerability and adaptive potential in the case studies. It suggests that there are a series of important constraints limiting the present capacity for coastal management 'on the ground' to respond to climate change threats in a strategic, integrated and inclusive manner, including risk uncertainties, pressure on local governmental resources, funding uncertainties and short-term local political priorities. The findings provide important insights on the utility of simplistic notions of 'anticipatory' adaptation to climate change impacts in the UK coastal zone, on the need for cross-scale institutional integration and on the applicability of an idealised 'community-based' decision-making process in long term coastal zone management.

Relevance to Tyndall Centre research strategy and overall Centre objectives

The research makes an important contribution to the science of integration and to the central research concerns of both theme 4 (sustaining the coastal zone) and theme 3 (adapting to climate change). The analysis of social and political processes of decision-making in relation to the coastal zone provides a necessary complement to the model-based and oceanographic work within theme 4, providing insights relevant to the national coastal vulnerability assessment and to the exploration of new institutional approaches to coastal management. Some of this work is continuing as part of research project T3.43. The trade-off analysis element in the work, in particular, has provided important insights to theoretical development within theme 3 by highlighting the subtle interplay between issues of risk, cost and local representation in the perceptions of

stakeholders. In addition, the engagement of stakeholders at two different coastal locations has motivated these elements of society, and the findings from the study will also facilitate the development of climate change responses in the coastal zone.

Potential for further work

We recommend that the research approach be extended to other case study sites and coastal management issues and combined with analysis at the national/regional decision-making level. Further work at both these levels would provide a foundation for the development of institutional structures that can enhance cross-scale integration, long-term strategic planning across sectors, and local adaptive capacity. A major innovation of the project is the development of an experimental research methodology designed to facilitate a deliberative process among coastal stakeholders. As highlighted in the technical report, the methodology proved successful and has potential application in research, policy analysis and development. Further refinement of this methodology could create an inclusive decision support tool with wide application for issues relating to climate change and sustainability.

Communication highlights

- 'Scaling adaptation: climate change response and coastal management in the UK' - submitted to Environment and Planning A (September 2004) and as a Tyndall Working Paper (October 2004).
- Two further journal papers in preparation for submission 2004, and 2 planned for submission in 2005.
- Report on legal framework for coastal zone management in the UK
- Four research/workshop reports circulated to case study participants.
- Presentation to the Swedish Academy of Sciences, Stockholm, October 2004
- Presentation to the Macaulay Land Use Research Institute, Aberdeen, September 2004

Technical report



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RESPONDING TO CLIMATE CHANGE: INCLUSIVE AND INTEGRATED COASTAL ANALYSIS

Technical report

This final project report is structured as a series of Questions. The first section describes the rationale, aims and methods of the project in fairly conventional format. In the following three sections we orient the findings of our project toward three key questions on which the project has yielded important insights and developments. Each of those sections includes short statements on findings of practical relevance for policy and/or research.

1. What did we do and why?

Coastal populations are potentially at risk from many aspects of climate change, directly through sea level rise, alterations in wind patterns and extreme events such as storms, changes in flow regime at river mouths, and indirectly through changes in air and sea temperature. The vulnerability of coastal populations is also influenced by decisions and actions on how to adapt to climate change hazards by people and institutions living within or managing the coastal zone. These decisions and actions are in turn shaped and constrained by a range of factors, including the resources available to decision-makers and the social, economic and political context in which decisions are made.

How this project differed from many other projects in this field is that it focussed not on the potential impacts of climate change per se, but rather on the potential for adaptive coastal management at sites on the UK coast, analysing the challenges and opportunities for long term planning and response by institutions and stakeholders. Its concern was to examine the processes for making decisions about how to manage the potential impacts, either in anticipation of the impacts, or after the fact. From the outset, it posed a series of searching and complex questions. How can stakeholders and coastal management institutions respond to the challenges posed by climate change? What adaptive actions are feasible, where and when? How should adaptive action be managed, so as to incorporate different perspectives and integrate with broader coastal management concerns?

Such an investigation required a different kind of research approach from most existing studies of climate change. We were interested in exploring individual's and institutions' perceptions of the problem and how they might approach it, how perspectives might differ depending on capacities and priorities, what factors might constrain or promote adaptive responses, and how perspectives might change through a process of discussion between stakeholders with different interests. The emphasis in the project was therefore on qualitative research, designed to deepen understanding of perceptions and decision-making processes. The most effective means through which to carry out such analysis was through in-depth case studies at specific coastal sites in the UK.

The research project had three strands. In order to set the context for the study, the first task was a desk review of UK climate change issues, national coastal management developments and planning and legislative systems for coastal management. Intensively in the first stages, and ongoing through the course of the project, the team has consulted a wide range of national level reports, briefing papers, articles, government documents and website materials. During the course of the project a number of important documents have been published, including outputs from UKCIP and from the 'Foresight Future Flooding' initiative. As part of the project, information was compiled on legal frameworks for coastal zone management in the UK (included here as Appendix 4).

The second and third strands were individual case studies in two locations - Christchurch Bay on the south coast of England and the isles of Orkney off the north coast of Scotland. In Christchurch Bay investigation of stakeholder and institutional responses to potential climate change impacts has focused primarily on issues relating to coastal defence. Together with a Bay-wide analysis, the team also selected two specific locations – Barton-on-Sea and Christchurch Harbour – as sites for more intensive study. In Orkney the project looked mainly at issues relating to future transportation (by sea, air and causeways – between the islands and between Orkney and the mainland), set in the context of existing challenges to the islands' long-term economic and demographic viability. Most of the analysis was Orkney-wide, but there was also a focus on one particular site, the island of Burray and its connection to mainland Orkney via the Churchill Barriers.

These two case studies provide detailed insights into the vulnerability and adaptation issues under scrutiny. Here, the account will concentrate on the standardised methodology used for these two case studies, with only background information from the studies summarized in Boxes 1 and 2 overleaf. However, further details are provided in the case study reports that are reproduced in full in Appendices 2-5.

Table 1 provides details of data collection at both sites. In each case study area, the first phase of data collection was based on consultation of documents, in-depth interviews with stakeholders (from resident groups, community-based organisations, economic and recreational sectors, local authorities, regional authorities and public agencies) and observation of planning meetings. Preliminary meetings with contacts at both areas helped define the sectoral focus for each case study, identify secondary sources and identify initial key informants.

Table 1 Case study data sources

<i>Christchurch Bay</i>	<i>Orkney</i>
<ul style="list-style-type: none"> • 27 regional/local documents consulted • Interviews with 38 stakeholders • Observation of coastal planning meeting • Stakeholder workshop 	<ul style="list-style-type: none"> • 35 regional/local documents consulted • Interviews with 35 stakeholders • Observation of environment group meeting • Stakeholder workshop

The process of identifying further key informants continued until the research team was confident they had interviewed a selection of representatives from all key stakeholder groups for each site. Interviews were semi-structured in format, guided by an informal question schedule designed to facilitate discussion of key themes relating to coastal issues, climate change risks, prospects for response measures and perspectives on coastal management approaches.

Following initial analysis, the project team organised research workshops with stakeholders to explore further key perspectives on future coastal management. Utilising an experimental participatory methodology, the workshops focused especially on questions of timing and scale of adaptive decision-making to long term climate risks. The workshop proceedings were designed to encourage participants to consider how to balance some of the fundamental trade offs that exist in choosing how to respond to possible future climate threats. For the first case study, the workshop focussed on coastal defence issues at a single site, Christchurch Harbour. For the second study, the workshop focussed on transportation issues for Orkney as a whole.

At the start of each workshop the participants were asked to undertake a brief voting (ranking and scoring) exercise on the following three basic decision-making criteria for future coastal management:

- Risk of future damage/disruption should be minimised ('Risk' criterion)
- New spending in response to risk should be minimised ('Cost' criterion)
- The decisions made must reflect local views ('Local' criterion)

Box 1 Christchurch Bay

The coastline of Christchurch Bay crosses the border of Hampshire and Dorset on the south coast of England. Much of the coastline is urbanized and the coastal zone is renowned as a destination both for tourists and for resident incomers of retirement age. After initial work in the area, it was decided that investigation of stakeholder and institutional responses to potential climate change impacts should focus primarily on issues relating to coastal defence. In particular, the research would examine the issues, perceptions, concerns, responses and adaptive capacities relating to two specific sites: Christchurch Harbour and the Barton-on-Sea cliffs. The former is a large, semi-urbanised inlet, fed by two major rivers that is potentially susceptible to severe tidal/riverine flooding. The latter is an actively eroding, but urbanised coastline with a number of vulnerable properties located close to the cliff edge.

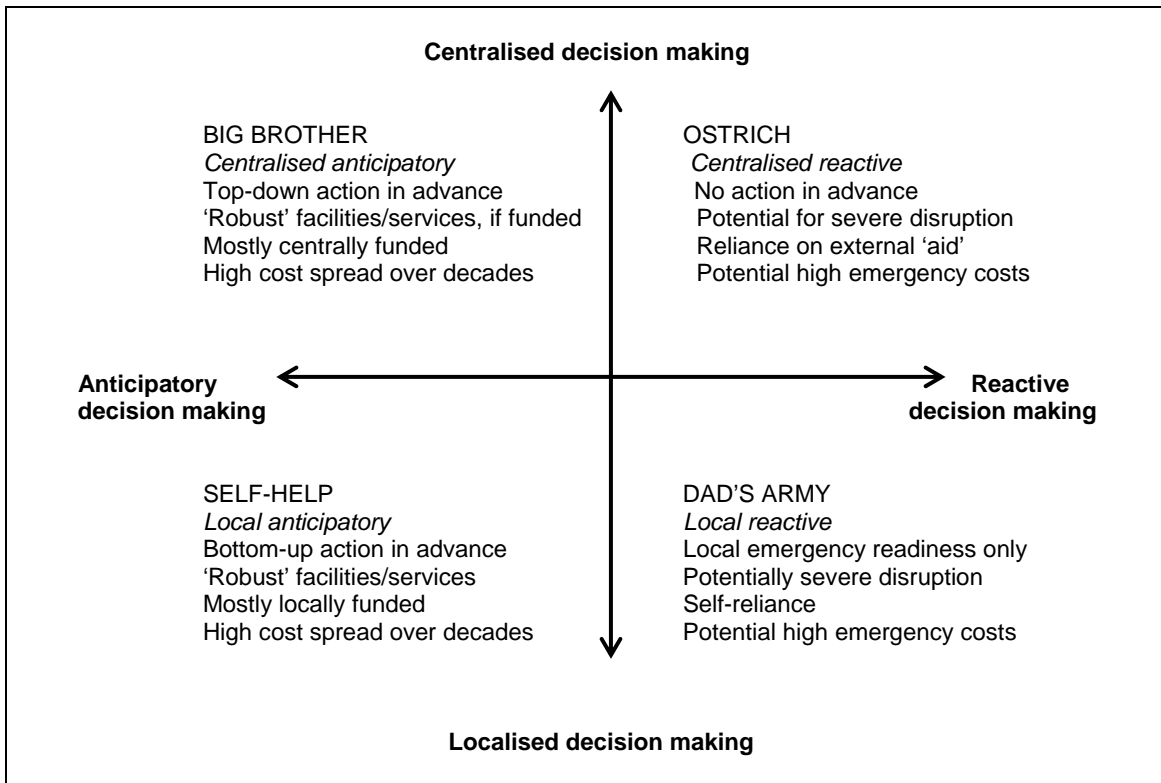
Box 2 Orkney

Orkney is an archipelago of small islands (16 permanently settled) lying off the north coast of Scotland. Though Orkney currently has a relatively buoyant economy, there are major concerns over long-term population decline, especially in the isles to the north and south-west of the principal island ('Mainland'). At Orkney, work has centred on the potential for future disruption of transport systems within Orkney and between the islands and mainland Scotland. The focus on transport impacts led, in part, from the fundamental importance of travel and transportation to economy and society in Orkney. Marine transport may be affected by both rising sea levels and storminess: the operational ability of piers and harbour facilities may be affected by increases in high water level; and increased storminess may create problems for the safe movement and docking of vessels. Higher incidence of strong winds could bring extra disruption to inter-island and external flights, including hospital flights. Increased storm conditions could also bring greater flood/erosion risk to coastal roads and causeways, including the fixed inter-island links created by the Churchill Barriers in the south-east of the archipelago.

The range of potential climate change threats to the study area was then outlined and a set of strategic considerations that relate to future management were posed for general discussion.

In the second part of the workshop, participants were asked to discuss and evaluate a set of different management scenarios – hypothetical alternative approaches to long-term risk management. Participants were presented with a diagram defining four hypothetical approaches to climate change management in the future. (Figure 1 below shows the diagram used for the Orkney workshop – the diagram for Christchurch Harbour differed only in minor detail from this and is shown in Appendix 2). Each segment of the picture describes an approach to climate change management. The differences between these ‘management scenarios’ are explained by their relation to two axes, the horizontal axis representing the timing of decision making (Anticipatory to Reactive) and the vertical representing the scale of decision-making (Centralised to Localised).

Figure 1 Management scenarios matrix for Orkney workshop



Following these discussions, the voting exercise on the decision-making criteria was then repeated to enable a comparison of results before and after the workshop (see Appendices 3 and 5 for further details of the workshop proceedings). A final, postal version of the voting exercise was also sent to participants three weeks after the workshop, together with a request for comments on the event. The reports in Appendices 2-5 were also circulated to interviewees and workshop participants.

2. What have we learned about climate change adaptation processes in coastal management decision-making in the UK?

Analysis of the findings from our study of climate change and coastal management prospects in the UK presents a complex picture of differential vulnerability, adaptive potential and decision-making trade-offs. It suggests that there are a series of important constraints limiting the present capacity for coastal management 'on the ground' to respond to climate change threats in a strategic, integrated and inclusive manner, including risk uncertainties, pressure on local governmental resources, funding uncertainties and short-term local political priorities. The findings provide important insights on the prospects for purely 'anticipatory' adaptation to climate change impacts in the UK coastal zone, on the present cross-scale deficiencies in coastal management, and on processes of public inclusion in decision-making process in long term coastal zone management. We argue that both further research in this field and effective coastal management requires an analysis that integrates ecological social and economic criteria and different scales, and that includes all relevant stakeholders, and we present some insights on methodological tools that might facilitate such work.

In this section we concentrate on the general issue of complexity. Clearly, climate change adaptation is a complex process. If action to tackle the impacts of climate change is to take place, people will have to take decisions to do so. The feasibility of the technical solutions provided by science therefore have to be assessed alongside an understanding of how decisions on strategic action are taken and implemented within society. Such an understanding requires attention to social and political detail: to unravelling the tangle of human perceptions, motivations, values and decisions in order to understand the social mechanisms of adaptation. It is an approach that explicitly embraces complexity rather than aiming for reduction and simplification.

What the study has underlined is that this very complexity of adaptation, as social process, must challenge any overly-simplistic notion of how adaptation might take place. No matter how significantly we might stress the potential impacts of climate change and the role of climate as a 'driver' of societal change, adaptation still has to come about through human action and decision. In the case of 'anticipatory' adaptive response, this requires people to undertake action intentionally in advance of climate impacts becoming manifest. In such circumstances no deterministic relationship between the estimated impact of the threat and human response can be assumed. Adaptation will almost always be associated with societal trade-offs, the interplay between which will shape how the process proceeds 'on the ground'. Based on the findings of the desk review and the case study interviews, we identified three key elements of trade-off that are likely to arise in questions of adaptive response in coastal zones – the three key criteria we employed in our workshop analyses of risk, cost and representation of local values (see section 1).

Moreover, adaptation to climate change, from our discussions with stakeholders, presents particular problems. Though science can point to increasingly strong evidence of present-day sea level rise and shifts in climate, current understandings suggest that major impacts from a changing climate will mostly become manifest toward the latter part of the present century. Climate change, for the most part, is therefore an inter-generational phenomenon. Moreover, much scientific uncertainty surrounds the climate change process itself: we cannot definitively predict what will happen, where and when.

Because of its long-term and uncertain nature, responding to climate change may be particularly complex and contentious compared with other, more tangible contemporary environmental problems such as biodiversity loss. This makes consideration of adaptive response to climate change especially ripe for contestation over perceptions and priorities, articulated through social power and politics. Our studies suggest that such issues play out especially intensely at the local scale and in contexts where anticipatory forms of adaptation entail radical changes to current practices.

At **Christchurch Bay**, rising sea level and/or potential changes in precipitation, wave regimes and severe weather systems would likely exacerbate present threats from cliff erosion and sea flooding around the Bay. Much of the coastline already has hard and soft engineered sea defences, but future strategies for defences are currently being developed that may not necessarily entail 'holding the line'. There is also some concern expressed about future riverine/tidal flooding, affecting particularly some of the urbanised portions of the coast. Adaptive responses to the potentially increased threats from climate change can be articulated along the alternative lines suggested by Bijlsma et al (1996) as 'protect', 'accommodate' or 'retreat' options. At Christchurch Bay, protection from flooding and erosion could include at the extreme massive engineered sea defences, such as high sea walls and embankments, or large-scale beach nourishment and other high-maintenance 'soft' defences. Accommodation might mean measures to cope with regular inundation such as extensive flood-proofing or elevation of property, modification of urban drainage systems and raising of roads. Retreat means major changes in land use and the distribution of homes away from vulnerable sites, involving perhaps acquisition of land and property by public authorities, planning set-back zones or subsidies to coastal dwellers to relocate inland.

All such options entail major changes in the built environment: bringing alterations in landscape/amenity, infrastructure or the integrity of current settlements. All are also likely to entail major expenditure, which may exceed the capacity for raising funds at the local level. Recourse to external funds, we suggest, may have implications for the degree to which local values can be represented in decision-making. The inherent trade offs between risk, cost and local views immediately become apparent, and are heightened by the long-term nature and predictive uncertainty of the climate change threat coupled with the notion of advance planning and action to combat that threat. These issues are illustrated by the following range of comments from interviewees and workshop participants:

- *There's a divide – those that say this is our England and we should be protecting it – or those that just say we walk our dogs there and it'll do us for the next 10 years.*
- *If you allow the first houses to go where does it stop – we will keep losing more and more. We need to draw a line somewhere.*
- *It's a natural, inexorable process – you have to work with it. When you start protecting where do you stop.*
- *Future generations will blame us if we do not act now.*
- *The best approach may be to monitor what changes are happening and keep revising the management strategy accordingly as changes become apparent.*
- *The decision-making generally should be reactive. Anticipatory action would require citizens' funding commitments and citizens have other short-term priorities.*

- ‘Consultation’ without genuine decision-making input is not sufficient public involvement. There needs to be community-level planning.
- The system has to be centralised, as now, because local people would not be prepared to cover the costs required.

In **Orkney**, transport facilities, vessels and services may be affected in the long term by sea level rise and wind/storm changes. If the rate of change is high, within the present century as many as nine settled areas of Orkney could become regularly cut off from vehicle access because of high seas washing across low-lying roads and causeways, including the Churchill Barriers. There could be more days with high winds above 50 knots when flights are cancelled from Kirkwall to mainland Scotland and to the northern isles. There could be many more occasions when high waters or high winds make it difficult for ferries, livestock ships and freight ships to cross the Pentland and Moray Firths or for inter-island ferries to dock at piers and linkspans, leading to cancellations of services. There may be more days when fishing is not possible and when cargo ships cannot dock.

Adaptive responses to these risks can again be divided into three categories, in parallel with those suggested above (see Box 3). One approach would be to maintain transport services as close as possible to those provided today. Discussions with interviewees and consultation of documents yielded a number of possible technical measures that might be considered such as the construction or modification of roadway and harbour structures designed to operate at higher sea levels, withstand higher waves or shelter vehicles and vessels from wind and waves. There may also be alterations too to the design or size of boats and aircraft so that they can cope better with rougher seas and

wind conditions. A second form of adaptation in this sector would be to reorganise present transport services and related activities so that they become less sensitive to weather-related disruption. Organisation of activity could include, for example, re-routing of inter-island ferries to take longer but more sheltered routes and better coordination of shipping traffic at ports to take account of local weather forecasts. Livestock export delays could be accommodated better through the provision of permanent reserve farm space on mainland Orkney. A third form of societal adaptation in this context might be to reduce

Box 3 Adaptive approaches to coastal management – equivalent categorisations

Though the triad of coastal adaptive response approaches suggested by Bijlsma et al (1996) has been critiqued for an over-emphasis on coastal defence issues, we can see utility in the division of approaches they put forward. Adaptive options against transport disruption in Orkney could be articulated along parallel lines. In the table below we compare the two sets of categorizations, and derive a third set that we suggest is more generic in application (see also the suggestions in Klein et al 2001).

<i>Coastal defence</i>	protect	accommodate	retreat
<i>Transport</i>	maintain services	reduce sensitivity to weather	reduce usage
<i>Generic</i>	control the problem	cope with the problem	avoid the problem

dependence on transportation – of people, livestock and goods. This might come about through strategic shifts in the islands' economy and work patterns, and even changes in the distribution of settlement. There could, for example, be more home-working, possibly facilitated by enhanced telecommunications links. There could also be a return to greater self-sufficiency in Orkney, with more foodstuffs and other products and services being supplied locally.

Again these potential options raise a series of trade-off issues between risk, cost and the balance of local representation and values. Many of the options in the first category are highly capital-intensive, dependent on external funding and might require periodic upgrading. The second category of changes suggested would mostly require considerable planning, reorganisation and monitoring, and be dependent on people's willingness to accommodate changed practices. The third adaptive approach is likely to entail major shifts in lifestyle and society, including reduction in personal travel and choice of consumer goods: sacrifices that many people may be unwilling to make. And, though it should be stressed that no interviewee actually advocated this, it may also lead to the abandonment of isles that are unable to maintain basic self-sufficiency. Again, comments during the interviews and workshop in Orkney suggest many shades of opinion and competing priorities in relation to these trade-offs:

- *We have to respond for small harbours – we have to spend money to modify them because we can't depopulate the islands.*
- *Generally people here don't see weather or the movement of the -sea as a problem. Its something to accommodate – accept and work around.*
- *Orkney may need to become more self-sufficient in many food products to reduce dependence on the importation of stocks.*
- *Orcadians should think ahead to alleviate prospective problems and need to start planning now.*
- *We should make investment for the future, but not if acting without proof.*
- *Investment in planning for possible climate impacts might be better spent sustaining local communities instead.*
- *Local people know best how to manage the islands.*
- *Orkney cannot do transport adaptation itself: transport is already hugely subsidised.*

Despite the differences in context between the case study examples, there are many parallel messages in these series of comments. They indicate that any attempt to undertake strategic planning for climate change adaptation will take place amid a range of competing perspectives, interests and arguments over prioritization and approach. Decision-making realities mean that consideration of trade offs is inevitable when concepts of adaptation are translated into practical action.



Politics cannot be overlooked in the formulation of strategic policies on climate change adaptation. The process needs to take account of competing priorities and fundamental trade offs, the balance of which will vary from context to context. These trade offs will become especially evident when generic policy statements are translated into concrete actions in specific places.

3. What are the constraints to strategic decision-making on coastal management in response to climate change risks?

A central theme of the project was an assessment of adaptive capacity in coastal areas of the UK. Adaptation to the potential impacts of climate change may be undertaken by public agencies charged with coastal management and by private individuals and groups that reside in or utilize the resources of coastal zones. Through our research we explored the prospects for decision-making and action in response to climate risks by a range of such actors, highlighting the factors that might shape capacity to adapt now and in future.

The generally supportive response to our work by the spectrum of stakeholders we interviewed in the study sites suggests a willingness for people to engage in debate on climate change issues. In Orkney, in particular, this was accompanied by a high level of existing public concern for long-term issues of economic, social and environmental sustainability for the islands in general. However, the research raised a series of important existing constraints to adaptive response that simply cannot be brushed aside by the simplistic advocacy of an 'imperative' to adapt. This section now concentrates on those key constraints.

Uncertainty and timescales. As has been stressed already, action to tackle climate change impacts faces two inherent hurdles: not only are most changes likely to take place over long (multi-generational) timescales, but the task of defining what may take place at specific sites is clouded by uncertainty. Our research emphasizes that these two issues raise fundamental problems for pro-active decision-making, particularly in cases where proposed adaptive actions entail radical changes to the status quo.

Despite new monitoring advances and ever-more sophisticated efforts to model future change, much predictive uncertainty remains over future climate parameters and how these might impact on the coastal environment. There is even greater uncertainty over the future shape of society, governance and technological change – as one local stakeholder in Orkney noted, what will matter is how future climate affects future society, not present society. In both case study areas this uncertainty makes it difficult to plan strategically and to justify actions that might produce long term benefits but incur short term costs. Some of the adaptive options noted in the previous section might be seen to pose major costs should the degree of climate change prove to be minimal. However, the complex nature of the climate change problem is always likely to defy certainty of prediction. A key question is how much certainty is needed before adaptive action should commence – given that measures to counter risks may themselves need a long lead-in time for integrated planning, public inclusion, negotiation and implementation. On the one hand, some interviewees in Orkney called for more national-level guidance on adaptive actions. Others, however, believed that, because there is so much uncertainty, decisions on action should be guided by local knowledge of Orkney's environment and socio-economic needs.

Given the uncertainties, the issues of timescale become heightened. As already has been made evident, active adaptation to climate change implies a consideration of long-term strategy. Although much climate change impact is predicted to take the form of a continuous or incremental intensification of current hazards, the rate of change is unlikely to bring significantly greater impact for several decades. In the Christchurch Bay

area it may be well into the second half of the 21st century before sea level rise and altered weather patterns compromise the design capacity of sea defences or bring major changes to cliff erosion rates. Predictions of climate change therefore increase the challenge to coastal management to take strategic long term planning decisions (TCPA, 2003; UKCIP et al, 2003). This is especially the case when they raise difficult trade-offs between short term and long term benefits.

Yet, as Box 4 illustrates, organisations concerned with flood and coastal management in the UK have been charged with short-termism in relation to existing hazards, let alone any potential changes in these hazards (Cobbold and Santeema, 2001; Metcalf et al, 2003). In this respect coastal management institutions receive little formal empowerment from central government to develop long term strategy. Although Defra is putting in place provision for shoreline management planning to take into account risks 100 years from now, the discounting of future costs and benefits in project appraisal, coupled with cyclical funding for schemes means that planning tends to remain on a much shorter time horizon. Short-termism is yet more pronounced within spatial planning, where central government has provided no mandate for local planning authorities to plan for the long term. The timescale for the current Local Plans for both New Forest District and Christchurch Borough runs only to 2011, a forward planning period advised by Regional Planning Guidance. In future, local development frameworks will have to comply with new regional spatial strategies from the regional authorities, but even for these the time horizon is likely to be limited to 20-30 years, according to one regional-level interviewee.

Box 4 Cliff recession and settlement at Barton-on-Sea

Even if there were no climate change impact, cliff erosion along the Barton coastline on Christchurch Bay would be an ongoing process. Unless retarded by major protection works it will almost certainly have implications for property and land ownership and for the distribution of settlement within the coming decades. However, apart from a 'redlining' measure to prevent new development within a predicted 60-year erosion risk belt along the clifftop, local authority planners presently argue they can make no long term provision for other adaptive measures such as the relocation of infrastructure and housing (which by its nature requires advance planning). If erosion rates increase because of higher levels of winter rainfall and sea level rise, the physical threats to existing development may accelerate.

Local government is often further constrained by local political pressures that may tend to work against long term actions with controversial present-day implications. All these factors may tend to reinforce a short-term outlook over climate: one that makes long term anticipatory action all the more difficult.

However, the issue of 'short-termism' may not be so simple. In Orkney, we perceive that society in general is relatively accustomed to taking a long-term perspective on issues such as population change, economic growth and sustainability: so why does climate change fail to register as a pressing concern for organisations or residents? It may be that people perceive climate predictions are too uncertain and distant in time to justify action now that may prove unnecessary. The short-term approach to climate may therefore have a perceived justification rather than merely being an artefact of competing priorities and constraints on strategic capacity.

Resources and finance. The issues of uncertainty and timing play out against a context of resource strains in agencies that have responsibility for coastal management. Many public and private agencies in the UK are constrained in their consideration of long term policies by financial and staffing resources (Ballinger et al, 2002). Such resource strains, including the necessary technical knowledge to understand and interpret climate risks, are most intense at the local scale.

Study respondents within the local planning systems of both case study areas pointed to the lack of concrete evidence on climate change impacts on which to base decisions as well as the technical ability within their offices to interpret that information. These factors acted together with other demands on limited human and financial resources within local government that tend to enforce a short-term outlook among planners and the prioritization of immediate urgent matters. According to one local planner strategic work on issues such as climate change is difficult for a local authority, which is basically an “all-singing, all-dancing body that only scratches the surface of most issues” (Interview: Christchurch, February 2003). All of these issues work against proactive long term planning in the absence of a clear mandate on authorities to undertake such efforts.

Overall, finance for strategic action is generally seen as the crucial issue. Strategic action, whether designed to protect against, accommodate or retreat from the disruption caused by coastal hazards, will incur an outlay of expenditure. At present, funding from Defra for coast protection and flood defence is seen to be stretched, and potential future increases in coastal threats will place yet more demand on the finances available. If central finances are not forthcoming it may be up to citizens in vulnerable settlements to contribute to a local levy, or for property owners directly affected by erosion and flooding to bear the costs or losses themselves.

In Orkney, costs of maintaining present-day transport services already place a strain on available financial resources, and the costs of modifying or constructing fixed structures to resist potential climate impacts would be extremely high in relation to the population base. Most participants in this research regarded external public finance from the national and international level to be essential for adaptive actions. A contribution from local residents, either through an element of local taxation or increased fares, might be feasible, together with a contribution from any reserve funds that may be available through major commercial activity in Scapa Flow. However, few people perceive major expenditure can take place without large-scale fiscal support from central government. Yet funds for climate change adaptation are likely to be constrained at all levels, and Orkney would likely be just one of a great many communities in the UK (and Europe) requesting assistance.

Public and political support. Responding to the prospect of climate change under conditions of uncertainty and long-term impact is not only complex, but inherently controversial. It requires active decision-making on financing and implementing action targeted to changes that may or may not arise, whose magnitude is unknown and that are likely to become manifest over timescales of more than one generation (Kay and Alder, 1999).

If the adaptive measure under consideration entails some kind of radical change – such as large-scale defence works, major alteration of infrastructure or phased abandonment of dwellings – the implications are yet more controversial. For example, loss of property and amenity, changes to local economies and landscapes, biodiversity changes, and

even threats to place-based identity are all potential impacts of different adaptive responses to climate change around Christchurch Harbour. Interview material suggests that decisions on any long term option pursued in the present will almost certainly have to contend with strong dissenting voices. Public support is also linked with local sense of 'ownership' of decisions and associated actions: an issue that came out particularly strongly in Orkney (see Box 5).

As King (2003) points out, disagreement, in itself, is not necessarily an impediment to considered decision-making, but several study participants argued that the political conditions of local democracy in the UK can make it so. The principal channel for public input on decisions is currently via elected local representatives on council committees. Proposals that generate controversy and that do not have a strong advocative lobby among the public are difficult for council members to consider rationally, they claimed, because of the short term local political cycles. Councillors elected every four years are unwilling to take decisions on local issues that may be unpopular with their constituencies, that are opposed by a vociferous minority, or that entail long term financial commitment with no obvious short term benefits. Local governance, they argued, is ill-equipped for strategic decisions of such nature.

Box 5 Transport adaptation and local representation in Orkney

Climate change adaptation in the transport sector in Orkney may well require major external financial assistance. At the same time, there are many voices in Orkney calling for increased local input into decision-making on major issues and actions that affect the islands. This is seen to build on local knowledge and priorities, and on what is perceived by some as a strong tradition of autonomy and civic responsibility among Orcadians. Yet, if there are increasing demands made by local communities around the UK on a finite purse of external funds, we suggest that funding rules and guidelines set by central authorities may well become tighter and more proscriptive. There is a chance, at least, that decision-making will become more centralized rather than more localized in the context of adaptation to climate change, if communities are unable to develop adaptive responses that are viable without majority-funding from elsewhere.

The discussion on 'short-termism' has already highlighted a view expressed by several participants in the research who stressed that some aspects of precautionary action to guard against potential climate impacts may simply not be appropriate or feasible in advance of those impacts occurring. In the global climate change debate a distinction has been made between 'anticipatory' adaptation (taken in advance of impacts) and 'reactive' adaptation (taken once impacts occur). Both the anticipatory and reactive approaches entail risks, but they are of a different nature. Support for advance anticipatory forms of adaptation certainly cannot be guaranteed. In making decisions on how to respond to climate change predictions, society needs to find an appropriate balance between the two approaches. One hybrid solution that may be workable in some instances is to aim for flexibility in design of structures and systems so that they can be easily amended if the need arises.

These issues illustrate the nature of some of the trade-offs that will have to be made by stakeholders at all levels in decisions on whether to take long term, anticipatory action. The trade offs in terms of costs, rights and responsibilities are closely linked with problems regarding cross-scale integration, discussed next, and with issues surrounding public inclusion in decision-making (see section 4).

The need for cross-scale integration. The research revealed that there is to some degree a mismatch between the strategic analysis of climate change adaptation needs undertaken at national or regional scale and the capacity and mandate of a range of agencies at the local scale to decide on and coordinate specific adaptive action in specific places (figure 2).

**Figure 2 Generic decisions in local places?
Beach huts below the Barton cliffs**



Presently, strategic coastal zone management activity in relation to climate change takes place predominantly at the regional or national scale. In national government, Defra has taken the lead in inserting climate change adaptation issues into government policy, both through its coastal defence and other funding operations and in commissioning a recent study on the implications of climate change for government activity (Defra, 2003). Planning Policy Guidance Note 25 from the Office of the Deputy Prime Minister (ODPM) is another central government policy advance, stating explicitly that development in flood risk zones should take account of climate change impacts. Input at the regional level from regional government, and from climate change and coastal management fora provides further policy level advice.

Ultimately, however, coastal management relies not just on policy but on actual intervention. In the case of response to climate change impacts

on coastal hazards, generic policy must translate into specific physical actions designed to *control*, *cope with* or *avoid* climate-related hazards. It is just this continuity of long-term planning between scales from policy to action that the research has brought into question.

Preparedness for climate risks requires specific plans and actions from local authorities and other local agencies in a range of sectors, including development control, transport, utilities and, in the most strategic sense, from spatial planning (Leafe et al, 1998; Titus et al, 1987). Yet, at present, the local authorities under study have no requirement to make specific plans for action within these sectors based on long term (multi-decade) assessments of need, let alone of climate change. For reasons discussed earlier, in the absence of this requirement there is little or no effective planning for climate change impacts at this level, and hence a mismatch between the nascent generic policy statements at national/regional scale and actions at the local scale in terms of intervention decisions (see Box 6).

The problems of long timescale and scientific uncertainty that complicate response to climate change risks may in many cases strengthen the case for vertically as well as horizontally integrated structures for coastal zone management (emphasized in the recent Foresight Future Flooding report for the UK - Evans et al, 2004). Vertical integration of planning requires a continuity of policy and action between spatial scales, and it may be that the most effective means to ensure continuity is the establishment of strong cross-scale mechanisms and perhaps cross-scale institutions for strategic coastal management.

Fundamental to this is likely to be a more sophisticated guidance role for the central state. Many interviewees in the studies believed that the central state has a crucial role to play in setting longer timelines for planning and provisions for an integrated approach to coastal adaptation. Presently, planning and funding guidelines at all levels in the UK do not enable long term considerations to have a major influence on present-day coastal management activity. Mechanisms are therefore needed to extend the time horizons for coastal planning and decision-making. Without such extended horizons it will be difficult to justify and source expenditure on anticipatory action to tackle the predicted effects of climate change. Strategic action may also require new enabling legislation in complex areas such as compensation and resettlement.

Box 6 Settlement retreat?

One particular aspect stressed repeatedly in generic policy is that coastal defence protection can no longer be assumed. Paragraph 9 of Planning Policy Guidance Note 25 states that: 'some existing development in more exposed locations may not be sustainable in the longer term and may need to be replaced in safer locations' (ODPM, 2001). Regional studies on climate change implications for southern England emphasize that a balance of protection, accommodation and retreat will be necessary in areas of coastal risk, and that this will require some difficult decision-making. "Some areas may have to be sacrificed to rising sea levels and this will provide some difficult choices for the future" (Metcalf et al, 2003, page 6.17).

It is unclear at present how such intervention options articulated at the coarse scale are going to be followed through at a scale where fine resolution is required: local implementation 'on the ground'. At the local level, at present, few areas of the UK have explicitly been marked for managed realignment of the coast (Naylor et al, 2003), let alone for a phased 'retreat' of settlement. The political controversy of doing is likely to be considerable. Yet, given the potential for increasing climate change impacts, their implications for fiscal budgets, and the broader environmental considerations all reflected in generic policy statements, it is a conceivable response (Leafe et al, 1998). At some stage it may have to happen. Is retreat, either planned or de facto, not a potential future scenario for 'frontline' settlements at places such as Barton-on-Sea and Christchurch Harbour?



In order to create a continuity between strategic policy relating to climate change and action 'on the ground' we suggest there is a need to: invest resources in local adaptive capacity; strengthen local long-term planning mechanisms; and establish genuinely cross-scale institutions on coastal management to take and support what may be difficult decisions.

4. What methods are potentially useful for coastal decision-making in the context of climate change adaptation?

Community participation in decision-making is already a central tenet of integrated coastal zone management (ICZM) approaches and the importance of engagement with the public is increasingly recognised in applied work on climate change. This research project set out both to examine the prospects for inclusive approaches to climate change adaptation and to contribute ideas on methodology for wider inclusion in decision-making.

Ostensibly, public involvement in decisions on coastal defence and transport futures was advocated by most interviewees in the case studies, and the call for greater inclusion was certainly not confined to local stakeholders (who might be expected to call for a stronger voice in decision-making). In Orkney, there was an especially strong affirmation of local strategic capacity to plan ahead and of the need for local inclusion in any decisions. However, the in-depth nature of the interviews enabled us to probe beneath the surface layers of this issue to reveal barriers and counter-currents to the inclusive process.

Such counter-trends were especially evident in the responses of several interviewees at the local authority or agency levels in the case of Christchurch Bay. Many argued that there should be limitations on the scope of participation because of the required technical knowledge of coastal processes and engineering for selecting defence options. Public consultation was seen instead as more suited to design details and construction arrangements for a pre-selected option, and it was stressed that this limited scope should be made clear in consultations to avoid raising expectations. There was also an argument from some interviewees (including stakeholders from potentially affected communities themselves) that questioned the motivation and capacity of local citizens to consider the inter-generational problem of long-term climate change adaptation, especially when the precise rates of impact are uncertain. The contentious nature of many long term strategic objectives would make local public and political support so difficult to achieve that such decisions would best lie in the hands of higher authorities. Central mechanisms such as planning policy guidance could be used to circumvent local opposition. Such a centralising trend would in effect run counter to calls for greater local responsibilities and rights that underscore much of the advocacy for inclusive and integrated coastal management (Kay et al, 2003; McGlashan, 2003; O’Riordan and Ward, 1997).

One reaction to such perceived difficulties in engaging the public in a climate change adaptation decision process might be to retreat from public involvement in strategic planning. Indeed, there may be an instrumental logic to the act of restricting and ‘containing’ public inclusion in this endeavour. However, the existence of one logical path does not necessarily preclude others. We suggest that rather than retreating in the face of inclusionary difficulties, climate change adaptation needs to forge a more creative and sophisticated deliberative approach that both can be more democratic and can yield genuine benefits for the process of societal adaptation.

First, it is crucial that those working on public participation issues in climate change adaptation draw on well-established principles and lessons from related fields, recognising the subtleties and complexities inherent in efforts to engage the public in

decision-making (e.g. see Box 7). 'Participation' is almost never straight-forward, as ample evidence from planning and development both in the North and the South underlines (e.g. Cooke and Kothari 2001, Healey 1997). There is not the space here to

Box 7 Means and ends in 'participation'

The well-established rationale for public participation in decision-making and action has both ethical and instrumental dimensions: it can be seen both as a human right and as a mechanism to improve the quality and sustainability of decisions. These dimensions map on to a distinction that has commonly been made between participation as a 'means' or as an 'end' (e.g. Nelson and Wright 1995, Parfitt 2004). Participation as a means suggests public inclusion activities are designed to ensure decisions are better geared toward meeting their objectives – people provide insights and/or gain a sense of 'ownership'. But participation in a deeper sense can be seen as an end in itself: as the development of capacity within communities that enables people to take greater control over actions that affect their lives. The distinction tends to be reflected in a spectrum of differing interpretations by agencies and stakeholders alike of what an inclusionary process might entail. Explicit communication about the scope of public involvement in a decision-making process on adaptive response to climate change is therefore essential to avoid confusion and alienation.

provide a full critique, but Mitchell (1997) useful summarizes the key requirements for successful participation in environmental projects, including: compatibility (respect and trust) between participants; benefits to all partners; equitable involvement; effective communication; adaptability and flexibility; and patience and perseverance on the part of all partners.

We strongly suggest that genuine attempts to engage the public proactively in strategic adaptation to climate change in the coastal zone require deliberative methods that go beyond a minimalist 'consultative' approach of staging a meeting, presenting information and asking for comment. Agencies promoting strategic planning should endeavour to create a forum for deliberation that meet the principles outlined above: a forum for sharing information, perceptions and concerns that encourages each participant to express their views and to explore alternative avenues of response.

Designing such a forum is not easy, and turning deliberations into concrete decisions is equally difficult. However, in our experimental workshops outlined in section 1 we believe we have made a useful contribution to this approach. The workshop methodology, which was devised on the basis of the earlier stages of the research and continued to evolve reflexively as the project proceeded, proved especially effective in the following respects:

- *Mix of participants.* For each workshop we set out to gather together a mix of participants to facilitate exchange of views and a constructive process of deliberation. In both cases we were able to attract a sample of stakeholders representing different roles and interests in the local areas.
- *Consideration of climate impacts.* In order to convey the uncertainty surrounding future climate and climate impact predictions we deliberately avoided use of mean estimates when outlining to participants the potential impacts of climate change in their area. Instead, we presented a set of 'envelopes of possibility' to indicate the range of possible effects on which decisions would have to be based. In the subsequent discussions we found that participants were indeed able to work cognitively with these statistical

ranges in mind: they did not necessarily need precise estimates (which, in the future climate change context, will always run the risk of being misleading).

- *Decision criteria.* The coastal management decision criteria we selected and asked people to prioritize and reprioritize were generally seen as relevant and appropriate, and participants readily understood the ranking and scoring rationale.
- *Coastal management scenarios.* Participants understood the concept of notional scenarios for coastal management style, were able to base their group discussions on them, and valued the approach as a means to embrace the complexity of considerations surrounding adaptive response.
- *Active participation.* The small group format in the second half of the workshop was particularly effective in gaining involvement and input from all the workshop participants. Flexibility of format is crucial in ensuring that all stakeholders present actively participate in the deliberative process.
- *Active deliberation.* The different stages of the workshop gave participants the opportunity not just to air their views but to consider the views of others and to engage in dialogue and reflection that might lead to a constructive reformulation of perspectives. Differences in prioritization of criteria between the initial and closing 'voting' exercises were common, providing qualitative evidence that the workshop deliberations may have induced changes in perspective. (see Appendices 3 and 5 for further details).

The majority of feedback on the workshops gained from participants was positive, with one regional agency representative indicating interest in using similar techniques in public consultations. Unlike formal tools such as cost-benefit analysis or multi-criteria analysis, the methodology we employed was not directed toward the formulation of an 'optimal' option. As a research approach, it was intended to deepen our understanding of stakeholder perspectives and served to 'open up' rather than 'narrow down' the discussion of adaptive responses. Employed as part of a decision-making process, it would therefore act as a mechanism for promoting deliberation and breadth of input into the process. Nevertheless, with further development - refinement and extension – we suggest this could perhaps become the basis for a decision tool as well as a decision-support tool.



The nature of the climate change problem poses special challenges for inclusive decision-making on adaptive response. Current consultative procedures for the coastal zone are not adequate to the task. A new, more equitable, transparent and creative approach to public involvement is required that encourages deliberation and consensus-building on strategic actions.

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Appendix 1

List of Project Outputs

Publications

- ‘Scaling adaptation: climate change response and coastal management in the UK’ - submitted to Environment and Planning A (September 2004) and as a Tyndall Working Paper (October 2004).
- 2 further journal papers in preparation for submission 2004, and 2 planned for submission in 2005.

Reports

- Summary report ‘Future coastal defence in Christchurch Bay’ + Workshop Report [see *Appendix 2*]
- Summary report ‘Orkney case study’ + Workshop Report [see *Appendix 3*]
- Report ‘Legal framework for coastal zone management in the UK’ [see *Appendix 4*]

Presentations/seminars

- Swedish Academy of Sciences (2004)
- Macaulay Land Use Research Institute (2004)
- ICIT, Orkney (2004)
- Orkney Environment Partnership (2003)
- Tyndall Assembly (2003, 2004)
- Tyndall Theme 3 and Theme 4 meetings (2003, 2004)
- School of Development Studies, UEA (2003)

Appendix 2

Christchurch Bay Case Study Reports

Responding to climate change: inclusive and integrated coastal analysis

**A research project funded by the
Tyndall Centre for Climate Change Research**

FUTURE COASTAL DEFENCE IN CHRISTCHURCH BAY

**Summary report on key findings to
date**

July 2003

Introduction

Coastal communities are potentially vulnerable to climate change. Climate change could increase stresses on coastal systems through sea-level rise, changes in air and sea temperature, wind and rainfall patterns, and an increased frequency of extreme events, such as storms. The vulnerability of coastal populations is also influenced by decisions and actions on how to adapt to climate change hazards by people and institutions living within or managing the coastal zone. These decisions and actions are in turn shaped and constrained by a range of factors, including the resources available to decision-makers and the social, economic and political context in which decisions are made.

Since December 2002 research work has been ongoing within the Christchurch Bay area as part of the project '*Responding to climate change: inclusive and integrated coastal analysis*'. This is a national study funded by the Tyndall Centre for Climate Change Research (which is itself funded by the Natural Environment Research Council, the Engineering and Physical Sciences Research Council, and the Economic and Social Research Council). This research project seeks to explore the challenges for coastal decision-making in the UK in the face of, at present, unpredictable climate and sea level changes. The project focuses on:

- decision processes relating to strategic long-term actions
- constraints and opportunities to adaptive actions
- the role of public participation in making decisions about coastal planning
- cross-sectoral integration issues in managing the coast.

Christchurch Bay was selected as the first of three case study areas. On the basis of previous work in the Bay by the University of Southampton, and the relatively advanced consideration within the region of long-term shoreline management issues, it was decided that the study here should centre on coastal defence (encompassing protection against both coastal erosion and flooding). To date, the research team have consulted all available documents relating to the coastal management of the area, and completed a series of meetings and formal interviews with a range of local and regional stakeholders, designed to explore in a qualitative sense the foci noted above. Two sites in particular were selected for detailed study: the Barton-on-Sea coastline, where coastal erosion is already a major issue; and Christchurch Harbour, where a combination of erosion and flooding threats may produce major impacts in the long-term.

The remainder of this report presents in summary form some of the initial findings from the work.

In the next phase of the project, the team plans to run a workshop with local and regional participants designed to elucidate perspectives on some of the important trade-offs inherent in undertaking long-term adaptive responses to potential future coastal threats. The aim is to run that workshop before the end of 2003, and further details will be announced as preparations proceed.

Coastal defence options

Assessment of future risks and potential responses to coastal hazards is already well advanced for the Christchurch Bay area, through the strategic work relating to SMPs (Shoreline Management Plans), the work of SCOPAC (Standing Conference on Problems Associated with the Coastline), numerous academic studies and other initiatives. It is not the purpose of this study to reassess those predictions and plans. However, some description is necessary to set the context for this report.

In brief, climate change is likely to exacerbate existing erosion and flooding trends, through a gradual rise in sea level and potentially through an increase in winter rainfall and storm conditions. There may also be significant changes in wave direction and sediment transport regimes, though such shifts are much harder to predict. The greatest certainty is attached to the prediction that sea level will rise. However, even the highest estimate of its rate of change suggests that sea level rise alone is unlikely to cause major impacts in most parts of the Bay during the present century. At both Barton and Christchurch Harbour, higher winter rainfall is potentially a more significant factor in exacerbating coastal changes that could be hazardous. At Barton groundwater seepage through the rocks of the cliff is the prime cause of cliff-top recession, while the Harbour area may be especially prone to future flooding from a combination of high winter river flow and extreme tidal events.

The largely urbanised coastline of Christchurch Bay heightens the risk of socio-economic impacts following coastal erosion and flooding. Existing and future hazards present a physical risk to properties and infrastructure close to the shore, as well as a threat to life and livelihood of the coastal population. Moreover, outside the urban areas, the coastal resources, including beaches, inland waters and cliffs, have high recreational, agricultural and conservation value that might be placed at risk by coastal processes.

To date, various hard and soft engineering techniques have been applied in the Christchurch Bay area to reduce wave attack and minimize flooding, most based on the premise that existing property and land use patterns should be protected (and in some cases that further development should be allowed to continue in existing sites). Coastal defence engineering has proved effective as a protection measure, but it represents a high cost that has to be met by national and local public funds or private landowners. In future, funds available for coastal defence works are likely to be increasingly stretched. Moreover, no defence structure can provide absolute protection, and artificial structures can interfere with natural coastal processes, such as sediment movement, which may exacerbate problems elsewhere. A long term effect of the groyne systems within the Bay, for example, may have been the weakening and past breaching of Hurst spit. Difficult site-specific decisions will have to be made in future on whether to maintain, increase or abandon defences around the Bay.

Engineered coastal defence options also have to be evaluated alongside a range of other long term response options relating to land use, property and infrastructure in the coastal zone. Long-term infrastructural adaptation, for example, might include the raising of drainage systems and flood-proofing of property in low-lying parts of Christchurch town. The planning system has a key role to play in setting development control regulations for sites of erosion risk or flood risk, but possibly also in future in developing strategic policies, plans and mechanisms for relocation of development away

from vulnerable zones (settlement retreat). However, coastal defense and coastal management is not just about public sector activity. It is also about the way in which individuals and businesses use the coast. Changing behaviour and expectations play an important role in coastal management. Hence it is important to think not only about what the government can do, but also what responsibilities those who live in and use the coast might have.

Key stakeholders

The initial task for the project was to establish who are the principal stakeholders and stakeholder groups with prime interest in and/or influence on coastal defence decisions for Christchurch Bay. That means assessing which institutions and sectors of the local population play a major role in coastal management or have a major stake in the impacts of decisions that are made. Given the complexity of decision processes, no assessment can reasonably include all those people or organizations at international, national, regional and local scales that ultimately impinge on decisions. Nor can the categorizations truly reflect the diverse identities and cross-groupings of local populations. However, Tables 1 and 2 present a simplified description of the key stakeholders for Barton and Christchurch Harbour, with an indication of their main interest in the decision-making process/output and a qualitative judgement of their 'importance' (the degree to which their interests may be threatened) and their 'influence' (on coastal management).

Table 1 Stakeholder assessment: Christchurch Harbour

Key stakeholder (group)	Prime interest	Importance (threat to interests)	Influence
Local			
1 Vulnerable property owners	Protect asset, amenity	High	Low/Medium
2 Local residents	Local economy/amenity	High	Low
3 Angling club	Fishing rights/quality	Medium	Low
4 Sailing clubs	Protect asset/moorings	High	Low
5 Commercial fishers/boatyard	Protect asset/moorings, access to sea	High	Low
6 Beach hut owners	Protect asset, amenity	High	Low/Medium
7 Tourists	Amenity	Medium	Low
8 Water company	Water supplies, harbour revenues	Medium	Medium
9 Local councils	Local economy, amenity, conservation, public safety, coastal defence	Medium	High

10 County councils	Local economy, amenity, conservation, public safety	Low	Medium
11 Coastal groups (e.g. SCOPAC, DCF)	Sustainable coastal development	Low	Medium
National			
12 Environment Agency	Flood protection, value for money	Medium	High
13 English Heritage	Archaeological preservation/record	Low	Low
14 English Nature	Habitat conservation, geological exposure	Low	High
15 DEFRA	Coast/river defence, value for money	Medium	High

Table 2 Stakeholder assessment: Barton area

Key stakeholder (group)	Prime interest	Importance	Influence
Local			
16 Vulnerable home owners	Protect asset, amenity	High	Low/Medium
17 Local residents	Local economy/amenity	High	Low
18 Vulnerable small commercial ventures	Protect asset	High	Low/Medium
19 Vulnerable large commercial/private	Protect asset	High	Low
20 Beach hut owners	Protect asset, amenity	High	Low
21 Tourists	Amenity	Medium	Low
22 New Milton town council	Local economy, amenity, public safety	Medium	Low
23 Local councils	Local economy, amenity, conservation, public safety, coastal defence	Medium	High
24 County councils	Local economy, amenity, conservation, public safety	Low	Medium
26 Coastal groups	Sustainable coastal development	Low	Medium
National			
27 English Nature	Geological exposure	Low	High
28 DEFRA	Coast protection, value for money	Medium	High

Strategic action issues

Identifying risks of and potential responses to future coastal hazards provides crucial input into short term coastal planning. But if society is to respond strategically, then there has to be momentum and capacity within society to develop and implement policies and actions appropriate to a long term perspective. We argue that there is a crucial role for social science research in highlighting the constraints on and opportunities for strategic action. From our work to date several important issues have emerged that currently shape prospects for strategic action to tackle future coastal erosion and flooding risks.

Uncertainty

Despite new monitoring advances that are now in place for the south coast and ever-more sophisticated efforts to model future changes, much predictive uncertainty remains over future climate parameters and how these might impact on the coastal environment. This uncertainty makes it difficult to plan strategically and to justify actions that might produce long term benefits but incur short term costs. However, the complex, anticipatory nature of the climate change problem is always likely to defy certainty of prediction. The key question is how much certainty is needed before adaptive action should commence – given that measures to counter risks may themselves need a long lead-in time.

Short-termism

Local government in particular is often constrained in its consideration of long term policies by financial and staffing resources, local politics and planning timelines – yet the local authorities play a key role in coast protection and in setting spatial planning guidelines. Resource strains may lead to the prioritization of immediate tasks, while local political stresses tend to work against long term actions that may generate controversy in the present. Even under the new planning systems introduced in the UK, forward planning is unlikely to be mandated beyond two to three decades. All these factors tend to enforce a short-term outlook: one that makes long term anticipatory action all the more difficult

Private responsibility

One important influence on action that might challenge orthodox coastal defence planning could be the link between private liability and attitudinal changes toward coastal development. Local perspectives on the rights and responsibilities of private citizens regarding coastal defence were mixed. From some interviewees there was a perception that people living in the risk-prone coastal stretches of Christchurch Bay are coming to accept that they must share the financial burden of responsibility for defence of vulnerable property. Others, and particularly many of those at the sharp end of the issue with homes at risk, argued that they have a right to expect publicly-funded protection or compensation.

Role of central government

Almost all interviewees, however, believed that the central state has a fundamental role to play in setting longer timelines for planning and provisions for an integrated approach to coastal adaptation. Clearer guidelines may be needed on criteria for justifying future coastal defence, including a reappraisal of current cost-benefit analysis methods. Strategic action may require new enabling legislation in complex areas such as

compensation and resettlement. Central or regional government may also have to take the lead in initiating an approach to planning that integrates coastal defence and spatial planning.

Finance

Overall, finance for strategic action is generally seen as the crucial issue, and one that is touched on in most of the foregoing points. Strategic action, whether designed to protect against, accommodate or retreat from coastal hazards, will incur high costs. At present, funding from DEFRA for coast protection and flood defence is seen to be stretched, and potential future increases in coastal threats will place yet more demand on the finances available. If central finances are not forthcoming it may be up to citizens in vulnerable settlements to contribute to a local levy, or for property owners directly affected by erosion and flooding to bear the costs or losses themselves.

A number of these issues also illustrate the nature of some of the trade-offs that will have to be made by stakeholders at all levels in decisions on whether to take long term, anticipatory action. The trade offs in terms of costs, rights and responsibilities are closely linked with questions regarding scales of decision-making and their influence on inclusion and integration.

Inclusion and integration

Public inclusion in decision-making and integration across sectors are two of the key tenets in the growing global trend toward ICZM (integrated coastal zone management). In a more general sense they are also two of the defining principles of 'sustainable development'. Analysis of perspectives on inclusion and integration and the prospects for achieving inclusive and integrated coastal decision-making with regard to climate change impacts are therefore central elements of the project.

Inclusion

Public involvement in decisions on coastal defence was advocated by most interviewees, and was certainly not confined to local stakeholders (who might be expected to call for a stronger voice). Yet there were evident counter-trends too in the responses of several interviewees at the local authority or agency levels. Many argued that there should be limitations on the scope of participation because of the required technical knowledge of coastal processes and engineering for selecting defence options. Public consultation was seen instead as more suited to design details and construction arrangements for a pre-selected option, and it was stressed that this limited scope should be made clear in consultations to avoid raising expectations. There was also an argument from some that the contentious nature of many long term strategic objectives would make local public and political support so difficult to achieve that such decisions would best lie in the hands of higher authorities. Central mechanisms such as planning policy guidance could be used to circumvent local opposition. Such a centralising trend would in effect run counter to the notion of increased participation.

Integration

Greater integration of the priorities and perspectives of sectors, agencies and interest groups was again advocated by the majority of interviewees. One called for a cross-departmental strategic vision from the local authorities for coastal management in

general. Many local stakeholders argued against the perceived narrow viewpoint of some sectoral interest groups, especially when it is combined with institutional power in the case of the national agencies. Advances in integrated work resulting from initiatives such as Dorset Coast Forum (DCF) and the SMP process were recognised largely by agency and governmental officials, but there were calls for greater information sharing between agencies and more liaison between coastal groups and planners. Many interviewees advocated a streamlining of coastal management responsibilities for complex sites such as Christchurch Harbour, but there was uncertainty whether another governmental tier (a local or regional CZM authority) was required.

Inclusion and integration arguably are important principles in strategic action to tackle future coastal risks, yet their application is not necessarily straight-forward in the context of long time frames and impact uncertainty. They are also likely to be affected by the scale at which coastal decisions are made (and funded) – more centralised decision-making is likely to involve reduced public participation and may well be less sensitive to the complexities of local context. Together with long term issues of cost and funding sources, they form part of the complex of trade offs that the researchers plan to explore further with Christchurch Bay stakeholders in the work to follow (see italics on page 1).

The project 'Responding to climate change: inclusive and integrated coastal analysis' is led by
Dr Katrina Brown of the School of Development Studies,
University of East Anglia (UEA), Norwich NR4 7TJ.
Email: k.brown@uea.ac.uk.

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HOW TO RESPOND TO CLIMATE CHANGE?

STAKEHOLDER WORKSHOP ON APPROACHES TO COASTAL MANAGEMENT FOR CHRISTCHURCH HARBOUR IN THE FACE OF FUTURE CLIMATE RISKS & UNCERTAINTY

**Hengistbury Head Outdoor Education and Field Studies
Centre
2-5pm, 10 November 2003**

WORKSHOP REPORT

1 Participants

Eighteen participants and two observers attended the meeting (plus four project team members). Participants included representatives of local organisations, local businesses, local authorities and regional agencies. The sectors formally represented by participants comprised: coast/flood protection (4); spatial planning (2); conservation (5); environmental education (1); residence/ownership (4); harbour use (2). However, it should be noted that some participants had linkages with more than one sector – e.g. were also residents of the harbour area.

2 Project rationale and workshop format

The research project is a national study investigating social and political dimensions of adaptation to climate change impacts in the coastal zone of the UK. Given the long time frames and major uncertainties surrounding climate change impacts, taking decisions and actions to combat the effects of sea level rise and climate alterations is by no means straight-forward. The project aims to illuminate what adaptive actions may be feasible and appropriate, by analysing the present and future constraints and opportunities for responding to climate change threats, and the trade offs that may be inherent in doing so. There are three case study sites, the first of which is Christchurch Bay, on the Dorset/Hampshire coast, where the work centres on issues connected with coastal defence in the face of sea level rise and potential increases in wave attack, storminess and winter river flows.

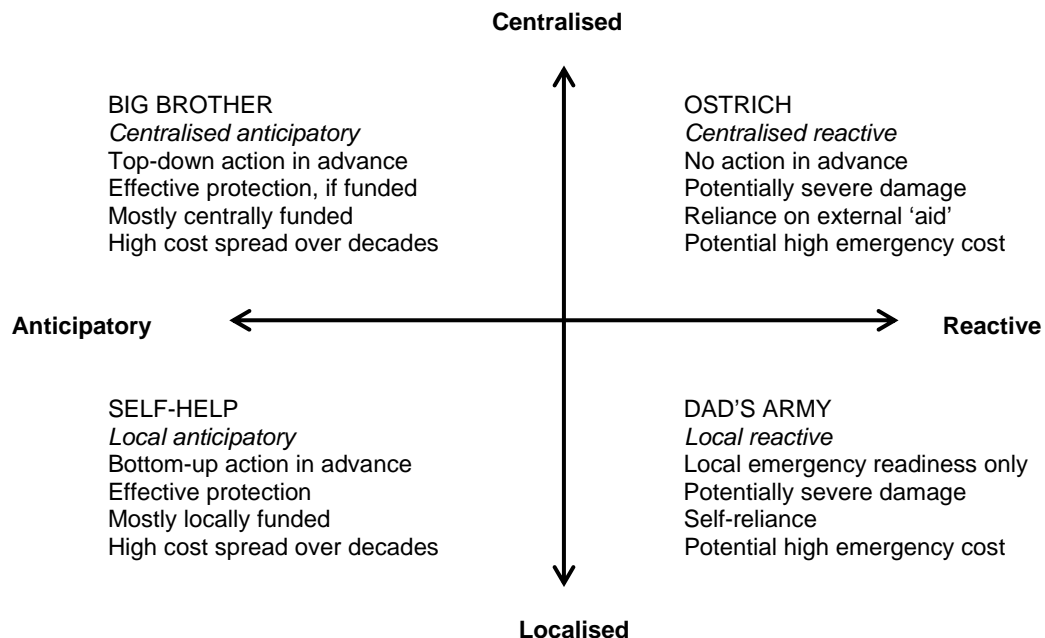
The workshop proceedings were designed to encourage participants to consider how to balance some of the fundamental trade offs that exist in choosing how to respond to possible future climate change threats in Christchurch Harbour – particularly potential long-term threats from increased flooding and coastal erosion. At the start of the workshop the participants were asked to undertake a brief voting (ranking and scoring) exercise on the following three basic decision-making criteria for future coastal management:

	<i>Criterion</i>
C1	Risk of future damage should be minimised
C2	Costs of any response should be kept low
C3	The decisions made must reflect local views

The range of potential climate change threats to the Christchurch Harbour area was then outlined and a set of strategic considerations that relate to coastal defence were posed for general discussion. Participants were then asked to discuss and evaluate a set of different management scenarios – hypothetical alternative approaches to long-term coastal management (see section 3). Following the scenarios discussions, the voting exercise on the decision-making criteria was then repeated to enable a comparison of results before and after the workshop (see section 4).

3 Results of the scenario (small group) discussions

Participants were presented with the following matrix of hypothetical approaches to coastal management in the future. Each scenario is defined by its relation to two axes, the horizontal axis representing the timing of the response (Anticipatory to Reactive) and the vertical representing the scale of decision-making (Centralised to Localised). It was suggested that perspectives on the decision-making criteria above can be seen to relate to these axes: C1 to the horizontal axis, C3 to the vertical axis, and C2 to both (in that timing of response has implications for overall expenditure, while scale of decision-making may have implications for who bears the costs).



The participants were divided into four groups and asked to discuss aspects of the scenarios and which of the four they favoured. Differences emerged both

between and within the groups. Many people voiced preferences for anticipatory action and a centralised approach though there were also arguments for a reactive and/or localised approach. In plenary, it appeared that two of the groups favoured 'Big Brother', one fell midway between 'Big Brother' and 'Self-Help', and one favoured 'Ostrich' (though consensus on these positions was not necessarily achieved). In terms of the overall research project, one of the most interesting outcomes was the lack of any strongly expressed support for the localised anticipatory scenario. This may suggest that broader arguments for community-based decision-making on coastal management (with its attendant combination of rights and responsibilities) are difficult to apply in the context of adaptive action to climate change risks.

In discussing their preferences, individual participants made a series of contrasting comments on the two axes that define the coastal management scenarios. The comments covered the following perspectives:

Perspectives on timing ('Anticipatory to Reactive' axis)

- Future generations will blame us if we do not act now.
- Action at a later date may not be feasible: can we be sure the economy will be strong enough in future?
- Recognising the problem and deciding on a line of action has to be the first step.
- The approach should be anticipatory, but with in-built flexibility.
- The best approach may be to monitor what changes are happening and keep revising the management strategy accordingly as changes become apparent.
- The current approach is reactive in that we wait until something serious happens before taking action: e.g. the increased finance that has come available now from DEFRA.
- The decision-making generally should be reactive. Anticipatory action would require citizens' funding commitments and citizens have other short-term priorities.

Perspectives on scale ('Centralised to Localised' axis)

- Strategic decisions are best taken at national or regional level: decision-making on locally contentious issues is difficult for a local authority and will always be contested.
- A degree of centralisation is needed for coordination.

- The public does not have sufficient knowledge or long-term perspective to make these decisions.
- A large percentage of incomers in the population means many people have no long term memory of the locality.
- Community spirit is hampered by the number of second homes in the area: housing policy is a critical issue.
- Local consultation processes are difficult for local authorities: insufficient people may attend and/or they can be dominated by certain interest groups or localities.
- The system has to be centralised, as now, because local people would not be prepared to cover the costs required.
- It may be time now to institute a national or regional fund for disaster compensation.
- Current system works well: funding through general taxation and policy guided from above, but with integration of local considerations.
- Central government should allocate the funds on the basis of need but decisions on its use should be made locally.
- Central government planners may lack key local knowledge.
- ‘Consultation’ without genuine decision-making input is not sufficient public involvement. There needs to be community-level planning.
- Informed local input into decisions is important: local education is key.
- Central guidance is needed on how to work with local people and get the balance right.
- If local people have to contribute to costs they may be motivated to gain a better understanding of the issues and become more involved in decisions.
- The cheapest approach is for people to put their own defences in place, because people will find the cheapest solution for themselves.
- Market forces may determine actions anyway e.g. via insurance/mortgage limitations on house occupancy in risk-prone areas.

4 Results of the criteria voting exercises

All of the 18 participants completed an identical form at the start (form1) and close (form 2) of the workshop, in which they gave each criterion a ranking and a score (from a combined total of 10 points) to reflect its relative priority. The combined results are summarized here:

Form 1

<i>criteria</i>	<i>average rank</i>	<i>average score</i>
C1 risk	1.39	4.22
C2 cost	2.78	2.25
C3 local	1.83	3.53

Form 2

<i>criteria</i>	<i>average rank</i>	<i>average score</i>
C1 risk	1.28	4.39
C2 cost	2.67	2.44
C3 local	2.06	3.17

The combined results show a consistent *order* of priority for the three criteria across both exercises. The results suggest that, *as they are phrased*, the criteria descend in importance from risk avoidance as top priority, through representation of local views as second and cost minimization as third.

However, the combined figures also indicate some change between the first and second exercises. Analysis of individual results shows that Form 2 was different from Form 1 for 14 of the 18 participants. Rankings changed for 7 participants and scores changed for 13 participants. Adjustments in scores (the number of points out of 10 that were reallocated) ranged from 0.5 to 3 pts.

In terms of the overall direction of these changes, the most discernible pattern was a lowering of the priority given to 'local views' (C3): this criterion was demoted in rank by 5 participants (promoted in rank by 1) and was scored lower by 8 people the second time round (3 people scored it higher).

Assessing the significance of the changes is not straight forward, since they are generally slight and may well be incidental. However, the overall demotion of 'local views' does suggest this may have been a deliberate change for several people. Whether that change was a direct result of the workshop discussions or a clarification of pre-existing perspectives is an open question. (In retrospect, we recognise it would have been useful to ask people to record if they made any deliberate changes, and why.)

In interpreting these results it is also important to remember that the participants are not representative of the various stakeholders in the area: the aggregated scores merely reflect the preferences of the mix of people at the meeting. The utility of this information is in revealing some of the possible trade-offs that some stakeholders are willing to make.

5 Final Request

Many thanks again to all the participants in the workshop. The workshop deliberations have provided important input to the research project, and we hope you also found this experimental meeting procedure a rewarding experience.

Attached is another blank version of the criteria voting forms completed in the workshop. We would be very grateful if you would fill out the form a final time and return it in the stamped addressed envelope enclosed. This will give you a chance to record your final thoughts on the rankings and scorings for the criteria if you have reflected further on these matters since the workshop. Please explain on the sheet why you have made any deliberate changes from Form 2. We would also appreciate any comments on organisation and procedure of the workshop itself, to help us evaluate the process.

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Email: k.brown@uea.ac.uk.

Other researchers involved in the project are: Dr Mikis Tsimplis (University of Southampton),
Dr Emma L. Tompkins (UEA), Dr Roger Few (UEA). Tarja Sortti (Southampton)

This report was prepared by Roger Few.

Appendix 3

Orkney Case Study Reports

Responding to climate change: inclusive and integrated coastal analysis

A research project funded by



ORKNEY CASE STUDY



Summary report
July 2004

The project 'Responding to climate change: inclusive and integrated coastal analysis' is led by
Dr Katrina Brown of the School of Development Studies,
University of East Anglia (UEA), Norwich NR4 7TJ.
Email: k.brown@uea.ac.uk.

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Responding to climate change: inclusive and integrated coastal analysis

ORKNEY CASE STUDY: Summary Report

Introduction

Coastal communities are potentially vulnerable to climate change. Climate change could increase stresses on coastal systems through sea-level rise, changes in air and sea temperature, wind and rainfall patterns, and an increased frequency of extreme events, such as storms. The vulnerability of coastal populations is also influenced by decisions and actions on how to adapt to climate change hazards by people and institutions living within or managing the coastal zone. These decisions and actions are in turn shaped and constrained by a range of factors, including the resources available to decision-makers and the social, economic and political context in which decisions are made.

Since June 2003 research has been ongoing within Orkney as part of the project '*Responding to climate change: inclusive and integrated coastal analysis*'. This is a national study funded by the Tyndall Centre for Climate Change Research (which is itself funded by the Natural Environment Research Council, the Engineering and Physical Sciences Research Council, and the Economic and Social Research Council). This research project seeks to explore the challenges for coastal decision-making in the UK in the face of, at present, unpredictable climate and sea level changes. Given the long time frames and major uncertainties surrounding climate change impacts, taking decisions and actions to combat the effects of sea level rise and climate alterations is by no means straight-forward. The study aims to illuminate what adaptive actions may be feasible and appropriate, and the trade offs that may be inherent in doing so. The project therefore focuses on:

- decision processes relating to strategic long-term actions
- constraints and opportunities to adaptive actions
- the role of public participation in making decisions about coastal planning
- cross-sectoral integration issues in managing the coast.

Orkney is one of two areas of the UK selected as case studies for this project: the other is Christchurch Bay in the south of England. At Christchurch Bay work centred on issues connected with coastal defence. At Orkney, work has centred on the potential for disruption of transport systems within Orkney and between the islands and mainland Scotland as a result of sea level rise and potential increases in storminess. The focus on transport impacts was chosen, in part, because of the fundamental importance of travel and transportation to economy and society in Orkney.

The research team have consulted all available documents relating to the coastal management of Orkney, and completed a series of meetings, formal interviews, group interviews and a workshop with a range of local stakeholders, designed to explore in a qualitative sense the foci noted above.

The remainder of this report presents in summary form some of the findings from the research.

Climate Change and Orkney: Vulnerability

Analysis of how society may respond to climate change must rest first on an understanding of what those changes might be and their likelihood of occurrence. To date, there has been no formal study on the potential impacts of climate change in Orkney, although the prospects of change are introduced in 'Orkney 2020: A Community Plan' (OIC 2003) and the draft 'Orkney Environmental Strategy and Action Plan' (Orkney Environment Partnership 2002). The following discussion of Orkney's vulnerability to climate impacts is therefore drawn from wider sources of material and from the perspectives of those who participated in this study.

Climate predictions

There is now increasing evidence from global meteorological records and from recent observations of environmental change that a gradual process of global warming is under way (IPCC 2001). This evidence, together with an increasing scientific capacity to model atmospheric, oceanic and terrestrial processes, suggests that there is a high probability of the Earth undergoing significant climatic changes in the coming decades. Many of those changes may be starting to occur now, and, over time, their cumulative effect is likely to become more apparent.

Using data provided by a report on UK islands from the British-Irish Council (Hadley Centre 2003) and by the UK Climate Impacts Programme (Hulme et al. 2002), it is possible to give a range of estimates of change in climate parameters for Orkney by the year 2080, based on the latest advances in long-term climate modelling (see Table 1). Despite the ever increasing sophistication of such modelling, it is important to note that we cannot yet be definitive about precisely what the changes may be. The range for each parameter reflects the predictive uncertainty that exists over many aspects of climate change: indeed, some scenarios of change raise the (remote) possibility of climate alterations on a far more dramatic scale.

Table 1 Estimates of the potential impacts of climate change on Orkney by 2080

	<i>minimum</i>	<i>maximum</i>
Mean annual temperature increase	1 °C	2.5 °C
Winter rainfall increase	5 %	15 %
Summer rainfall decrease	10 %	30 %
Sea level rise	9 cm	69 cm
Increase in extreme sea level	15 cm	85 cm

One aspect that we can now quite confidently predict is that by 2080 Orkney will experience a rise in sea level as a result of global warming. This is likely to be somewhere in the range of 9cm to 69cm above the present day level (depending largely on how effective the efforts are to curb global emissions of greenhouse gases). Orkney is also likely by then to experience an increase in average annual temperature of between 1 and 2.5 degrees celsius. Climate predictions suggest that total annual rainfall will change very little here, but there will be a significant change in the seasonal distribution of that rain. Winter precipitation is likely to increase by 5 to 15%, but in the peak summer months there may be 10 to 30% less rain than at present.

One of the possible climate changes that is extremely difficult to predict with precision is change in storminess. Overall, there is a clear possibility that storms will become more common and more intense. If so there will be more days of high winds and perhaps an increase in extreme wind speeds. Extreme sea levels that occur during combinations of high tide and storm surge will become greater, both because of a stronger storm surge effect and because the mean sea level will be higher anyway. The latest predictions for Orkney suggest that by 2080 an exceptional 1 in 50 year storm event may produce a sea level 15 to 85cm higher than a 1 in 50 year event happening today. In addition to this, there may also be a slight increase in the average size (amplitude) of waves.

It is important to note that, though we have provided estimates of change by 2080, it does not mean there will be no observable shifts in climate before then. In most cases the process of change is likely to be continuous, and so some of the potential impacts of climate change may well start to 'bite' within the next few decades.

Impacts on island life

Climate change effects within the ranges predicted above could have impacts on many aspects of life in Orkney. By no means all the consequences would be negative: warmer temperatures, for example, might enable new crops to be cultivated and might lengthen the summer tourist season (although other aspects of climate change such as shifts in rainfall patterns and storminess would also enter the equation). However, many of the changes are likely to lead at least to short-term disruption of present-day patterns of activity and possibly to longer-term problems (see Kerr et al. 1999). Drier summers, for example, might lead to regular water shortages on some of the isles. There may be shifts in the distribution of marine fish as a result of rising sea temperatures, which could bring further problems for the fishing industry. Higher sea levels, stronger waves and an increase in gales could increase the risk of coastal erosion, overtopping of sea defences and inundation of low-lying buildings, farms, burial grounds and archaeological sites.

Because of the many ways it affects so many aspects of life in Orkney, we focus here particularly on the potential impact of climate change on transport between the isles and to/from mainland Scotland. The principal changes to take account of here are sea level rise and any increase in storm and wind conditions. Marine transport may be affected by both rising sea levels and storminess: the operational ability of piers and harbour facilities may be affected by increases in high water level; and increased storminess may create problems for the safe movement of small vessels and docking difficulties for all vessels. Increased storm conditions could bring greater flood/erosion risk to coastal roads and causeways, and higher incidence of strong winds could bring extra disruption to inter-island and external flights, including hospital flights. (We note also the

importance of fog and low-level cloud on air services, but climatic modelling presently provides no information on changes in these aspects of climate).

As is already apparent, it is impossible to say precisely by how much transport facilities, vessels and services in Orkney will be affected by sea level rise and wind/storm changes. This is partly because of the uncertainty surrounding climate predictions, but also partly because it depends on how society responds to this risk now and in future, as well as any other changes that may arise in the way external and internal transport is organised. If we assume the organisation of transport remains much the same as now, the range of possible impacts on it from climate change remains considerable.

On the one hand, should the lowest estimates of climate change prove true the disruption to shipping, air services and use of causeway roads might be little different from the occasional disruptions brought about today. If, on the other hand, the climate and sea level changes are at the other extreme, it is possible to envisage major threats to services and infrastructure. As many as nine settled areas of Orkney could be come regularly cut off from vehicle access because of high seas washing across low-lying roads and causeways, including the Churchill Barriers (see Box 1). There could be more days with high winds above 50 knots when flights are cancelled from Kirkwall to mainland Scotland and to the northern isles. There could be many more occasions when high waters or high winds make it difficult for ferries, livestock ships and freight ships to cross the Pentland and Moray Firths or for inter-island ferries to dock at piers and linkspans, leading to cancellations of services. There may be more days when fishing is not possible and when cargo ships cannot dock at Flotta (presuming the port continues to function in some form).

Box 1 The Churchill Barriers

Present-day problems with high waves at the Churchill Barriers have caused mounting concern for motorists, particularly on Barrier no. 2 connecting Lamb Holm and Glimps Holm, which is exposed to a long fetch from the south-east. A 100m wave wall was erected on the north end of the Barrier in 1995, but reported incidents of damage to cars and temporary road closures continue to occur. Many sources suggest that the incidence of severe wave impact on Barrier 2 is increasing, though it is unclear whether this is a result of apparent climatic shifts (including wind direction), seabed changes, or the disintegration of block ships. There is also uncertainty whether the reported increase in damage to vehicles relates to increased usage and dependence on the fixed links by island residents, increased reporting of incidents or, indeed, a greater physical threat. (There is a commonly-expressed argument that the wave wall has heightened the risk to vehicles.)

A series of interviews in Burray suggest that most residents perceive the extreme wave action at the Barriers to be a significant but manageable problem, occurring on only a few occasions per year. However, economic and social dependence on the causeways is placed so high that if sea level rise and increased storminess were to create frequent disruption to their use, people would envisage major problems for the future population of Burray and South Ronaldsay. Several interviewees suggested that a regular disruption of vehicle access to/from the islands would lead to depopulation. Given that high waves at the Barriers are already a well-publicised concern and that regular maintenance of the Barriers needs to be undertaken now because of storm damage, we suggest that they are the elements of transport infrastructure within Orkney perhaps most obviously vulnerable to high-estimate climate change impacts.

Not only may such disruptions become more frequent but they may last for longer periods. At the extreme, there is even the risk of permanent damage to roads and piers, or the permanent closure of high-risk services. At best the impacts of climate change might prove negligible, but if the worst case were to result there would be considerable disruption, cancellation and even damage unless very costly adaptation measures were implemented.

Sources drawn on for this research suggest that any increase in the frequency or duration of climate-related disruption to transport services in Orkney could have far-reaching consequences. Orkney as a whole is dependent on regular external links for export of products and livestock and import of foodstuffs and other goods. Increased incidence of disruption during the livestock export season, for example, could further undermine the farming sector. The isles are yet more dependent because they also rely on internal services for export and import. But is not only the movement of goods that is affected. Disruption of transportation would hinder travel for employment, business, schooling and health care, and would reduce accessibility of Orkney for tourism.

Perhaps of great importance for the future sustainability of the islands' population, reduced reliability of transport to and from Orkney may become a critical disincentive for immigration. Many respondents in this study perceive that the attraction of incomers, especially of young families, will be a crucial factor in stemming depopulation trends in the outer isles and sustaining the long-term economy and social fabric of Orkney as a whole. But many such people may only be willing to settle, and to stay, if they perceive 'island life' does not equate increasingly with 'isolation'. Orkney society has inherent vulnerabilities, as well as inherent qualities and capacities. How climate change impacts on transport reliability, economic performance and, indeed, the clemency of the weather might be an additional factor capable of tilting the balance.

Climate Change and Orkney: Responding to the Challenges

Society's response to the threat of climate change has two aspects. 'Mitigation' refers to efforts to forestall the climate change process itself, mainly through reduction in emissions of so-called 'greenhouse gases'. 'Adaptation' refers to efforts to reduce the negative impacts on society that may result from climate change. Because of inertia in the atmospheric system, some future climate change is likely to take place even if humanity were to engage now in widespread mitigation actions. This project is concerned principally with the prospect for adaptation in Orkney.

Adaptation options

Strategic approaches to dealing with the impacts of future climate change are of course hampered by one crucial problem: we cannot say for sure what will happen, where and when. For some of the types of impact outlined above for Orkney, such as those in tourism and crop cultivation, it is difficult to take preparatory action other than planning out possible future options because the very direction of future change is unclear. For others, such as the distribution of fish stocks, the direction of change is established but it is unclear whether the magnitude of the change will cause problems to arise. It is perhaps easiest to formulate and consider potential technical adaptations to changes that are likely to exacerbate existing problems such as present-day coastal flooding and

erosion and disruption of air services and shipping by gales. However, an argument can be made that society should at the very least consider possible adaptive needs, plan response options and, if appropriate, take concrete action in every sector that might be affected.

Again, our work on this aspect focussed especially on transport and travel within and to/from Orkney. Discussions with interviewees and consultation of documents yielded a number of possible technical measures that might be considered in order to maintain transport services as close as possible to those provided today. Such measures include the construction or modification of roadway and harbour structures designed to operate at higher sea levels, withstand higher waves or shelter vehicles and vessels from wind and waves. Already, recent modifications to piers in Orkney have included an additional height allowance of 50cm to take into account predicted sea level rise. Possible engineering options suggested for the Churchill Barriers include strengthening and raising the structures, building breakwaters and even the use of replacement block ships. There may also be alterations too to the design or size of boats and aircraft so that they can cope better with rougher seas and wind conditions. Many of these options are highly capital-intensive, dependent on external funding and might require periodic upgrading.

A second form of adaptation in this sector would be to reorganise present transport services and related activities so that they become less sensitive to weather-related disruption. Organisation of activity could include, for example, re-routing of inter-island ferries to take longer but more sheltered routes and better coordination of shipping traffic at ports to take account of local weather forecasts. Livestock export delays could be accommodated better through the provision of permanent reserve farm space on mainland Orkney. Such changes would require considerable planning, reorganisation and monitoring, and be dependent on people's willingness to accommodate changed practices.

A third form of societal adaptation in this context might be to reduce dependence on transportation – of people, livestock and goods. This might come about through strategic shifts in the islands' economy and work patterns, and even changes in the distribution of settlement. There could, for example, be more home-working, possibly facilitated by enhanced telecommunications links. There could also be a return to greater self-sufficiency in Orkney, with more foodstuffs and other products and services being supplied locally. There could be an increase in meat processing on the islands, so that export of live animals across the Pentland Firth is no longer necessary. This adaptive approach is likely to entail major shifts in lifestyle and society, including reduction in personal travel and choice of consumer goods: sacrifices that many people may be unwilling to make. And, though it should be stressed that no interviewee actually advocated this, it may also lead to the abandonment of isles that are unable to maintain basic self-sufficiency.

Issues in strategic adaptation

If society is to respond strategically to the challenges of climate change, then there has to be momentum and capacity within society to develop and implement actions and policies appropriate to this long term problem. As well as studies that promote strategic technical and organizational solutions, we argue that there is a crucial role for social science research in highlighting the constraints on and opportunities for strategic action.

From our work to date three important issues have emerged that currently shape prospects for strategic action to tackle future transport risks in Orkney.

- ***Uncertainty***

As noted already, much predictive uncertainty remains over future climate parameters and how these might impact on the coastal environment. There is even greater uncertainty over the future shape of society, governance and technological change – as one local stakeholder noted, what will matter is how future climate affects future society, not present society. This uncertainty makes it difficult to plan strategically and to justify actions that might produce long term benefits but incur short term costs. Some of the adaptive options noted above might be seen to pose major costs should the degree of climate change prove to be minimal. However, the complex nature of the climate change problem is always likely to defy certainty of prediction. The key question is how much certainty is needed before adaptive action should commence – given that measures to counter risks may themselves need a long lead-in time. On the one hand, some interviewees call for more national-level guidance on adaptive actions. Others, however, believe that, because there is so much uncertainty, decisions on action should be guided by local knowledge of Orkney's environment and socio-economic needs.

- ***Short-termism?***

Weather and sea conditions are a commonplace topic of discussion for Orcadians, but, to date, there has been little formal attention given to future climate risks in Orkney. Climate change is discussed in broad terms within the Community Plan and the draft Environmental Strategy, and featured in the 2002 Orkney Science Festival, but it has been seldom addressed by OIC in general or by commercial and non-governmental organisations in Orkney. In part, this may be because of limitations to the scope of (multi-decade) strategic planning that apply for many organisations in the UK. Many public and private agencies are constrained in their consideration of long term policies by financial and staffing resources, which may lead to the prioritization of immediate tasks. Local government is often further hamstrung by formal planning timelines and by local political stresses that may tend to work against long term actions with controversial present-day implications. Dealing with complex issues such as climate change impacts also requires stronger cross-sectoral integration than has perhaps existed in Orkney until recently. All these factors may tend to reinforce a short-term outlook over climate: one that makes long term anticipatory action all the more difficult.

However, the issue of 'short-termism' may not be so simple. We perceive that Orkney society in general is relatively accustomed to taking a long-term perspective on issues such as population change, economic growth and sustainability: so why does climate change fail to register as a pressing concern for organisations or residents? It may be that people perceive climate predictions are too uncertain and distant in time to justify action now that may prove unnecessary. Moreover, relative to some regions of the world, the predicted climate changes for Orkney are relatively undramatic (although it has been suggested that had there not been recent years of relatively mild weather the focus on potential climate risks might have been sharper). The short-term approach to climate may therefore have a perceived justification rather than merely being an artefact of competing priorities and constraints on strategic capacity.

- ***Funding constraints***

Strategic action, whether designed to protect against, accommodate or retreat from the disruption caused by coastal hazards, will incur an outlay of expenditure. Costs of maintaining present-day transport services already place a strain on available financial resources, and the costs of modifying or constructing fixed structures to resist potential

climate impacts would be extremely high in relation to the population base of Orkney. Most participants in this research regarded external public finance from the national and international level to be essential for adaptive actions. A contribution from local residents, either through an element of local taxation or increased fares, might be feasible, together with a contribution from any reserve funds that may be available through major commercial activity in Scapa Flow. However, few people perceive major expenditure can take place without large-scale fiscal support from central government. Yet funds for climate change adaptation are likely to be constrained at all levels, and Orkney would likely be just one of a great many communities in the UK (and Europe) requesting assistance.

As well as placing severe challenges on our overall ability to respond to climate change impacts, the issues outlined above have important implications, we argue, for the timing and the scale of decision-making on how to adapt.

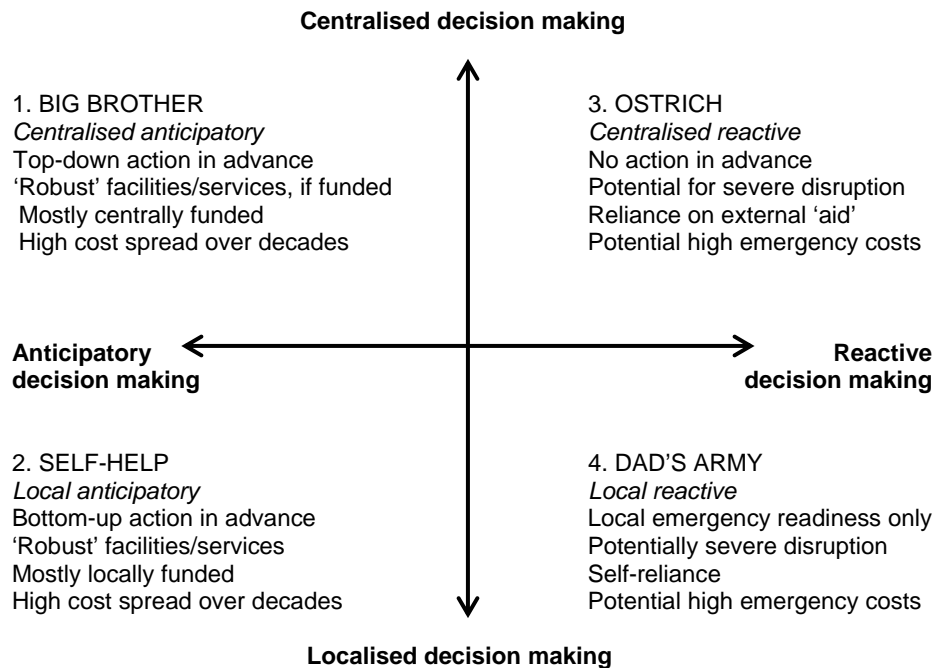
The discussion on 'short-termism' has already highlighted a view expressed by several participants in the research who stressed that some aspects of precautionary action to guard against potential climate impacts may not be appropriate or feasible in advance of those impacts occurring. In the global climate change debate a distinction has been made between 'anticipatory' adaptation (taken in advance of impacts) and 'reactive' adaptation (taken once impacts occur). Both the anticipatory and reactive approaches entail risks, but they are of a different nature. In making decisions on how to respond to climate change predictions, society needs to find an appropriate balance between the two approaches. One hybrid solution that may be workable in some instances is to aim for flexibility in design of structures and systems so that they can be easily amended if the need arises.

We have also seen that successful adaptation in Orkney may well require major external financial assistance. At the same time, there are many voices in Orkney calling for increased local input into decision-making on major issues and actions that affect the islands. This is seen to build on local knowledge and priorities, and on what is perceived by some as a strong tradition of autonomy and civic responsibility among Orcadians. Yet, if there are increasing demands made by local communities around the UK on a finite purse of external funds, we suggest that funding rules and guidelines set by central authorities may well become tighter and more proscriptive. There is a chance, at least, that decision-making will become more centralized rather than more localized in the context of adaptation to climate change, if communities are unable to develop adaptive responses that are viable without majority-funding from elsewhere.

Many of these issues were raised during a concluding project workshop, in which the timing and scale of decision-making were explicitly addressed. Box 2, overleaf, provides some summary information on that meeting (a longer report on the workshop is also available from the project team).

Box 2: Workshop, 6th April 2004 : 'How to respond to climate change?'

At the close of the case study in Orkney, a workshop was held at ICIT in Stromness with participants from community groups, non-governmental organisations, local businesses, public authorities and academic institutes. At the workshop, participants considered some of the fundamental trade offs that exist in choosing how to respond to future climate change threats relating especially to transport. After general discussion of climate impacts and response considerations, participants were presented with the following picture of four hypothetical approaches (1-4) to managing future change. The differences between the management scenarios are explained by their relation to two axes, the horizontal axis representing the timing of decision making (Anticipatory to Reactive) and the vertical axis representing the scale of decision-making (Centralised to Localised).



The participants were asked to discuss aspects of the scenarios and which of the four they favoured. Many people were wary of taking too much anticipatory action until predictions of change became more certain, although some felt low-cost anticipatory planning now would be useful. Actions could be taken now to provide stepping stones for greater resilience in communities. A need for central government funding was generally voiced, but there were concerns over the 'inappropriateness' and unreliability of centralised decision-making. Contrary to the assumptions made above, centralised funding and localised decision-making were not necessarily seen as mutually exclusive.

During the workshop the participants were also asked to undertake voting exercises to indicate how they would prioritize the following three basic decision-making criteria for future management:

- a) *Risk of future disruption should be minimised*
- b) *New spending should be minimised*
- c) *The decisions made must reflect local views*

The averaged results suggest that, for most participants, the criteria descend in importance from representation of local views as top priority, through risk avoidance as second priority to cost minimization as a third priority.

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We wish to express our sincere gratitude to you for participating in the study and for taking the time and interest to read this report. Please feel free to send us any comments you have on its contents, and do also get in touch if you are interested in any further information on the case study, the project or the work of the Tyndall Centre for Climate Change Research. Please note that a final report on the UK project will be made publicly available in late Autumn 2004 on the Tyndall Centre website <http://www.tyndall.ac.uk/>

HOW TO RESPOND TO CLIMATE CHANGE?

STAKEHOLDER WORKSHOP ON APPROACHES TO MANAGING FUTURE RISK FOR ORKNEY IN THE FACE OF CLIMATE CHANGE PREDICTION & UNCERTAINTY

**ICIT, Stromness
2-5pm, 6 April 2004**

WORKSHOP REPORT

Workshop Report

1 Participants

Thirteen participants attended the meeting (plus six workshop team members). Participants included members of community groups, non-governmental organisations, local businesses, public authorities and academic institutes. The sectors represented by participants comprised: transport & infrastructure (4); public administration (4); local development (4); business (2); environmental and coastal science (5). Note several participants had linkages with more than one sector.

2 Project rationale and workshop format

The research project in Orkney is part of a national study investigating social and political dimensions of adaptation to climate change impacts in the coastal zone of the UK. Given the long time frames and major uncertainties surrounding climate change impacts, taking decisions and actions to combat the effects of sea level rise and climate alterations is by no means straight-forward. The study aims to illuminate what adaptive actions may be feasible and appropriate, by analysing the present and future constraints and opportunities for responding to climate change threats, and the trade offs that may be inherent in doing so. There are two main case study sites. At Christchurch Bay, on the Dorset/Hampshire coast, work has centred on issues connected with coastal defence. At Orkney, work has centred on the potential for disruption of transport within Orkney and between the islands and mainland Scotland as a result of sea level rise and potential increases in storminess.

The workshop in Orkney was designed to encourage participants to consider how to balance some of the fundamental trade offs that exist in choosing how to respond to possible future climate change threats – particularly (but not exclusively) potential long-term threats to transportation by sea, air and road. At the start of the workshop the participants were asked to undertake a brief voting (ranking and scoring) exercise on the following three basic decision-making criteria for future coastal management:

- Risk of future disruption should be minimised ('Risk' criterion)
- New spending should be minimised ('Cost' criterion)
- The decisions made must reflect local views ('Local' criterion)

The range of potential climate change threats to the Orkney was then outlined and a set of strategic considerations that relate to future transport were posed for general discussion (see section 3).

In the second part of the workshop, participants were asked to discuss and evaluate a set of different management scenarios – hypothetical alternative approaches to long-term risk management (see section 4). Following the scenarios discussions, the voting exercise on the decision-making criteria was then repeated to enable a comparison of results before and after the workshop (see section 5).

3 General discussion: potential impacts of climate change and management considerations

The following list summarizes the key (and sometimes contrasting) points raised by meeting participants during the first half of the workshop:

Perspectives on the implications for transport

- Transport costs are a major consideration for business, and transport to/from Orkney is already expensive (this view was countered by one participant).
- Orkney may need to become more self-sufficient in many food products to reduce dependence on the importation of stocks. The threat of disruption of transport may have a positive effect in stimulating more local production and more local trades.
- Transport problems may affect people's willingness to settle in Orkney. The remoteness of the islands is already a disincentive for incomers.
- Orkney cannot afford an outflow of people.

Preparing for climate change impacts

- Orcadians should think ahead to alleviate prospective problems and need to start planning now
- It is important that Orcadians continue to actively consider the future and make positive steps to adapt if necessary – complacency and raised expectations could be major impediments.

- Orcadians are resilient, and should draw on their tradition of pragmatism and adaptability to look upon climate change as an opportunity and not solely as a threat.
- It is difficult to plan 75 years ahead when there is uncertainty not only about climate change impacts but also about the future trajectory of economy and society in Orkney.
- Sustaining the community requires investment not just in transport but in employment and provision for social needs.
- Investment in planning for possible climate impacts might be better spent sustaining local communities instead.

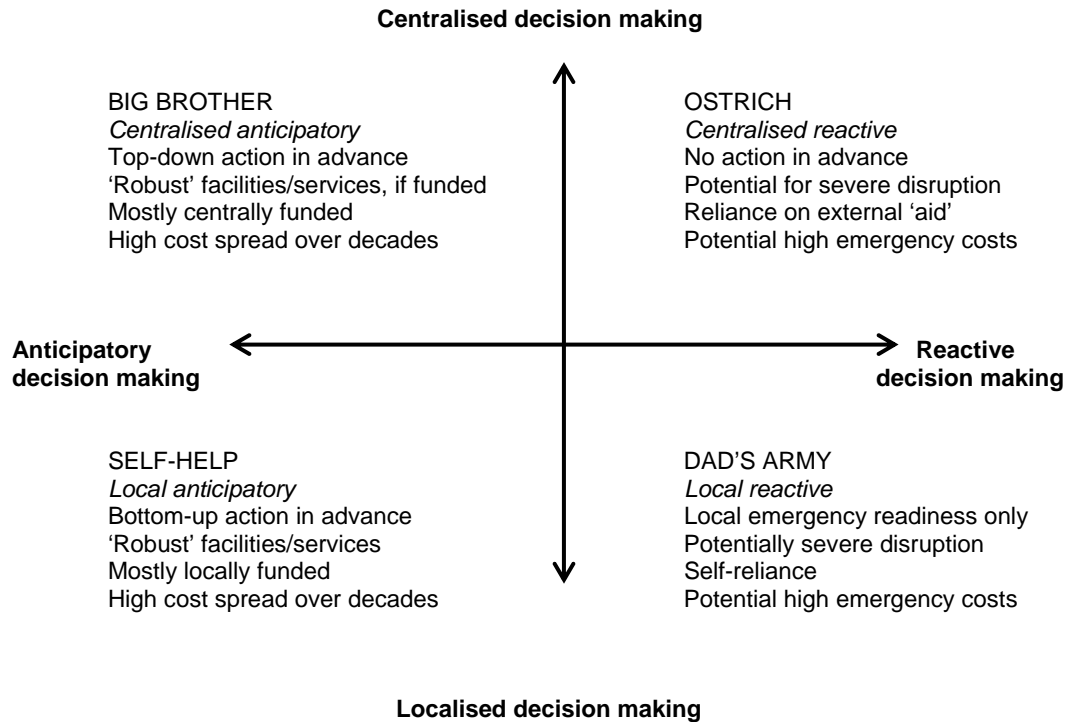
Who should take action?

- External funding for adaptive action is essential, but it cannot be assumed that Orkney will be a priority for central government: Orkney has to fight its corner.
- Local people know best how to manage the islands.
- Prioritising representation of local views in decision-making is vital to ensure that actions promote the maintenance of viable communities on the islands.

Many of these points were subsequently revisited and expanded on during the discussions in the second half of the workshop, which is summarized in the next section.

4 Results of the scenario (small group) discussions

Participants were presented with the following picture of four hypothetical approaches to climate change management in the future. Each segment of the picture describes a climate change management scenario. The differences between the management scenarios are explained by their relation to two axes, the horizontal axis representing the timing of decision making (Anticipatory to Reactive) and the vertical representing the scale of decision-making (Centralised to Localised).



The participants were divided into three groups and asked to discuss aspects of the scenarios and which of the four they favoured. Differences emerged both between and within the groups. Many people were wary of taking too much anticipatory action until predictions of change became more certain, although some felt low-cost anticipatory planning now would be useful. Actions could be taken now to provide stepping stones for greater resilience in communities. A need for central government funding was generally voiced, but there were concerns over the 'inappropriateness' and unreliability of centralised decision-making. Contrary to the assumptions made in the matrix, centralised funding and localised decision-making were not necessarily seen as mutually exclusive.

In discussing their preferences in the groups, individual participants made a series of contrasting comments on the two axes that define the coastal management scenarios. The comments covered the following perspectives:

Perspectives on timing ('Anticipatory to Reactive' axis)

- Climatic changes are already happening here and they are already leading to change e.g. waterlogging of grass runways and provision of hard runways.
- Anticipation need not cost money: it can mean contingency planning so that we are better prepared.

- Port developers need to take possible changes into account in pier/breakwater designs: would only have marginal effect on capital costs.
- Design of structures can provide flexibility to incorporate future adaptation e.g. for raising breakwater heights.
- Non-party politics in Orkney means authorities are better able to take long-term outlook.
- We should make investment for the future, but not if acting without proof.
- Need to be both anticipatory and reactive. Provide flexibility for future reactive adaptation.
- Uncertainty over climate change means we should probably be more reactive.
- We do not know what the effects of anticipatory action would be.
- Government is poor at budgeting in advance: so action is inevitably reactive.

Perspectives on scale ('Centralised to Localised' axis)

- Central funding is essential for anticipatory action.
- Orkney cannot do transport adaptation itself: transport is already hugely subsidised.
- The reality is we depend on central funding and so at some point there has to be centralised decisions no matter how much we want local decisions.
- We need to make the decision locally and ask the central government for money.
- Strategic funding decisions on transport must be central, but action implemented through localised decision-making.
- The demand for funding has to come from local level, because central government does not have the knowledge of local situations.
- A local cooperative to build or raise piers is a possibility.

- With better information, education and a robust argument, a local levy on fares for advance adaptation would be feasible.
- A 'nest egg' fund for future local adaptation drawn from major economic projects in Orkney could be possible (but may mean less money comes available from central government).
- Since central government is unlikely to be anticipatory, it may be up to us to look after ourselves anyway.

5 Results of the criteria voting exercises

All of the 13 participants completed an identical form at the start (Form1) and close (Form 2) of the workshop, in which they gave each criterion a ranking and a score (from a combined total of 10 points) to reflect its relative priority. The following tables show the average rank and score participants assigned to each criterion in the two exercises - in each table the top ranking and highest score are shown in bold:

Form 1

<i>critterion</i>	<i>average rank</i>	<i>average score</i>
risk	1.8	3.8
cost	2.8	2.4
local	1.5	3.8

Form 2

<i>critterion</i>	<i>average rank</i>	<i>average score</i>
risk	2.1	3.2
cost	2.8	2.6
local	1.1	4.3

The combined results show a consistent *order* of priority for the three criteria across both exercises. The results suggest that, *as they are phrased*, the criteria descend in importance from representation of local views as top priority, through risk avoidance as second and cost minimization as third.

However, the combined figures also indicate some change between the first and second exercises. Analysis of individual results shows that Form 2 was different from Form 1 for 9 of the 13 participants. Whilst only five people changed the ranking, or order, of the criteria, nine people changed the scores, or emphasis, of the criteria.

In terms of the overall direction of these changes, a clear pattern emerged, with 'local' gaining in priority at the expense of 'risk'. 'Local' was promoted in rank by 5 participants and was scored higher by 6 participants the second time round (2 people scored it slightly lower).

Assessing the significance of the changes is not straight forward, since they are generally slight and may well be incidental. However, the overall promotion of the 'local' criterion does suggest this may have been a deliberate change for several people.

In interpreting these results it is also important to remember that the participants are not representative of the various stakeholders in the area: the aggregated scores merely reflect the preferences of the mix of people at the meeting. The utility of this information is in revealing the nature of some of the trade-offs that stakeholders may be willing to make.

The project 'Responding to climate change: inclusive and integrated coastal analysis' is led by
Dr Katrina Brown of the School of Development Studies,
University of East Anglia (UEA), Norwich NR4 7TJ.

Email: k.brown@uea.ac.uk.

Other researchers involved in the project are: Dr Mikis Tsimplis (University of Southampton),
Dr Emma L. Tompkins (UEA), Dr Roger Few (UEA). Tarja Sortti (Southampton)

This report was prepared by Roger Few.

Appendix 4

Legal framework on Coastal Zone Management in the UK

Legal framework on Coastal Zone Management in the UK

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IV CONCLUSION

I INTRODUCTION

One aspect of research on climate change and coastal population's vulnerability and ability to adapt for its future impacts on coastal zones is to look at the current coastal zone legislation and the institutions which have some responsibilities in managing the coastal regions.

This report attempts to give a description of the current legislation that affects coastal zone in the UK. It will also present the authorities and institutions, which are involved with the management of the coastline in some respect. An effort is made to see what the advantages and disadvantages of the current legal framework on the coast may be for different people and communities in respect of impacts of climate change. The report also includes a case study where one site on South England's coast is examined in respect of the legal framework.

Unfortunately it is not possible to analyse the laws and policies in depth because of the short time which was allowed to this work. Hopefully however it gives some understanding of this complicated area of legislation, ideas for improving the coastal management legislation and above all references and guidance for further research.

II GENERAL

1. The legal concept of the coastal zone in the United Kingdom

There is no general definition for the coastal zone in the United Kingdom and therefore different classifications for coastal land and water must be examined.¹

¹ For comparison see for example The United States *Coastal Management Act of 1972* which defines coastal zone to be “the coastal waters (including the lands therein and thereunder) and the adjacent shorelands (including the waters therein and thereunder), strongly influenced by each other and in proximity to the shorelines of the several coastal states, and includes islands, transitional and intertidal areas, salt marshes, wetlands, and beaches. The zone extends, in Great Lakes waters, to the international boundary between the United States and Canada and, in other areas, seaward to the outer limit of State title and ownership under the Submerged Lands Act, the Act of March 2, 1917, the Covenant to Establish a Commonwealth of the Northern Mariana Islands in Political Union with the United States of America, as approved by the Act of March 24, 1976, or section 1 of the Act of November 20, 1963, as applicable. The zone extends inland from the shorelines only to the extent necessary to control shorelands, the uses of which have a direct and significant impact on the coastal waters, and to control those geographical areas which

Terra firma, foreshore and sea bed

The earliest law applicable to the coastal zone consists of the common law i.e. the court decisions. These decisions were often concerned with the foreshore and seabed ownership. In 1832 the court held in *Lowe v Govett*² that foreshore did not extend above the ordinary high-water mark. Later *A-G v Chambers*³ which was a dispute concerning the Crown's property boundaries of the foreshore landwards decided that "the limit indicating such land is the line of the medium high tide between the springs and the neaps". According to one opinion that also was laid as a basis for the decision in the case "The shore is that ground that is between the ordinary high-water and low-water, and no more."

Accordingly *the soil on the coastal zone* may be divided into three boundaries: terra firma, the intertidal foreshore and the seabed. Terra firma, the dry land, ends at high water mark whereas the seabed begins at low-water mark and finally the land between them is called foreshore.⁴

Inland waters and high seas

Although the courts in general have avoided specifying precise limits of inland waters and high seas *R v Keyn*⁵ held that the realm ends and the high seas begin at low-water mark. Therefore waters which were inside of the body of a county i.e. within realms were considered to be inland waters. Inland waters also include inlets, creeks and arms of the sea, "where a man standing on the one side may see what is done on the other" as suggested in *Pleas of the Crown, Bk II, ch 9, s 14* (where to find this?).⁶

Territorial sea and continental shelf

Another way of defining the coastal zone is to look at the territorial sea, the international baselines and the continental shelf. In the UK the baseline principles of the international law have been implemented in the UK by the Territorial Waters Order in Council 1964, SI 1965, Part, p 6452A and by the Territorial Sea Act 1987 the territorial sea was extended to 12 miles. The Territorial Sea (Amendment) Order 1998, SI 1998/2564 and

are likely to be affected by or vulnerable to sea level rise. Excluded from the coastal zone are lands the use of which is by law subject solely to the discretion of or which is held in trust by the Federal Government, its officers or agents."

The full text of the Act can be found for example <http://iimirror.warwick.ac.uk/uscode/16/1451.html>

² (1832) 110 English Reports 317.

³ (1854) 43 English Reports 486.

⁴ <http://web.uct.ac.za/depts/pbl/jgibson/index.htm> This Coastal Zone Law Web Site contains legal materials and a commentary on coastal zone law in the United Kingdom, together with links to sources of national, European Union and international law on coastal management.

⁵ (1876) 2 Exchequer Division 63.

⁶ See <http://web.uct.ac.za/depts/pbl/jgibson/iczm/notes/note1.htm>

The Territorial Sea (Limit) Order 1989, SI 1989/482 give particular definitions for baselines in the West Coast of Scotland and between the UK and France.⁷

The Geneva Convention on the Continental Shelf 1958 was implemented in the UK by the Continental Shelf Act 1964. The Act allows the designation of the areas where the rights of the UK may be exercised and English, Scottish or Northern Irish law is applicable. In 1997 the UK finally acceded the United Nations Convention on the Law of the Sea which was agreed already 1982 and is a comprehensive international convention on the rights and obligations and the boundaries between the nations at the sea.⁸

1.1 Property rights on the coastal zone - who own the coast?

The starting point is that the Crown is the owner of the foreshore. This was argued already in 1568-69 and resurrected when the Crown's land property was transferred to the management of former Commissioners of Woods, Forests and Land Revenues in 1800 (Crown Estate Commissioners). In the House of Lords case *A-G v Emerson*⁹ the Crown's *prima facie* ownership of the foreshore was confirmed.¹⁰ Although historically the Crown owned the foreshore some of it is now owned privately¹¹. However about 55% of the coastline is still owned by the Crown.¹²

The question of the Crown's ownership of the seabed under territorial sea has not been judicially decided in England and Wales but in Scotland *Crown Estate Commissioners v Fairlie Yacht Slip Ltd*¹³ decided that the seabed under the territorial sea and the foreshore are the Crown's property.¹⁴

1.2 Coastal zones in International Law

The most comprehensive international convention governing the uses of the sea is United Nation Convention on the Law of the Sea (UNCLOS) which entered into force 1983, just one year after it was agreed. The United Kingdom ratified the Convention as late as 1997.¹⁵

There are various types of maritime zones recognised by international law. The most important are internal waters, the territorial sea, the exclusive economic zone and the

⁷ See <http://web.uct.ac.za/depts/pbl/jgibson/iczm/notes/note1.htm>

⁸ See <http://web.uct.ac.za/depts/pbl/jgibson/iczm/notes/note1.htm>

⁹ [1891] Appeal Cases 649.

¹⁰ See <http://web.uct.ac.za/depts/pbl/jgibson/iczm/notes/note1.htm>

¹¹ For example The National Trust owns and cares for almost 600 miles of the coastline.

See more <http://www.nationaltrust.org.uk/main/>

¹² Gibson, J. "European Commission - DG XI.D.2, Legal and Regulatory Bodies: Appropriateness to Integrated Coastal Zone Management", 1999, p 25.

¹³ 1977 Scots Law Times 19.

¹⁴ See <http://web.uct.ac.za/depts/pbl/jgibson/iczm/notes/note1.htm>

¹⁵ The full text of the Convention with additional information can be found at

http://www.un.org/Depts/los/convention_agreements/convention_overview_convention.htm

continental shelf. These zones are subject to coastal jurisdiction, which in the case of UK may be rather complicated.¹⁶

1.3 European Union and coastal zones

There is no common practice on the definition of the coastal zone in the legal systems of Member States but some states including the United Kingdom have restricted concepts of the *seashore*. They are based on tidal criteria and are quite narrow.¹⁷

1.4 Other definitions for the coastal zone

New Forest District Coastal Management Plan 1997¹⁸ recognises the difficulty of defining the coastal zone "because of the number and variety of factors which affect our perception of it". As there may be activities far offshore having impacts on the shoreline and on the other hand the coastal landscape can suddenly merge into that of inland areas, Coastal Management Plan 1997 does not define coastal zones in geographical respect. Instead of geographical definition Coastal Management Plan 1997 deals with full range of *activities and interests that affect the coast*. The District Council accepts that there are activities beyond their powers but by identifying and recording their impacts the first step towards those who control the activities is taken and it creates an open forum in order to make progress on shared objectives for the coast.¹⁹

1.5 Do the definitions matter?

There may be various different definitions for the coast in the UK coastal zone legislation. However none of them seems to be designed for overall coastal management purposes. Often these definitions deal with the application of the particular law; it either applies to the land or the sea. This may cause the legislation become sectoral and complex which cannot be an advantage when managing the coast.

On the other hand it may not be advisable to have an exclusive legal definition of the coastal zone for general purposes. However, important seems to be that all areas where land and sea exert a mutual influence are included in the definition. Also specific boundaries where management is applied at the particular places need to be defined.²⁰

2. Coastal zone management

¹⁶ <http://web.uct.ac.za/depts/pbl/jgibson/iczm/notes/note1.htm>

¹⁷ Gibson, J. "European Commission - DG XI.D.2, Legal and Regulatory Bodies: Appropriateness to Integrated Coastal Zone Management", 1999, p iv.

¹⁸ New Forest District Council, April 1997. Coastal Management Plan 1997 is currently being reviewed.

See more information <http://www.nfdc.gov.uk/mnu1.html>

¹⁹ New Forest District Coastal Management Plan 1997 p 10.

²⁰ See Gibson, J. "European Commission - DG XI.D.2, Legal and Regulatory Bodies: Appropriateness to Integrated Coastal Zone Management", 1999, p iv. See also the broad definition in the US Coastal Management Act of 1972 on footnote 1.

2.1 Non-statutory management

As will be seen below there is a wide variety of coastal legislation that affects the UK coasts at international, European Community and national level. However the management of the coasts in the UK is carried out on a non-statutory basis i.e. there is no specific legislation on coastal management. The UK government view has been that the most effective way of bringing together organisations with coastal interests to deal with the managing issues on the coast is to do it through non-statutory management plans based on different government policies and strategies rather than by statutory process.²¹

(Questions: What is the Government's position today -is it still based on non-statutory management policies? Are future climate change impacts particularly recognised in the Government's policies and strategies? How does the UK Government encourage the local authorities to take more effective steps in non-statutory coastal management process -> the Coast Protection Act includes a discretionary grant aid system, which seeks to assist the maritime district authorities financially with government funding. But compare to the US Coastal Management Act 1972 offers incentives in the form of administrative grants where the state has complied with the requirements of the Act in completing a management program for coastal zone)

2.2 Integrated Coastal Zone Management

Integrated Coastal Zone Management²², ICZM, is "dynamic, multi-disciplinary and iterative process to promote sustainable management of coastal zones. It covers the full cycle of information collection, planning (in its broadest sense), decision making, management and monitoring of implementation. ICZM uses the informed participation and co-operation of all stakeholders to assess the societal goals in a given coastal area, and to take actions towards meeting these objectives. ICZM seeks, over the long-term, to balance environmental, economic, social, cultural and recreational objectives, all within the limits set by natural dynamics. 'Integrated' in ICZM refers to the integration of objectives and also to the integration of the many instruments needed to meet these objectives. It means integration of all relevant policy areas, sectors, and levels of administration. It means integration of the terrestrial and marine components of the target territory, in both time and space."²³

²¹ This was reflected in the Government response to the House of Commons Select Committee Report "Coastal Zone Protection and Planning" "YEAR" but compare e.g. to the United States that is one of those first states, which have used legislation as an instrument of coastal management. In the US the Coastal Management Act of 1972 provides a framework for voluntary co-operation between the federal government and coastal states. The Act offers incentives in the form of administrative grants where the state has complied with the requirements of completing a management program for coastal zone. See Sec. 1455 of the US Coastal Management Act of 1972.

²² See ICZM bibliography at <http://europa.eu.int/comm/environment/iczm/biblio.htm>

²³ This definition is given in the glossary of the European Environment Agency, see more http://glossary.eea.eu.int/EEAGlossary/I/integrated_coastal_zone_management

The European Union has 30.5.2002 adopted a Recommendation²⁴ on implementing integrated coastal zone management ICZM in Europe. The purpose of this Recommendation is to encourage Member States "to undertake a national inventory of legislation, institutions and actors involved in the planning and management of the coastal zone and based on this, to develop a national strategy or strategies to promote Integrated Coastal Zone Management."²⁵ This Recommendation recognises in particular the risks of climate change on coastal zones. According to it Member States must report to the Commission on the experience in implementation of this Recommendation 45 months after its adoption.²⁶

To launch the process of implementing the ICZM Recommendation in the UK and to update stakeholders on the progress of the Marine Stewardship initiatives, DEFRA sponsored a major conference in November 2002, in London, for everyone involved in the management of our coastal and marine resources. DEFRA informs that the results of the meeting will feed into the national stocktaking exercise which should begin in early 2003.²⁷

(Questions: What have the Government done since the meeting in London in order to implement the ICZM Recommendation? Could be a good idea to ask the local authorities whether they are aware of this Recommendation and what is their opinion of it and overall follow the progress with ICZM and whether it would bring along something concerning climate change?)

3. Coastal zone legislation

There is a significant amount of legislation affecting the coastal zone in the United Kingdom. Unfortunately it is complicated first of all by the different constitutional status of England, Wales, Scotland and Northern Ireland. By *the Government of Wales Act 1998*, *the Scotland Act 1998* and *the Northern Ireland Act 1998* many statutory responsibilities have been transferred to the local governments²⁸. There may also be differences between the powers of the government, regional and local authorities within in the UK. Some legislation applies throughout the UK, some only within certain geographical areas and accordingly many differences between the provisions appear.²⁹

²⁴ *Council Recommendation of the European Parliament and of the Council of 30 May 2002 concerning implementation of Integrated Coastal Zone Management in Europe* (OJ No L 148, 6.6.2002, p 24)

²⁵ See "Amended Proposal for a European Parliament and Council Recommendation concerning the implementation of Integrated Coastal Zone Management in Europe", Commission of the European Communities, Brussels, 25.9.2001.

²⁶ See Chapter VI of the Recommendation.

²⁷ See more at <http://www.defra.gov.uk/environment/marine/iczm/>

²⁸ See more at <http://www.wales.gov.uk/index.htm>, <http://www.ni-assembly.gov.uk/> and <http://www.scottish.parliament.uk/>

²⁹ See Gibson, J. "European Commission - DG XI.D.2, Legal and Regulatory Bodies: Appropriateness to Integrated Coastal Zone Management", 1999 p 24.

The most of the coastal zone legislation is sectoral and applies either to the land or the sea. The ownership issues of the foreshore and seabed with the public and private rights (such as right to navigate, fishery, bathing, shooting, and collecting) on the coast make the legal framework even more complicated. The need of harmonising and organising of the coastal zone legislation has been recognised on many sectors.³⁰

3.1 Sources of UK coastal zone law

3.1.1 International law

International law often takes a form of treaties or conventions that impose obligations on governments³¹, provide jurisdiction in maritime zones and on the continental shelf. Many international legal instruments are *indirectly* relevant to the coastal zone management as the issues they deal with occur or affect the coastal zones as well. Also there are various global conventions that *specifically* relate to marine and coastal areas.³²

Conventions and treaties may be either bilateral or multilateral and in the case of multilateral conventions they may be global or regional. The treaties and conventions can be legally binding only on the States that have agreed to ratify and enforce them.³³ Therefore effectiveness of the international legal instruments depends on whether the convention is global or regional, whether a State has decided to implement it and the pace of implementing them. Many of international agreements that affect marine environment may also take a form of declarations, in which the intentions of the States to achieve specified objectives are declared. However these instruments are not legally binding.³⁴

The following legal instruments are examples of the conventions that have *an indirect relevance* to the coastal zone management: *the Convention on Biological Diversity 1992*³⁵, *the UN Framework Convention on Climate Change 1992*, *the Kyoto Protocol 1997*³⁶, *the Bonn Convention on the Conservation of Migratory Species of Wild Animals 1979*³⁷ and *the Bern Convention on the Conservation of European Wildlife and Natural Habitats 1979*³⁸.

The United Kingdom is party to all these conventions as well as signatory of the Kyoto Protocol 1997. The situation with the Kyoto Protocol in January 2003 is that there are

³⁰ See <http://web.uct.ac.za/depts/pbl/jgibson/iczm/notes/note3.htm>

³¹ Generally in the United Kingdom these obligations are implemented by a statute. See <http://web.uct.ac.za/depts/pbl/jgibson/iczm/notes/note1.htm>

³² Gibson, J. "European Commission - DG XI.D.2, Legal and Regulatory Bodies: Appropriateness to Integrated Coastal Zone Management", 1999 p 61-62.

³³ The obligations imposed by the international conventions are generally implemented by statute in Britain. See <http://web.uct.ac.za/depts/pbl/jgibson/iczm/notes/note1.htm>

³⁴ Gibson, J. "European Commission - DG XI.D.2, Legal and Regulatory Bodies: Appropriateness to Integrated Coastal Zone Management", 1999 p 61-62.

³⁵ The full text of the Convention can be found at <http://www.biodiv.org/>

³⁶ The full text of the Climate Conventions can be found at <http://unfccc.int/index.html>

³⁷ The full text of the Convention can be found at <http://www.wcmc.org.uk/cms/>

³⁸ The full text of the Convention can be found at <http://www.ecnc.nl/doc/europe/legislat/bernconv.html>

now 100 members on the agreement as Canada ratified the Protocol on 18 December 2002. However it has not entered into force yet, as the protocol requires that the ratifying governments must include developed countries representing at least 55% of that group's 1990 carbon dioxide emissions. At the moment developed country ratifications account for 43.7%.

The most important global instruments that relate *in particular to marine and coastal areas* are the *UN Convention on the Law of the Sea*³⁹, *Agenda 21*⁴⁰, *IMO Conventions*⁴¹ and the *Ramsar Convention on Wetlands*⁴².

Agenda 21, in particular Chapter 17 deals with the protection of oceans, sea and coastal areas. Although *Agenda 21* is not legally binding document it is an important declaration of policy. In Chapter 17 the marine environment is recognised as an integrated whole, including the oceans and all seas and adjacent coastal area. In particular Programme A, which deals with "Integrated management and sustainable development of coastal and marine areas, including exclusive economic zones" and Programme E about "Addressing critical uncertainties for the management of the marine environment and climate change" may be of great interest for the future research of legal framework on coastal zone. In addition the Chapter 17 suggests a wide variety of appropriate activities as well as describes the means of implementation in order to achieve the objectives and principles.⁴³

The International Maritime Organization⁴⁴ (IMO) has promoted several global conventions and protocols regulating the conduct of international shipping in order to improving maritime safety and preventing pollution from ships. Many of these legal instruments that can be used to protect the coastal zone from environmental risks arising ships.⁴⁵ The following conventions relate to marine environmental protection:

³⁹ See above and at

http://www.un.org/Depts/los/convention_agreements/convention_overview_convention.htm

⁴⁰ See the text of the Convention at <http://www.un.org/esa/sustdev/agenda21.htm>

⁴¹ IMO Conventions can be found at <http://www.imo.org/home.asp>

⁴² See <http://www.ramsar.org>

⁴³ See more <http://www.un.org/esa/sustdev/agenda21.htm> See also the national reports contained in this website that member states have submitted to the Commission on Sustainable Development and in particular the information regarding "Oceans and coastal areas" in the United Kingdom. There it is stated that "The UK's national policy on oceans is integrated into a national strategy. *An integrated coastal area management programme* has also been implemented. The following national policies have been partially addressed: coastal vulnerability assessment; identifying on-going and planned programmes for the systematic observation of the marine environment, integrating activities and establishing priorities; and research to determine the biological effects of increased levels of ultraviolet rays due to depletion of the stratospheric ozone layer." See if right!

⁴⁴ See Conventions and more information at <http://www.imo.org/HOME.html>

⁴⁵ The future climate change impacts such as sea level rise and the storminess may "edesaattaa" that the number of incidents with oil leaking vessels increases.

International Convention relating to Intervention on the High Seas in Cases of Oil Pollution Casualties 1969,
International Convention on Civil Liability for Oil Pollution Damage 1969,
International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage 1971,
London Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter 1972,
International Convention for the Prevention of Pollution from Ships 1973/78 (MARPOL),
International Convention for the Safety of Life at Sea 1974,
International Convention on Salvage 1989,
International Convention on Oil Pollution Preparedness, Response and Co-operation 1990 and
International Convention on Liability and Compensations for Damage in Connection with the Carriage of Hazardous and Noxious Substances by Sea 1996

The one of the first modern global treaties on nature conservation was *the Convention on Wetlands of International Importance, the Ramsar Convention*. The United Kingdom signed the Convention in 1976. *The Ramsar Convention* applies areas of marsh, fen, peatland and water including marine water up to six meters deep at low tide and every signatory must designate at least one significant wetland to be included in a List of Wetlands of International Importance. The UK has designated 169 sites, with a surface area of 859,023 hectares, as Wetlands of International Importance.⁴⁶

There are also international instruments that have been agreed on a regional basis in order to protect the marine and coastal environment. One example which also the United Kingdom is party to is *the Convention for Protection of the Marine Environment of the North-East Atlantic (OSPAR Convention)*. OSPAR Convention covers parts of the Atlantic and Arctic Oceans and imposes general obligations and measures on the signatories to prevent and eliminate pollution and to protect the maritime areas against the adverse effects of human activities. A particular commission, the OSPAR Commission has been established in order to supervise the implementation of the Convention.⁴⁷ The London based Commission has the power to make recommendations and binding decisions.⁴⁸

The United Kingdom also participate *the International Conferences on the Protection of the North Sea*, which are periodic ministerial meetings where the participants discuss the common marine environmental policies of North Sea States. The meetings are political meetings and the decisions take the form of Ministerial Declarations. Thus the declarations are not legally binding but more like political statements. The Fifth International Conference on the Protection of the North Sea took place in Bergen, Norway in March 2002.⁴⁹

⁴⁶ See <http://www.ramsar.org>

⁴⁷ See <http://www.defra.gov.uk/environment/marine/ospar/osp02.htm>

⁴⁸ See Gibson, J. "European Commission - DG XI.D.2, Legal and Regulatory Bodies: Appropriateness to Integrated Coastal Zone Management", 1999, p 69.

⁴⁹ See the Bergen Declaration at <http://www.dep.no/md/nsc/>

The Council of Europe⁵⁰ has in 2000 published a "*Model law on sustainable management of coastal zones and European code of conduct for coastal zones*" (Nature and Environment No. 101). This present code of conduct and model law on coastal areas establish some general management principles aimed at the sustainable development of coastal areas and the preservation of their environmental. The idea of Model law and the code of conduct is that they would work as a source of inspiration for national legislation and practice, if appropriate. The document is produced by a group of specialists on coastal protection (PE-S-CO). The group was set up by the Committee of Ministers.⁵¹

3.1.2 European legislation

The Council of the Commission of the European Communities provide legislation on three levels. These are 1) regulations which are automatically binding on all Member States, 2) directives which require that the States in order to achieve the objectives provide new legislation and 3) decisions which are binding only particularly addressed States or private citizens.

One of the advantages directives may have over regulations is their flexibility in terms of that they can specify the objectives and standards that the Member States must achieve and comply with but it is responsibility of the Member States to devise the laws and measures which are appropriate for implementing directives in their administrative systems. On the other hand regarding in particular environmental problems, directives as they involve two legislative processes, are a slow way of dealing with environmental problems. For example *EIA Directive, Council Directive on the assessment of the effects of certain public and private projects on the environment* took totally eight years with all negotiations and implementations.⁵²

Another advantage of directives is that they can require Member States to devise laws and measures in such fields where legislation is of some reason ignored or the devise there is an unenforceable non-statutory measure. Disadvantage with EC directives is that they often are difficult to interpret because of imprecise provisions and therefore may lead to litigation. However the most important for effective operation of EC directives is their implementation and enforcement: "a directive will only achieve its purpose if Member States comply with it both formally and actually".⁵³

There are various EC laws which affect the management of the coastal zone because they deal with activities or issues that arise in or has some impact on the coast. The most important are environmental directives which many of them deal with general approaches

⁵⁰ The Council of Europe should not be confused with the European Union as the two organisations are very distinct. The 15 European Union states, however, are all members of the Council of Europe. See at <http://www.coe.int/portalT.asp>

⁵¹ See <http://www.coe.int/PortalT.asp>

⁵² Gibson "European Commission - DG XI.D.2, Legal and Regulatory Bodies: Appropriateness to Integrated Coastal Zone Management", 1999 p 47.

⁵³ Gibson "European Commission - DG XI.D.2, Legal and Regulatory Bodies: Appropriateness to Integrated Coastal Zone Management", 1999 p 47.

to environmental issues. In addition to general environmental legislation there are also legislation which concerns specific sectors such as water quality and nature conservation.

The following are examples of EC legislation that has a general approach to environmental management also affecting the coastal zones:

Council Directive 79/409/EEC of 2 April 1979 on the conservation of wild birds (OJ No L 103, 25.4.79, p 1)

Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (OJ No L 206, 22.7.92, p 7)

The United Kingdom passed Conservation (Natural Habitats &c.) Regulations 1994 in order to implement Habitats Directive.

Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment (OJ No L 175, 5.7.85, p 40)

Council Directive 97/11/EC of 3 March 1997 amending Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment (OJ No L 073, 14.3.97 p 5)

Directive 2001/42 /EC of European Parliament and of the Council of 27 June 2001 on the assessment of the effects of certain plans and programmes on the environment (OJ No L 197, 21.7.2001, p 30)

Strategic Environmental Assessment, SEA, is a supplement to the existing EIA system as the purpose of it is to ensure that an environmental assessment is also carried out of plans and programmes that are likely to have an environmental impact. Member States must bring into force the laws, regulations and administrative provisions necessary to comply with this Directive before 21 July 2004.

Council Directive 96/61/EC of 24 September 1996 concerning integrated pollution prevention and control (OJ L 257, 10/10/1996, p 26)

The IPPC Directive 96/61/EC has adopted an integrated regulatory approach to the protection of the environment as a whole. It aims to prevent or reduce pollution of air, water and land from various industrial activities listed in the annexes.

Council Directive 90/313/EEC of 7 June 1990 on the freedom of access to information on the environment (OJ L 158, 23.6.1990, p 56)

Council Recommendation of the European Parliament and of the Council of 30 May 2002 concerning implementation of Integrated Coastal Zone Management in Europe (OJ No L 148, 6.6.2002, p 24)

In order to meet EU's responsibilities to implement the objectives and principles under international agreements in particular such as in Chapter 17 of Agenda 21.⁵⁴ The recommendation in particular recognises the threat to coastal zones by climate change and of the dangers entailed by the rise in the sea level and the increasing frequency and violence of storms. (Here: To what extent do the current UK legislation / policies comply to this Recommendation?)

Proposal for a Directive of the European Parliament and of the Council providing for public participation in respect of the drawing up of certain plans and programmes relating to the environment and amending council directives 85/337/EEC and 96/61/EC

In order to implement the public participation in environmental matters provisions of the Aarhus Convention (the UNECE Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters), European Commission has proposed a new EC law to be accepted in the form of directive.

The following are examples of EC legislation that has a more specific approach to environmental matters. This legislation is more sectoral but affect the coastal zones in particular the legal instruments that deals with water quality:

Council Directive 91/271/EEC of 21 May 1991 concerning urban waste water treatment (OJ No L 135, 30.5.1991, p 40)

Council Directive 79/923/EEC of 30 October 1979 on the quality required of shellfish waters (OJ No L 281, 10.11.1979, p 47)

Council Directive 76/160/EEC of 8 December 1975 concerning the Quality of Bathing Water (OJ No L 31, 5.2.1976, p1)

The Commission has 24.10.2002 adopted the proposal for a revised Directive of the European Parliament and of the Council concerning the Quality of Bathing Water. The revised Directive will provide long-term quality assessment and management methods for improving the quality of bathing water. Well-developed management of bathing waters and extensive information given to the public is to replace a pure monitoring and retrospective compliance approach.

⁵⁴ See more Communication from the Commission to the Council and the European Parliament on Integrated Coastal Zone Management: A Strategy for Europe, Commission of the European Communities, Brussels 27.09.2000

Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (OJ L 327, 22.12.2001)

3.1.3 Common law

The common law which consists of the decisions made by judges in court disputes is usually the earliest law regarding the coast. Common law applicable to the coastal zone often concerns with the issues of ownership of the foreshore and sea bed but also the questions of rights to exercise public and private rights (navigating, fishery, bathing, shooting and collecting) over water and land.

3.1.4 Statutes

Public general Acts of Parliament, statutes, often take a form of enabling legislation in the coastal zone. This means that they empower ministers to establish subordinate authorities and to provide secondary legislation. The statutes form the legal basis and give powers for central government departments, statutory bodies and local authorities.

3.1.5 Local Acts

Local Acts are also Acts of Parliament but they are a separate series and relate to individual local authorities or particular places. The powers and duties of local councils and harbour authorities are often legislated by local Acts although most of the new harbour legislation is made by statutory instruments.

3.1.6 Statutory instruments

Statutory instruments (SI) are made by ministers under statutory powers. They are considered as secondary legislation and often provide detailed implementation of general provisions of the statutes.

3.1.7 Byelaws

Local authorities may have statutory powers to make local regulations i.e. byelaws. Byelaws give legal support to action on the ground, offer a clear basis for enforcement and can highlight broader aims and objectives.⁵⁵

For example Water Resources Act 1991 (Sch 25 and 26) empowers the Environment Agency to make byelaws for flood and defence purposes. Another example is public health sector (Public Health Acts Amendment Act 1907, Sections 82 - 84, Public Health Act 1936, Section 231 and Public Health Act 1961, Section 76) where district and unitary councils have powers to make byelaws which regulate e.g. public activities on or near the foreshore. However, byelaws shall not be valid until the relevant minister or Secretary of State confirms them.

⁵⁵ gibson web

One of the interesting questions here is whether the system of byelaws could be considered as a possible tool in managing the coastal areas in different climate change scenarios. Site managers, when considering issues of environmental decline or impact were in "*Review of Byelaw Powers for the Coast: Report of the Inter-Departmental Working Group*" particularly reminded to take into account that "assessing damage to the environment is difficult, as only limited research is available in this area."⁵⁶

3.2 National legislation affecting the coastal zone

3.2.1 Planning⁵⁷

In England and Wales planning functions are governed by *the Town and Country Planning Act 1990* and performed by either the unitary councils (in Wales and some other parts of England the unitary local authorities replaced the two-tier system with the counties, districts and parishes as a result of the Local Government review) or distributed between the county and district councils. County councils are responsible for *structure plans* and deciding applications relating the county matters whereas district councils produce *local plans* and handle applications for planning permission. The Unitary Councils combine the planning functions of the two authorities and produce unitary *development plans* containing both strategic and local policies. ODPM, the office of the Deputy Prime Minister (in Wales the National Assembly for Wales) determines national planning policy.⁵⁸

According *the Local Government Act 1972 s 72* the seaward boundary of local government areas for general purposes is *normally* the low-water mark of medium tides. The issue may arise in cases such as where a pier extends beyond low-water mark or where land has been reclaimed artificially from the sea.⁵⁹ However there are a few local government areas (for example Bristol, Wirral and Torbay) which extend beyond low-water mark. This is as a result of ancient practice or local legislation.

Regarding *limits of the planning control* on the coast areas another question is whether English and Welsh authorities are entitled to exercise planning control beyond low-water mark within local government areas. The issue has been decided by the court in Scotland where the Judge in *Argyll and Bute District Council v Secretary of State for Scotland*⁶⁰

⁵⁶ There is a summary available of the findings of a consultation exercise on bylaws, which was published by DETR October 1998 at http://www.ukmarinesac.org.uk/activities/recreation/r07_07.htm Otherwise see DETR, *Review of Byelaw Powers for the Coast: Report of the Inter-Departmental Working Group*, October 1998.

⁵⁷ See Coastal Planning bibliographies at <http://www.nottingham.ac.uk/sbe/planbiblios/bibs/country/27.html>

⁵⁸ <http://web.uct.ac.za/depts/pbl/jgibson/iczm/notes/note3.htm>

⁵⁹ See *Blackpool Pier Co v Fylde Assessment Committee* (1877) 46 Law Journal Magistrate's Cases 189 and *Barwick v South Eastern & Chatham Ry Cos* [1921] 1 King's Bench 187.

⁶⁰ 1976 Session Cases 248, 1977 Scots Law Times 33.

case has held that planning control is limited by low-water mark everywhere. In England and Wales it is considered that planning control is co-extensive with local government areas i.e. in certain cases could extend beyond low-water mark.⁶¹

The primary legislation governing the planning process in England, Wales and Scotland is mainly contained in the Acts of Parliament below. Many of these Acts (as the subordinate legislation) have been amended by new planning or other legislation since they came into force. In order to look at the legislation which applies currently to a particular question it is necessary to do thorough research on the question and the amendments. Within this report it is unfortunately not possible. The same applies also to all other areas of coastal legislation below.

the Town and Country Planning Act 1990 c. 8
the Planning (Listed Buildings and Conservation Areas) Act 1990 c. 9
the Planning (Hazardous Substances) Act 1990 c. 10
the Planning (Consequential Provisions) Act c. 11
the Planning and Compensation Act 1991 c. 34

the Town and Country Planning Act (Scotland) 1997 c. 8
the Planning (Listed Buildings and Conservation Areas) (Scotland) Act 1997 c. 9
the Planning (Hazardous Substances) (Scotland) Act 1997 c. 10
the Planning (Consequential Provisions) (Scotland) Act 1997 c. 11

The following statutory instruments are examples of various regulations and orders i.e. subordinate legislation governing planning system in the UK:

the Town and Country Planning (Use Classes) Order 1987
the Town and Country Planning (Assessment of Environmental Effects) Regulations 1988
the Town and Country Planning (Development Plan) Regulations 1991
the Town and Country Planning (Development Plan) Regulations 1991
the Town and Country Planning (General Permitted Development) Order 1995
the Town and Country Planning (General Development Procedure) Order 1995
the Environmental Impact Assessment (Scotland) Regulations 1999
the Town and Country Planning (Enforcement Notices and Appeals) (England) Regulations 2002

The planning system at least as to some parts of it in England and Wales is currently under reform. The House of Commons has on 4th December 2002 [Bill 12] introduced *the Planning and Compulsory Purchase Bill*. The purpose of the Bill is to speed up the planning system: "the provisions introduce powers which allow for the reform and speeding up of the plans system and an increase in the predictability of planning decisions, the speeding up of the handling of major infrastructure projects and the need for simplified planning zones to be identified in the strategic plan for a region or in relation to Wales. The provisions relating to compulsory purchase powers and

⁶¹ <http://web.uct.ac.za/depts/pbl/jgibson/iczm/notes/note3.htm>

compensation will liberalise the compulsory purchase and compensation regimes. They support policies relating to investment in major infrastructure and regeneration."⁶²

(What does the Local Government Act 2000 bring into force regarding coastal management / climate change? What are "community strategies" and what is the purpose of them -how do they work in practice, usefulness on the coast)?

3.2.2 Coast Protection

Under *the Coast Protection Act 194 c. 74*, which is the main Act governing coast protection in the UK, powers to carry out *coast protection work* are vested in *coast protection authorities*. According to section 1 of the Coast Protection Act 1949, "The council of each maritime district shall, subject to the provisions of any order under the next following section, be the coast protection authority for the district as the case may be". The maritime district here means a district any part of which adjoins the sea. As a result of the Local Government review a unitary council may now also be a coast protection authority. Other people may undertake coast protection work only with the consent by the coast protection authorities.

According to section 49 of the Coast Protection Act 1949, "*coast protection work* means any work of construction, alteration, improvement, repair, maintenance, demolition or removal for the purpose of the protection of any land, and includes the sowing or planting of vegetation for the said purpose". "*The protection*" means protection against erosion or encroachment by the sea as defined in the same section.

In the following some subordinate legislation governing coast protection:

the Coast Protection (Variation of Excluded Waters) Regulations 1993
the Coast Protection (Notices) (England) Regulations 2002
the Coast Protection (Notices) (Scotland) Regulations 1988
the Coast Protection (Notices) (Scotland) Amendment Regulations 1996

The Crown has *a common law duty* to protect the coast. This was decided in the *Isle of Ely Case*⁶³ where the Judge said: "...the King ought of right to save and defend his realm, as well against the sea, as against the enemies, that it should not be drowned or wasted." In another case it was held that a statutory body that assumes the Crown's duty to protect the land might interfere in a case where a landowner acts so as to expose another's land to invasion by the sea.⁶⁴ A landowner may not act so as to expose another's land to invasion by the sea as it could cause a breach of the Crown's Duty.⁶⁵ However a landowner who

⁶² Documents relating to the reform can be found at

<http://www.planning.odpm.gov.uk/consult/greenpap/greenind.htm>

⁶³ (1609) 77 English Reports 1139.

⁶⁴ See *Canvey Island Comissioners v Preedy* [1922] 1 Chancery 179, *Symes and Jaywick Associated Properties Ltd v Essex River Catchment Board* [1937] 1 King's Bench 548.

⁶⁵ *A-G Tomline* (1880) 14 Chancery Division 58.

builds a seawall to protect his own benefit does not have an obligation to maintain the seawall in order to protect others.⁶⁶

In a recent case *Holbeck Hall Hotel Ltd v Scarborough Borough Council*⁶⁷ the Court of Appeal considered the local authority's extent of liability to the adjoining land in the case of major landslide which caused substantial damage to the plaintiff's hotel. The defendant SBC appealed against the first instance decision whereby the Court held that SBC as an occupier of coastal land owes duty of care to take reasonable steps to prevent a risk of damage to neighbouring property due to the collapse of his own land because of a landslide. The Court of Appeal held, however, that that duty depended on foreseeability and SBC had not foreseen the magnitude of the risk and would not have done so without expert evidence derived from a geological survey. The duty might extend only to warning the owner of the dominant land of the foreseen risk and did not necessarily require expensive preventative works. Furthermore, it would be unfair and unreasonable to find liability in such circumstances where the danger had been equally apparent to the dominant owner.⁶⁸

3.2.3 Flood Defence

The Water Resources Act 1991 c. 57 and *the Land Drainage Act 1991 c. 59* are the main Acts of Parliament governing flood defence. Under the Water Resources Act 1991 responsibility for flood defence functions is vested on the Environment Agency. The functions of the Environment Agency are carried out by its regional flood defence committees. The regional flood defence committees are empowered to maintain improve or construct drainage works in order to defend the land from the sea or tidal water in their area as well as provide warning systems. They have also powers to make by-laws for flood defence purposes.⁶⁹

3.2.3.1 Coast protection and flood defence

The House of Commons Agriculture Committee recommended in its report "Flood and Coastal Defence that the legislative base of flood and coastal defence policy should be rationalised in a way that it also includes "removing the artificial distinction between sea defence and coastal erosion".⁷⁰ However this was rejected by the Government on the basis that it would create another artificial distinction between coastal and inland defence.⁷¹

3.2.4 Public health

⁶⁶ *Hudson v Tabor* (1877) 2 Queen's Bench Division 290.

⁶⁷ [2000] Q.B. 836.

⁶⁸ The case has produced several case comments, see for example "*Coastal Erosion and collapsing hotels*" by M.P. Thompson in *Conveyancer and Property Lawyer*, 2001 Mar-Apr 177-184.

⁶⁹ <http://web.uct.ac.za/depts/pbl/jgibson/iczm/notes/note4.htm>

⁷⁰ HCP (1997-98) 707.

⁷¹ HCP (1997-98) 1117.

The Public Health Acts Amendment Act 1907 s. 82, the Public Health Act 1936 s. 231 and Public Health Act 1961 s. 76 are the main Acts of Parliament which regulate public behaviour such as placing of temporary structures of vehicles, playing of games, riding, driving, selling, hawking and bathing on or near the seashore. These Acts give statutory powers to the local authorities to make byelaws however subject to confirmation by the Office of the Deputy Prime Minister or in Wales the National Assembly for Wales. What do those byelaws regulate in different regions must be examined case by case.

3.2.5 Pollution from land based sources and ships

Pollution from land based sources

Part III of the Water Resources Act 1991 c. 57 is about the control of pollution of water resources. It includes chapters of quality objectives, pollution offences, powers to prevent and control pollution and supplemental provisions with respect to water pollution. It provides a machinery for implementing the OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic 1992 and the EC directives on bathing water⁷², dangerous substances⁷³, shellfish waters⁷⁴ and urban waste water treatment⁷⁵. A new EC Water Framework Directive⁷⁶ which will replace the dangerous substances and shellfish waters directives must be implemented by 23 December 2003.

(What is the current stage of the implementation of EC Water Framework in the UK?)

The Pollution Prevention and Control Act 1999 and the Pollution Prevention and Control (England and Wales) Regulations 2000, SI 2000/1973 provide tools for implementation of the EC Directive on integrated pollution prevention and control i.e. IPPC directive⁷⁷.

The Government Department, which is responsible on all aspects of water policy in England, is DEFRA.⁷⁸

Pollution from ships

Legislation concerning pollution from ships in the United Kingdom is contained in *the Merchant Shipping Act 1995* and *the Merchant Shipping and Maritime Security Act 1997*. Examples of secondary legislation are:

The Merchant Shipping (Prevention of Pollution: Substances Other than Oil) (Intervention) Order 1997, SI 1997/1869

The Merchant Shipping (Prevention of Pollution) (Intervention) (Foreign Ships) Order 1997, SI 1997/2568

⁷² OJ No L31, 76/160/EEC, 5.2.1976, p 1.

⁷³ OJ No L129, 76/464/EEC, 18.5.1976, p 23.

⁷⁴ OJ No L281, 79/923/EEC, 10.11.1979, p 47.

⁷⁵ OJ No L135, 91/271/EEC, 30.5.1991, p 40.

⁷⁶ OJ No L327, 2000/60/EC, 22.12.2000, p 1.

⁷⁷ OJ No L257, 96/61/EC, 10.10.1996.

⁷⁸ See more <http://www.defra.gov.uk/environment/water/index.htm>

The Merchant Shipping Act 1995 also gives statutory powers for the Department for Transport, which has an overall responsibility of the control of pollution. Currently the DfT is in a process of reviewing development in coastal and marine waters. The objective is to reduce the complexity of the regime governing development in coastal and marine waters. For example Coast Protection Act 1949, Food and Environmental Protection Act 1985, Harbours Act 1964, EU Habitats and Birds Directives will be audited within this review.⁷⁹

3.2.6 Other fields of legislation affecting the coast

Because of a lack of time, unfortunately, the other fields of legislation and the main regulation affecting the coast must be just listed down here:

- Deposit of substances or articles in the sea
 - the Food and Environment Protection Act 1985, Part III
- Conservation
 - the Wildlife and Countryside Act 1981 (sites of special interests)
 - the Countryside and Rights of Way Act 2000 (sites of special interest)
 - the Conservation (Natural Habitats, &c) Regulations 1994, SI 1994/2716 (amended by SI 1997/3055 and SI 2000/192) (the Habitats Directive)
 - EC Birds Directive (79/409/EEC)
 - the Protection of Wrecks Act 1973
- Fisheries
 - the Sea Fisheries Regulation Act 1966 (much of the detailed regulation of fisheries is contained in secondary legislation made by the Secretary of State for Environment, Food and Rural Affairs or in byelaws made by *local sea fisheries committees*)
 - the Sea Fisheries (Shellfish) Act 1967
 - the Sea Fisheries (Shellfish) (Amendment) Act 1997
 - the Fishery Limits Order 1997, SI 1997/1750 (on the basis of the Law of the Sea Convention)
 - the Fishing Boats (European Community) Designation Order 1983, SI 1983/253
- Harbours
 - the Harbours, Docks and Piers Clauses Act 1847
 - the Transport Act 1981
 - the Transport and Works Act 1992
 - the Merchant Shipping Act 1988, s 37 (licensing of tidal works, see the effect on the Coast Protection Act 1949)
 - the Dangerous Vessels Act 1985
 - the Merchant Shipping Act 1995 (removal of wreck)
 - the Dangerous Substances in Harbour Areas Regulations 1987, SI 1987/37
- Pilotage

⁷⁹ See more <http://www.shipping.dft.gov.uk/marine/programme.htm>

- the Pilotage Act 1987 (responsibility for pilotage transferred from pilotage authorities to competent harbour authorities)
- Mineral resources
 - the Petroleum Act 1998
 - the Continental Shelf Act 1964
 - the Mineral Workings (Offshore Installations) Act 1971
- Customs
 - the Customs and Excise Management Act 1979
- Port Health
 - the Public Health (Control of Disease) Act 1984 (powers to establish port health districts and port health authorities are given to the Secretary of State)
- Defence
 - the Military Lands Act 1892
 - the Military Lands Act 1900
 - the Land Powers (Defence) Act 1958
 - the Dockyard Ports Regulation Act 1865
 - the Protection of Military Remains Act 1986

4. Authorities with coastal functions

There is no central authority that is responsible for the coastal zone. The administration is divided between a wide range of institutions at different administrative level. In the following the UK institutions with coastal functions are introduced.

4.1 The administrative structure

4.1.1 Central government departments with coastal functions

<p>ODPM – Office of the Deputy Prime Minister</p>
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<p>http://www.odpm.gov.uk</p>
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<p>http://planning.odpm.gov.uk</p>
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ODPM is responsible of providing Government policies for planning, local government and regions.

The government has prepared Planning Policy Guidance Notes (PPG) after public consultation in order to provide guidance to local and other authorities on policies and the operation of the planning system. PPGs can be downloaded from ODPM website. Planning Policy Guidance Notes are under revision as is the whole planning system as indicated above.

One of important documents is PPG 20 *Planning Policy Guidance: Coastal Planning* which is published by Department of the Environment, Welsh Office in September 1992. This note covers planning policy for the coastal areas of England and Wales. In Chapter 1 it sets out the general context for policy, Chapter 2 identifies planning policies for the coast and Chapter 3 presents policies for development that require a coastal location. Chapter 4 provides guidance on how these policies should be reflected in development

plans. The Secretaries of State and their Inspectors expect local planning authorities to have regard to PPG 20 when exercising their planning functions.

DEFRA – Department for Environment, Food and Rural Affairs (DETR, MAFF, DTLR) <http://www.defra.gov.uk/>

In June 2001, (SI 2001/2568), the functions of former DETR – Department of the Environment, Transport and the Regions were divided between DEFRA and DTLR – Department for Transport, Local Government and the Regions.

In March 2002, (SI 2002/794), the functions of former MAFF – Ministry of Agriculture, Fisheries and Food were transferred to DEFRA.

In May 2002, the functions of DTLR were divided between Department for Transport and ODPM and DTLR was abolished.

DEFRA works for the essentials of life: food, air, land, water, people, animals and plants. DEFRA as a Government department has overall policy responsibilities for flood defence and coastal protection in England.

DEFRA is responsible for all aspects of water policy in England, including water supply and resources, and the regulatory systems for the water environment and the water industry. They have sought to categorise material on water issues into the following main sections: water quality, marine and flood management, water resources and water industry.⁸⁰

In 1999 MAFF published the Government's *High Level Targets for Flood and Coastal Defence and the Elaboration of the Environment Agency's Flood Defence Supervision Duty*.⁸¹ It came into operation 1 April 2000. The purpose of the High Level Targets is to provide a framework for ensuring and demonstrating delivery of the Government's stated policy aims and objectives for flood and coastal defence. These policy aims and objectives were introduced in *the 1993 Strategy for Flood and Coastal Defence in England and Wales*.⁸²

According to the 1993 Strategy, the policy aim is: "*To reduce the risk to people and the developed and natural environment from flooding and coastal erosion by encouraging the provision of technically, environmentally and economically sound and sustainable defence measure.*" The three central objectives in achieving the policy are: 1) "*To*

⁸⁰ See more via the links at <http://www.defra.gov.uk/environment/water/index.htm>

⁸¹ The High Level Targets were born as a result of the Government response (published in October 1998) to the report on Flood and Coastal Defence by House of Commons Agriculture Committee (published in August 1998) where the Government *inter alia* committed MAFF (DEFRA) to prepare a series of high level targets. See Flood and coastal defence High level targets, Ministry of Agriculture, Fisheries and Food, November 1999.

⁸² Flood and coastal defence High level targets, Ministry of Agriculture, Fisheries and Food, November 1999.

encourage the provision of adequate and cost effective flood warning systems", 2) "To encourage the provision of adequate, economically, technically and environmentally sound and sustainable flood and coastal defence measures" and 3) "To discourage inappropriate development in areas at risk from flooding and coastal erosion".⁸³

In practice the responsibilities in achieving these aims and objectives was placed on flood and coastal defence operating authorities (*district and unitary councils*): they were asked to provide policy statements of how they will contribute to the delivery of these aims. *The Environment Agency* as a principal operating authority would have a key role through advice, monitoring and reporting. Some of the targets apply to local authorities in their capacity as local planning authorities and as bodies responsible for emergency planning. The targets set out in the High Level Targets must be reviewed alongside of the legislation applicable to flood and coastal defence operating authorities, all other statutory requirements including those relating to the environment, and guidance issued by DEFRA (MAFF) and other Government Departments.⁸⁴

DfT – Department for Transport

<http://www.dft.gov.uk/>

Department for Transport is responsible for all issues with respect of transport. The areas that in particular may affect the coastline are shipping (harbours, pollution from ships, offshore safety and most harbours) transport safety, integrated transport and local transport.⁸⁵

In July 1999 in Wales the Welsh Office was replaced by the National Assembly for Wales that is concerned of most of the functions of ODPM, DEFRA, DCMS and the Department of Health.

DTI – Department of Trade and Industry

<http://www.dti.gov.uk/>

Department of Trade and Industry is responsible for industrial sector of oil and gas which are the most important natural resources to be discovered in the UK Continental Shelf.⁸⁶

DCMS – Department for Culture, Media and Sport

<http://www.culture.gov.uk/heritage/index.html>

This Department is responsible for underwater archaeology which primarily extends to administering the Protection of Wrecks Act 1973 in England and designating wrecks off

⁸³ Flood and coastal defence High level targets, Ministry of Agriculture, Fisheries and Food, November 1999.

⁸⁴ Flood and coastal defence High level targets, Ministry of Agriculture, Fisheries and Food, November 1999.

⁸⁵ See shipping issues at <http://www.shipping.dft.gov.uk/index.htm#marine>

⁸⁶ See <http://www.og.dti.gov.uk/regulation/legislation/index.htm> about the regulation concerning oil and gas.

English waters under the Act and, related to this, acting as Secretariat to the Advisory Committee on Historic Wreck Sites.

Department of Health

<http://www.doh.gov.uk/>

Port health is administered by the Secretary of State for Health (or the National Assembly for Wales) under *the Public Health (Control of Disease) Act 1984*. The Act empowers the Secretary of State to establish port health districts and port health authorities by statutory instrument.

MOD – Ministry of Defence

<http://www.mod.uk/>

Under *the Military Lands Act 1892* the Secretary of State for defence is empowered to make byelaws in relation to land managed by him or belonging to a territorial, auxiliary or volunteer reserve association and which is used for naval, military or air force purposes. These powers have then been extended to apply to sea and tidal water

4.1.2 Statutory (governmental) bodies

Crown Estate Commissioners (Commissioners of Woods, Forests and Land Revenues)

http://www.crownestate.co.uk/index_4.shtml

The Crown Estate Commissioners manage virtually the entire territorial seabed and about half the foreshore (which is considered as a "movable freehold" between the high and the low-water mark) which is owned by the Crown.

The Crown Estate was established in its present form by *the Crown Estate Act 1961*. Under this Act, the Estate is managed by a Board of Commissioners who have a duty to 'maintain and enhance the value of the estate and the return obtained from it, but with due regard to the requirements of good management. According to the Act which was amended 1983 Crown Estate Commissioners are permitted to dispose absolutely of Crown property but they often grant leases for up to 150 years, also licenses are granted for *minor works and for dredging*.

Environment Agency (The regional flood defence committees)

<http://www.environment-agency.gov.uk/>

The National Rivers Authority who had had responsibility for flood defence since 1989 was replaced in April 1996 with the Environment Agency. Before 1989 the responsible authority for flood defence were water authorities.

Scottish Environment Protection Agency

<http://www.sepa.org.uk/>

The main responsibilities are for flood defence and water quality. These responsibilities are based on the below Acts:

The Water Act 1989

The Environment Act 1995

The Water Resources Act 1991

The Land Drainage

The organisation of Environment Agency

The head office (divided between Bristol and London) is responsible for national policies, which are to be delivered consistently taking into consideration all the local differences in environmental, social and economic climate.

There are eight national centres all together. The National Flood Warning Centre and the National Water Demand Management Centre are some examples of these eight national centres, which provide technical and scientific expertise to support the key areas of work of Environment Agency.

The National Laboratory Service and the National Library and Information Service are examples of the services overall 22 national services based in one place in order for providing key services for the whole organisation.

There are overall eight regional offices. These eight regions are **Southern**, Thames, South West, Midlands, Anglian, Wales, NorthWest and NorthEast. Every region has a Regional Office, which provide co-ordination, technical and administrative support to the 26 area offices.

The 26 Area Offices in England and Wales are responsible for the day-to-day management of the area. Every area office has also a customer services department.

English Nature

<http://www.english-nature.org.uk/>

English Nature works largely as a Government Agency in the field of conservation of wildlife and geology throughout England.

Under *the Wildlife and Countryside Act 1981* and *the Countryside and Rights of Way Act 2000* English Nature has a duty to notify any land which is of special interest (site of special scientific interest, SSSI) by reason of its flora, fauna or geological or physiographical features to the local planning authority, owners and occupiers and the Secretary of State for Environment, Food and Rural Affairs, in Wales the National Assembly for Wales.

English Nature manages those marine nature reserves, which has specifically been designated by the Secretary of State for Environment, Food and Rural Affairs under the *Wildlife and Countryside Act 1981*.

The Wildlife and Countryside Act 1981 also gives English Nature a general power to make byelaws protecting a marine nature reserve, and specifically authorises prohibitions or restrictions on certain activities.

English Nature has issued several position statements⁸⁷ that regards issues which are of prime concern to English Nature and nature conservation; where English Nature stands on the issue, and how achievement of nature conservation goals can be integrated within other policies, practices and programmes. Some of the interesting position statements are *Climate change and nature conservation, October 2002* and *Shoreline Management, January 2002*.

Countryside Agency

<http://www.countryside.gov.uk/index.htm>

The Countryside Agency has resulted from the merger of the Countryside Commission and the Rural Development Commission. They work for to make life better for people in the countryside; and improve the quality of the countryside for everyone.

Corporate Plan 2002/2003 - 2004/05 and *Towards Tomorrow's Countryside* describe how The Countryside Agency will deliver the outcomes set out in their *Corporate Strategy*. These publications will be revised in spring 2003 and can be downloaded at their website.

In Wales *the Countryside Council for Wales* (<http://www.ccw.gov.uk/>) is concerned with the functions of the Countryside Agency and English Nature.

Commissioners of Customs and Excise

Commissioners of Customs and Excise administer customs in the UK. The Commissioners are empowered under *the Customs and Excise Management Act 1979* to appoint any area of the UK as a customs port. Currently there are ca. 70 customs ports covering the entire coast of Great Britain.

Health and Safety Executive

They have responsibilities for offshore safety.

National Trust

<http://www.nationaltrust.org.uk/main/>

National Trust for Scotland

<http://www.nts.org.uk/>

⁸⁷ See more <http://www.english-nature.org.uk/news/position.asp>

The National Trust works to preserve and protect the coastline of England, Wales and Northern Ireland. This is done through practical caring and conservation and educating and informing people.

The National Trust is not a Government Department, it is an independent charity which relies completely on the continued generosity of its supporters. However the National Trust is among those who own and manage some coastal areas and in that respect important institution.

4.1.3 Local Authorities

District/county councils or unitary councils

They have responsibilities regarding planning, flood defence, coast protection and public health etc.

Harbour authorities

Functions of harbour authorities includes e.g. a) the provision and maintenance of quays, wharves and other facilities, b) regulating activities in the harbour covering areas such as movement of vessels, mineral extraction, construction of works, c) conservancy activities e.g. dredging and marking channels, removal of wrecks and d) performing harbour operations such as cargo handling.

Sea Fisheries committee

There are 12 local sea fisheries committees established in England and Wales under *the Sea Fisheries Regulation Act 1966*. The Committees have large powers to make byelaws which regards fishing and conservation of species

Water companies

See:

the Water and Sewerage Undertakers (Inset Appointments) Regulations 2000, SI 2000/1842,
the Water Industry Act 1991

III A CASE STUDY

1. Christchurch Bay - Description of the site

Narrow shingle beaches and slumping or eroding cliffs, which many of them are included in a Site of Special Scientific Interest (SSSI), characterise this coastline from Highcliff to Hurst within the administrative area of New Forest District Council in Hampshire. Of the

18 km of shoreline owned or leased by the Council, 10 km is defended against erosion; the total coastal frontage within the boundaries of the Council administration is 18 km. The need to protect the coast from coastal erosion has generated remarkable coast protection work in particular on built-up areas at Barton-On-Sea and Milford-On-Sea. In the eastern end of the bay Hurst Spit has been breached by storms during the recent years and considerable works have been carried out there in order to stabilise it. The whole of Christchurch Bay is accessible to the public.⁸⁸

Western part of Christchurch Bay from Highcliff to Stanpit Marsh (which is leased from Borough of Bournemouth) belongs to the administrative area of Borough of Christchurch in Dorset. The council of Christchurch administers 10.3 kilometres of coast including areas of Christchurch Harbour 3ha of special salt-tolerant grass sward. The 1990 value of these defences was estimated at £8m and they protect, conservatively, about £100m of real estate in the front line.

2. Coastal and flood protection policies affecting Christchurch Bay

2.1 The New Forest District Council (NFDC) Policy Statement on Flood and Coastal Defence

The purpose of the policy statement, which was approved under Minute 232 of Policy and Resources Committee on 16 May 2001, is to provide a public statement of the Council's approach to flood and coastal defence in its area and thus to fulfil the Government's requirement for each operating authority to provide a policy statement setting out the plans for delivering the Government's aim and objectives for flood and coastal defence.⁸⁹

NFDC is recognised as a relevant operating authority for 1) flood defences on ordinary watercourses which are not within the area of an internal drainage board and 2) coast protection (i.e. measures against coastal erosion) on all frontages in the authority's area. *The Environment Agency* is the relevant operating authority for flood defences on designated main rivers and sea defences (i.e. measures against coastal flooding). The relevant *Highway Authority* (county council or Highways Agency) is responsible for culverts under roads.⁹⁰

Although recognised as an operating authority for flood defence and coast protection, the Statement points out that NFDC is not obliged to carry out flood and coastal defence works as all defence works are undertaken under permissive powers. The Council is not normally responsible for maintenance of flood defences on private land.

⁸⁸ New Forest District Coastal Management Plan 1997 p 11.

⁸⁹ New Forest District Council Policy Statement on Flood and Coastal Defence, February 2001.

⁹⁰ New Forest District Council Policy Statement on Flood and Coastal Defence, February 2001.

The main actions to reduce or manage flood risks are through *the Environment Agency's local flood warning plans for Hampshire and Dorset*. The plans contain arrangements for warnings within NFDC's area including individual warning to high-risk properties.⁹¹

(Question: What was the decision making system/chain behind this Statement -could stakeholders (individuals, organisations etc.) contribute? What is the legal effect if any, of the Statement -does it bind the Council and if yes in what respect? "NFDC is not obliged to carry out flood and coastal defence works as all defence works are undertaken under permissive powers" - legality of this statement?)

2.2 The New Forest District Council Coastal Protection Strategy 2001

This strategy is produced and published on the basis of *the Government's High Level Targets for Flood and Coastal Defence and the Elaboration of the Environment Agency's Flood Defence Supervisory Duty* which came into operation 1 April 2000. The High Level Targets requires each operating authority to publish a policy statement setting out their plans how they are planning to response to flood and coastal defence risk.

2.3 Christchurch Borough Council Policy Statement on Flood and Coastal Defence

This policy statement has been prepared by Christchurch Borough Council to provide a public statement of the Council's approach to flood and coastal defence in its area on the basis of *the Government's High Level Targets for Flood and Coastal Defence 2000*.⁹²

2.4 Other policies and strategies

Western Solent Coastal Defence Strategy, February 2002

NFDC Local Agenda 21

Borough of Christchurch Local Agenda 21

A Strategy for Hampshire's coast 1991 (prepared by Hampshire County Council June 1991)

3. Plans regarding the Christchurch Bay coastline

As indicated above the whole planning system is under Government revision and therefore it may be a good idea to look at the planned amendments parallel with the current system.

3.1 Statutory Plans

New Forest District Local Plan and

Borough of Christchurch Local Plan

⁹¹ New Forest District Council Policy Statement on Flood and Coastal Defence, February 2001.

⁹² See more at <http://www.christchurch.gov.uk/mainframe.htm>

- Local plans contain detailed policies to guide the development of land in their area. The plans cover the whole of a local authority area and may include detailed proposals for specific sites

Hampshire County Structure Plan and Bournemouth, Dorset & Poole Structure Plan (Dorset County Council together with Bournemouth and Poole is responsible for preparing the Structure Plan)

- Structure plans set out policies and major proposals to guide new development, improve the transport system and conserve the natural and built environment. It must implement national and regional policies, in particular the Government's Planning Policy Guidance (PPG) notes and Regional Planning Guidance (RPG). In turn, structure plans provide the framework for local plans prepared by district, borough and city councils and for the Minerals and Waste Local Plan.

"Community Strategy" (the Local Government Act 2000) -> future tool also for managing the coast?

3.2 Non-Statutory Plans

New Forest District Council Coastal Management Plan 1997

- The purpose of this Management Plan is to provide a framework that sets out aims, objectives and proposals in order to develop the management of the coastline in co-operation with other organisations with interests in the coast. It is also intended to promote public awareness and understanding of the special qualities and problems of the coast.
- The Management Plan 1997 incorporates *Lymington - Keyhaven Coast Policies for Future Management* (prepared jointly by Hampshire County Council and NFDC 1982)

Western Solent and Southampton Water Shoreline Management Plan 1998

Poole and Christchurch Bays Shoreline Management Plan 1999

- The purpose of Shoreline Management Plans (SMP) is to set out a general strategy for *coastal defence* taking into account of natural coastal processes and human and other environmental influences and needs in order to provide a strategic framework for the management of coastal defences on the coastline.
- SMP's must comply with SMP Guidelines issued by MAFF in June 1995 in order to get financing from the Government

3.3 Other Management Plans

The above non-statutory plans in general consider coast protection and flood defence. However Christchurch Borough Council Policy Statement on Flood and Coastal Defence

refers to "*Coastal Habitat Management Plans*", "*Biodiversity Action Plans*" and "*Water Level Management Plans*" which may be of interest for the further research.⁹³

4. Institutions with interests and responsibilities in Christchurch Bay coast or coastal waters

Hampshire County Council (<http://www.hants.gov.uk/>)

- Strategic planning for mineral extraction and waste disposal, archaeological sites and historic landscapes, Sites of Importance for Nature Conservation, ecological information, coastal landowner, rights of way and the Country Structure Plan.

Dorset County Council (<http://www.dorset-cc.gov.uk/>)

New Forest District Council (<http://www.nfdc.gov.uk/>)

New Forest District Council is responsible for:

- a) planning - it controls of land use and development to low water mark
- b) coast protection work - provide works to protect parts of the coast from erosion by the sea
- c) public facilities - take care of access roads, public car parks, public conveniences and some footpaths
- d) recreation - licencing of some activities and encouraging coastal recreation and tourism
- e) moorings - which are in District Council's ownership
- f) cleansing of beaches and coastal open spaces
- g) food safety -supervise in shellfish cleaning
- h) pollution - complaints
- i) managing the land owned or leased by the Council
- j) local byelaws

The Council has a particular department, Coastal Group, for coast protection and defence work.

Borough of Christchurch (<http://www.christchurch.gov.uk/>)

Southern Region of Environment Agency

(http://www.environment-agency.gov.uk/regions/southern/?version=1&lang=_e)

This region covers areas of Kent, Sussex, Hampshire and the Isle of Wight and has responsibilities for flood defence, water quality and pollution.

⁹³ See more about Solent Plans and coastal initiatives and other UK Coastal Management Plans at http://www.solentforum.hants.org.uk/othercoast/other_coastal_initiatives.htm

State of the Environment Report, 2001 (South East) includes information on the current state of the environment of the South East of England, and the issues affecting it, for which the Environment Agency has a key role and responsibility. The report is considered as making an important contribution to the sustainable development agenda in the South East.

South West Region of Environment Agency

(<http://www.environment-agency.gov.uk/regions/southwest/?lang=e>)

This region covers Cornwall, Devon, Dorset, Somerset, Bristol, South Gloucestershire and most of Wiltshire. Key issues include reducing the risk of flooding, clean coastal waters, decreasing the amount of waste produced and disposed of to landfill, maximising the environmental benefits of agriculture, for natural resources and wildlife.

Environment South West 2002 - A report on the state of the environment in the South West of England provides a baseline for all of the people who live, work in or visit the South West and against which all of these people will be able to gauge progress in the coming years. The report also highlights a number of the more pressing environmental issues that are facing the region.

South East Region of English Nature

(<http://www.english-nature.org.uk/maps/region.asp?Reg=6>)

Hampshire and Isle of Wight Team which covers areas of Hampshire, Isle of Wight, Portsmouth & Southampton, is based at Lyndhurst in the New Forest, leads on four terrestrial and one maritime natural area, and contributes to five others. The work of the team is structured within two groups focussing on Lowlands and Maritime work.

Hampshire and the Isle of Wight is rich in biodiversity and the Team is responsible for the sustainable management of 162 Sites of Special Scientific Interest (of which 91 fall within the boundaries of internationally important wildlife sites) and 5 National Nature Reserves. Many rare and threatened species can be found in the Team's area of responsibility and a number of projects relating to bats, red squirrels, many different kinds of invertebrates and plants are underway with English Nature's Species Recovery Programme.

Key issues the Team is currently working on in the area include the coastal port development at Dibden Bay, the proposed New Forest National Park, and various *coastal management schemes around the Solent coastline*.

South West Region of English Nature

(<http://www.english-nature.org.uk/maps/region.asp?Reg=7>)

Dorset Team covers areas of Dorset, Bournemouth & Poole. The work of the team focuses on supporting the 1400 SSSI owners as well as working in partnership with a

range of communities and groups to encourage sustainable management of Dorset's fine natural heritage.

Countryside Commission (Areas of Outstanding Natural Beauty)

English Heritage (Scheduled Ancient Monuments and Register of Parks and Gardens)

Harbour Authorities: (controls over the movement of commercial shipping and recreational craft, moorings and dredging -powers may vary)

Associated British Ports

Lymington Harbour Commissioners

Beaulie River Management Ltd

Poole Harbour Commissioners

SCOPAC - Standing Conference on Problems Associated with the Coastline

(<http://www.scopac.org.uk/>)

SCOPAC works for sustainable shoreline management and promotes to facilitate the duties and responsibilities of local authorities and other organisations managing the coastal zone in South England Coast. Both NFDC and Borough of Christchurch are members of SCOPAC.

SCOPAC is currently doing research on climate change. A summary of "Preparing for the Impacts of Climate Change, a strategy for long term planning and management of the shoreline in the context of Climate change predictions" can be found at <http://www.scopac.org.uk/research.html>.

Solent Forum (<http://www.solentforum.hants.org.uk/>)

The Solent Forum is a regional coastal body that was established in 1992 in order to improve the management of the Solent and its coastline.

The Solent Forum has published "*The Marine Consents Guide*" (last time updated June 2000 can be reviewed at their website): "There are many considerations to take in to account when deciding to undertake activities in the marine environment. This Guide provides a signposting service to show what consents and licences will need to be obtained when undertaking specific activities. It will help to clarify the type of consent needed, where to go to get it and give basic information on the application process. It is the duty of the relevant authority who grants the licence or consent to determine whether or not an application meets their criteria. In many cases the consenting authority produces detailed information on the respective consent and its application process. Applicants should, therefore, ask the relevant authority for this information before making an application."

H.M.Coastguard

Southern Water plc (water supplies, sewage disposal and pollution)

Crown Estate Commissioners (ownership of the sea bed, mineral extraction etc.)

Port Health Authorities (water quality as it affects public health)

Parish Councils (maintenance of coastal public open spaces and some coastal recreation facilities)

IV Conclusion

UK coastal zone legislation is a very large and complicated area. As can be seen from this work it is complicated because of various different fields of legislation at international, European and national level. It is complicated also because of various different institutions having different or partly overlapping responsibilities and often statutory powers to make local legislation i.e. byelaws. This mixture of legislation cannot be an advantage for coastal populations in their adaptation to future climate changes.

Now that the legal framework on UK coastal zones is recognised in general and after the research group has narrowed down what issues are to be examined there really the research on the legal framework should be continued. The relevant legislation should be examined in depth taken into consideration all amendments made by the Acts of Parliament including other Acts or by secondary legislation in order to see what their position is to the climate change and its possible impacts and also to the local community decision making system. It could be interesting to compare the individuals subjective ideas of their possibilities to participate and their legal right to participate to coastal zone management issues.

Finally there are several interesting legal issues on coastal zone legislation and management that could be ideal for further research. Here are some examples of them:

To what extent do the current UK legislation / policies comply with the Recommendation of the European Parliament and of the Council of 30 May 2002 concerning the implementation of Integrated Coastal Zone Management in Europe; alternative ways of implementing ICZM?

To what extent do the UK coastal zone legislation / policies recognise of the threat to coastal zones posed by climate change and of the dangers entailed by the rise in sea level and the increasing frequency and violence of storms?

What are the advantages and disadvantages of statutory coastal zone management; research on the US Coastal Zone Management Act 1972 - what can be learnt from the US?

Do the UK government has a duty to protect the coast?

Should ICZM be implemented by way of legislation in the UK?

Some maritime districts are considered to be effective in managing their coastal zones but if the adjacent areas are not as effectively managed as theirs -what is a result of that - would legal enactment assist the situation?

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For more information, visit the Tyndall Centre Web site (www.tyndall.ac.uk) or contact:

- External Communications Manager
- Tyndall Centre for Climate Change Research
- University of East Anglia, Norwich NR4 7TJ, UK
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