

8.1 Introduction	198
8.2 Governance in the future	199
– Scenarios	199
– Governance frameworks	202
– Who pays?	204
– The role of markets and incentives	205
– Risk perception and awareness	207
8.3 Governance options for a portfolio approach	208
8.4 Obstacles and opportunities	209

Chapter 8

Governance of flood management

In previous chapters, we explored responses that may reduce flood risk under the four Foresight Futures. However, the success of responses to reduce flood risk depend not only on having effective measures, but also on the governance of flood management.

In this chapter we consider how governance might develop under the four future scenarios, together with the implications for flood management, the finance of flood management, the role of the markets in flood management, and risk perception and awareness. The latter affect the priority with which society addresses the question of flood-risk management as well as the effectiveness with which some of the societal responses can be delivered.

Finally, we consider the governance options that influence the development of a portfolio approach to flood management, together with some of the practical obstacles and opportunities to developing that approach.

8.1 Introduction

Governance refers to the actors, processes and policy tools that steer the development of society (see Box 8.1). It is important in our consideration of flood management in the future because:

- Governance determines how flood management is delivered, since most responses, and portfolios of responses, depend on governance mechanisms, such as regulation, central government funding, or public awareness campaigns.
- Governance affects the way society is organised, and therefore determines society's capacity to adapt to change.
- The way in which governance is configured will determine how society meets the cost of flooding, and will thus shape the way that the costs and benefits are distributed within society.

The latter point is particularly important. Social justice is a major concern in relation to the implementation of flood-management policies in some scenarios (see Chapters 2, 3 and 7). That does not mean that we cannot use responses with social justice concerns in the development of a portfolio of responses. Rather, it indicates that the governance must be at the centre of building a portfolio of responses if social equity is to be delivered.

Box 8.1 What is governance?

Governance has traditionally been used as a synonym for 'government' – the forms and functions of the state, local, regional and central government. Nowadays it is increasingly used to refer more broadly to the multifarious ways in which the whole of society is steered.

The term 'governance,' instead of 'government', draws implicit attention to the ways in which government interacts with civil society to reach mutually acceptable decisions about the direction in which society is travelling.

Crucially, under a system of *government*, society is mainly steered by government departments issuing regulations and charging taxes. In a system of *governance* society itself undertakes more and more steering, through the work of businesses and local authorities. Non-regulatory mechanisms, such as the market, are more important when governance is dominant. Corporate social responsibility schemes and voluntary agreements are also tools of governance.

The term 'governance' is frequently used to emphasise the decline in the power of central government to steer society. This shift in power has been upwards to international organisations such as the European Union, downwards to regions and devolved localities, and outwards to international corporations, non-governmental organisations and other private or quasi-private bodies. Therefore, governance refers to the emergence of new governing styles that blur the boundaries between and within the public and private sectors as a result of the privatisation of government assets, the creation of independent regulators as well as globalisation and Europeanisation.

8.2 Governance in the future

8.2.1 Scenarios

Governance is a central feature of the scenario approach of the Foresight Flood and Coastal Defence project. It is implicit in our analysis that, in the different Foresight Futures, different degrees of steering of flood management and coastal defence would be undertaken by government and other bodies, such as businesses and local authorities, using non-regulatory mechanisms such as the market (Table 8.1).

Under the Foresight Futures, one futures axis is concerned primarily with the scale of governance from global to local (see Chapter 1 Figure 1.2). In two scenarios, World Markets and Global Sustainability, society is steered at a national or international scale, while governance is more likely to take place at a local scale in the Local Stewardship scenario. However, the other axis also has implications for the nature of governance. In World Markets and National Enterprise, the state has a lesser role: society relies on market or private mechanisms for policy delivery. In effect, society is assumed to be 'self-steered' with less control by central government. In Global Sustainability and Local Stewardship, the state steers society more actively. Government, therefore, dominates over governance, be it local or more international.

Table 8.1 **Governance under the four Foresight scenarios**

World Markets	National Enterprise	Local Stewardship	Global Sustainability
<ul style="list-style-type: none"> – Customer-oriented governance in a rights-based culture – Limited public involvement at the local level – Preference for instruments based on self-regulation, transparency, Public Private Partnerships and economic incentives – Pressure to reduce taxes – Relative decline of public expenditure (but high GDP growth) 	<ul style="list-style-type: none"> – Customer-oriented governance with a 'statist' approach – Very little involvement at local level – Preference for instruments based on economic incentives and self-regulation – Pressure to reduce taxes – Relative decline of public expenditure 	<ul style="list-style-type: none"> – Heavy regulation of markets – Citizen-oriented governance with participatory approach – Very strong local participation – Decision-making is devolved, with strong emphasis on local level – Preference for traditional regulation, planning instruments – Local implementation varies – High levels of taxation – Relative increase of public expenditure (but low GDP growth) 	<ul style="list-style-type: none"> – Fairly heavy regulation of markets – Citizen-oriented governance with consultation approach – Strong public involvement at the local level – Policy mix of negotiated agreements, market instruments and traditional regulation – Relatively high levels of taxation – Relative increase of public expenditure



In each of these four modes of steering, the costs associated with flooding are paid for differently: the policy tools for flood-risk management also differ. For example, flood risk reduction expenditures in World Markets are more likely to be met from private funds such as insurance schemes, whereas under Global Sustainability there would be a much greater role for public expenditure met through general taxation. Consequently, in World Markets, there is likely to be greater emphasis on ensuring cost-effective protection of economically important assets, particularly through private schemes. Central government is unlikely to play a strong role in managing flood events, but it might be expected to orchestrate larger, engineering-type interventions to protect nationally important areas. In contrast, wider-scale preventative policy responses in urban and rural areas are likely to be more commonplace under Global Sustainability, linked to longer-term sustainability strategies such as the reform of the Common Agricultural Policy and SUDS schemes.

A scenario approach does not imply that the four Foresight Futures are mutually exclusive or that society moves inexorably towards one to the exclusion of the rest. In fact, history shows that society's values, ethics and modes of action will continue to change, as they have in the past. There have been major transitions in the nature of the responsible institutions and in the dominant beliefs about governance and social and environmental responsibility (see Box 8.2).

It is not for us, in this report, to foresee the future in relation to governance or to make recommendations about appropriate governance structures. However, scenarios provide one way of simplifying future change and laying bare fundamental policy implications. In particular, they help to highlight some of the tensions and obstacles to developing portfolios of responses that fit the governance characteristics of particular future worlds. Crucially, some policy responses are more likely to work better in some scenarios than others.

Box 8.2 A brief historical overview of the governance and ethical issues involved in flood management

- Prior to the 19th century flood provision was based on individual or local enterprise. What has changed most since then, is the overall scale of interventions and the interdependence of communities. This means that the costs and benefits, direct and indirect, are now much less likely to be internalised to the same group of people. In the 1930s and 1950s, the emergence of a strong national flood management policy meant that there was a marked divergence among those who paid the direct costs of interventions, those who, as a result of the actions, benefited directly from them, and those who were affected indirectly, whether benefiting or losing out.
- Over time, more emphasis has been placed on the indirect or incidental beneficiaries and losers. Historically, those suffering only indirect consequences could expect little consideration. For example, throughout the long history of fen drainage, and in the 1917 tragedy at Hallsands in Devon, whole communities were displaced as a result of interventions designed to benefit other people. In both cases, it could be argued that the priority was to support nationally important industry, rather than the protection of the poor.
- At various stages, society has wanted to control nature – 18th-century fen drainage, post-war land reclamation, even possibly some of today's restoration of habitats. Occasionally, the society/environment interface has been more adaptive, for example, the construction of 'flood-friendly' buildings. The ideal of balancing socioeconomic systems and the natural environment was formally stated at the United Nations Conference on Environment and Development, Rio 92. However, even before that, concerns over sustainability were already emerging in the UK across many sectors.
- Shifts in social priorities have been accompanied by substantial changes in institutional arrangements. Cycles of concentration and dispersal of power are evident in the past – for example, in the establishment of land-drainage boards to manage multiple landowners; the creation of the Environment Agency bringing together a broad environmental protection remit, flood risk management and public engagement; and, in the opposite direction, regional subsidiarity and multi-agency partnerships.
- An ethical shift is becoming more apparent. There is a move away from utilitarian aims, where actions should maximise overall final well-being, towards social responsibility throughout the process, framed in terms of duties, rights, and social contracts. It is interesting that little emphasis has ever been given to the causers of flooding, although examples abound of instances where actions – even flood-management interventions – have increased flood risk, often elsewhere. The idea that 'polluters should pay' is becoming more embedded in policy here and worldwide. It may be the natural (rights-based) corollary to the utilitarian 'Beneficiary Pays' principle in some scenarios that the 'causer' should pay too.



8.2.2 Governance frameworks

In looking 30 to 100 years into the future, the one thing we can be sure about is that the current institutional and governance framework will change dramatically. The insurance market could be radically different; Defra and the Environment Agency will not exist in their present form. The EU may have disappeared: its Habitats and Water Directives may be little more than footnotes in history. There are, however, a number of general issues that need to be factored into any analysis of the future. Here we briefly consider four: scale, integration, participation and adaptability.

Scale: The first axis of the Foresight Futures (see Chapter 1, Figure 1.2) relates to the scale of governance, which needs to relate to the scale at which any policy responses are implemented. If flood-risk management is to be effective, the spatial reach of the governance tools and steering systems used in any portfolio of responses must match the spatial scale of the problems they seek to address. A strategic overview at the scale of system functioning and national co-ordination also needs to be matched to local needs. The creation of the Broads Authority in 1989, as the local planning authority for the Norfolk Broads, is illustrative of an authority that matches the scale of the problems it seeks to address.

Integration: Flood management has a bearing to varying degrees, on most sections of government, including, among many others, land-use planning, agriculture and management of the rural environment, the water industry, transport and economics. Consequently there needs to be adequate vertical coordination between governance systems operating at differential spatial levels. The difficulty of achieving adequate vertical co-ordination is particularly clear in relation to policy responses in upland catchments. Such responses typically will need to involve multiple agencies at the local level working within a wider policy framework, such as the Common Agricultural Policy, that is steered at a supra-national level, in this case by the EU. (See Box 8.3. for transport issues).

Participation: There has been an increasing desire for more inclusive community-wide involvement in fluvial and coastal management. Advocates for such an approach argue that it is more legitimate, in that it obtains community consent and provides benefits from specialised local knowledge (O’Riordan 2004). It is also likely to lead to less-contested outcomes if management plans

Box 8.3 Flood management and transport

The UK depends on complex patterns of movement of people and goods in time and space. This movement relies on the infrastructure of road, rail and inland waterways and that of ports, airports and stations.

Damage to these networks through flooding could cause serious disruption and economic damage. Interrupted supply chains can quickly lead to widespread and serious consequences. It is important to have proactive and reactive measures in place to improve the resilience of the networks.

Proactive measures include: flood-risk mapping, forecasting and warning; taking steps to prevent major movements of people/goods being dependent on a single route option; and decoupling critical transport infrastructure from flood-defence structures. Reactive measures to floods include diversion strategies and contingencies for the repair of damaged infrastructure.

It is important to have a more comprehensive assessment of the resilience of the transport network to flood and coastal erosion. Such an assessment would address the level of risk and scale of impact associated with different parts of the transport and communications infrastructure.

Weaknesses need to be addressed, either in terms of increasing the infrastructure's resistance to damage, relocation of infrastructure, downgrading its significance within strategic network movements or enhancing other parts of the network to provide 'spare capacity' in the event of disruption.

All the current signs are that people are travelling more. At the same time, the networks and services are in the hands of many organisations. Governance will be a critical issue in the response of the transport sector to an increase in flood risk.

receive broad local support. Indeed, the very nature of integrated coastal management would seem to require and benefit from stakeholder involvement. There are, however, difficulties in achieving inclusion, especially where strategic decisions being made at a larger scale, in Government or the EU for example, may not always match the needs of local people.

Adaptability: The same degree of success in delivering some response measures under the four scenarios may result from their very different governance structures. Flood insurance cover is an example. Arrangements for post-event recompense for losses could be market-based or controlled by state regulation. Risks could be pooled across society or cover could be targeted to particular risk groups. Consequently, many variants and combinations of governance could give the same overall level of cover to communities. The design of a portfolio of responses needs to consider how a particular response will be delivered and whether its implementation will become more or less effective if the nature of governance changes. The key here is how best to ensure adaptability.



8.2.3 Who pays?

The question of governance is intimately associated with the thorny question of who pays for the management of flooding. Direct costs associated with most of the response measures are significant, raising several issues for financial governance. The role of the state in providing for flood-risk reduction has varied in the past, but society has consistently demanded a duty of care from the state, and individuals generally accept a modest degree of contribution to communal action in exchange for that care.

Several conventional options are available for raising funds for state-led action on flood risk. Taxation raises funds for the state at regional or national level, predicated on the view that society as a whole benefits from strategic state decisions made in its interests. Local taxes could be raised directly in areas that need flood-management measures. In areas of higher flood risk, the funds for risk reduction are obviously concomitantly higher. The financial demands on the local communities could become onerous. Alternatively, general (national) taxation could be used.

The 'levelling' effect of pooled taxation spreads the financial burden, and may thus allow strategically important actions to be carried out that would be locally constrained by resource availability. The converse of this is that there are often tensions between local and national aims, especially since the tax resource available for disbursement by the state is finite and subject to multiple alternative demands. Another concern is that decisions at national level about taxation may be less strategic, because the immediacy of the local need, either to implement an action or to deal with cost escalation, is diffused.

Alternative funding mechanisms that the state can invoke are levies, typically on activities that may contribute to flood risk, development levies, carbon taxes, and so on, or subscriptions for the use of flood-reduction measures, analogous to road tolls.

In pursuit of national sustainability, some responses are expected to have negative side-effects on individuals or communities. The governance implications have already been discussed, but there are financial implications too.

Flood protection for individual households has not been a statutory right in the UK. Yet as land and environmental resources become increasingly squeezed by socioeconomic development and climate pressures, the need may arise for significant local changes in flood and coastal protection, often to meet a range of other national social aims, including international commitments on sustainability. The issues that emerge relating to the extent of the state's duty of care for households, and the strategic sacrifice of properties for the implementation of effective measures, sharply focus attention on human rights and our conception of property ownership. Human rights have risen high on the policy agenda in many sectors in recent decades.

An option is compensation for indirect or individual losses incurred in flood-prevention measures for social gain, for instance, where individuals or communities relinquish property as part of a strategic flood-management plan. Compulsory purchase mechanisms are effective and reasonably acceptable options for property.

This analysis also has implications for the management and provision of large-scale emergency flood relief. Planning and financial governance instruments often focus on a steady progression in the increase in risk. If, as is likely, climate change is characterised by stepwise changes and an increase in the variance of climate variables – that is, erratic periods of drought and storminess – severe flooding events could follow each other in quick succession. Extreme flood events are more likely in the high-emissions scenarios, which will also have a lower propensity for precautionary thinking and community contingency planning. Emergency state intervention might be necessary if a series of severe events were to deplete the public and private resources available for flood management.

8.2.4 The role of markets and incentives

Several flood-management responses can be delivered through the market or other mechanisms, with a varying degree of independence from the state. Corporate voluntarism can shape building codes, for instance. Several measures for managing flood losses can be effectively implemented through the markets. Charities could be important in the implementation of some measures, particularly in post-event reparation.



Individuals have always assumed the right to protect their own property. While this right may be curtailed in scenarios where strategic landscape planning is a priority and social institutions have more power, a significant amount of flood-management expenditure could, in the more consumerist scenarios, come from individuals.

The supply and nature of flood insurance will depend very much on the scenario. It demonstrates the three-way balance between governments, the private sector and individuals in making post-event provision. In World Markets, the vibrant international finance markets would make insurance cover available, but only as long as returns on investment were favourable.

In the Global Sustainability scenario, the dynamism of international markets would still be important, but state intervention might result in a highly regulated insurance market, with government reinsurance. In this case, risk would be pooled, possibly through compulsory insurance for all – in effect, an ‘environment tariff’. Communitarian values extend over a large spatial area in this scenario, so national, or even European, compensation schemes for flood damage may be viable.

In Local Stewardship, concern is local. There is less recourse to the global market. So self-insurance, or local-level mutual societies providing co-operative insurance cover would be likely. More responsive social behaviour is expected: co-ordinated community and local government support following floods, ‘living with floods’ policies, or relocations would be likely consequences of serious flood events.

In many ways, National Enterprise has a high potential for leaving individuals vulnerable. They may bear the brunt of paying for flood-management measures, and there would be limited capacity for insurance or for government underwriting of the national insurance industry.

Ensuring that markets, individuals and other organisations contribute to the strategic investment in flood-risk management may require new incentives. If the strategic overview is lost, the installation of measures in the dynamic and multi-use environments of rivers and coastline may result in adverse impacts elsewhere in space, in time, or in the structures of society. Market regulation can control those effects and allow the strategic vision to be achieved without full reliance on direct state funding.

Of course, markets will fund flood-management measures only when it makes commercial sense for them. They will not provide funds for the broader social aims to which the state may subscribe, so a combination of regulation and incentives may need to be devised in order to direct private sector actions in appropriately strategic forms.

The provision of incentives can fine-tune actions so that they also contribute to the mitigation of environmental problems and enhance social justice. Where state mechanisms, the markets, and other institutions are all deployed in implementing a portfolio of responses, it could be hard to distinguish a specific flood-management budget. Measures solely aiming for flood-risk reduction may imply the narrow allocation of financial responsibility, whereas novel approaches would need to be sought for measures that are designed to bring flood-risk reduction as part of a suite of valuable benefits.

8.2.5 Risk perception and awareness

Risk perception and awareness influence public behaviour, expectations and government response. They have implications for the design of flood-management policies, the effective delivery of some of the responses, for example, Managing Flood Events and Managing Flood Losses, and also the willingness of society to pay for those responses through individual, community or state actions.

This Foresight project has attempted to assess flood risk (Volume I) and the potential responses to meet that risk. We cannot know the actual risk because the future is unknown, both in terms of climate and socioeconomic development, which is why we have used climate and socioeconomic scenarios to try to assess future risk. There is obviously a need to update the assessed risk as new information becomes available as a result of monitoring and research. Responses to the assessed risk will, however, depend as much on the perception of risk, by individuals, communities and the state, as on the assessed risk. Perception of risk is affected by the nature of the risk, knowledge, trust, communication about risk, trade-offs, and whether a risk is imposed or voluntary. As a consequence, it may be very different from the actual or assessed risk.



Risk perception in the future will also depend on the extent of extreme events. For example, if we go through a period over the next 10 years where floods are few and minor, as awareness declines, the actual flood risk could increase as a result of building in flood-prone areas and less investment in defences. On the other hand, major flood events, such as the 1953 or 2000 floods, will heighten awareness and lead to a tightening of policy and institutional responses. In theory, the latter could lead to a perception of flood risk being more important than it actually is relative to other risks. This change in perception may take place over many years or decades. There is also the problem that, with an increase in winter rainfall and a decrease in summer rainfall, the public will have to handle the mixed message of increases in both drought and flooding.

In order to manage the problem of risk awareness in such a climate, there is a need for better communication of risk so that society's perception of risk will hopefully converge and be proportionate to the assessed risk. Government, institutions, the media and the education sector all have a role here in informing and educating about risk – a prerequisite for successful risk management. Good governance will in this case depend upon openness and transparency, involvement, proportionality, evidence and consistency (Treasury 2003). We recognise that many UK flood and coastal defence organisations have already begun to adopt a risk management approach.

8.3 Governance options for a portfolio approach

Taking into account the various issues raised above, we can summarise a number of general points that need to be taken into consideration when developing portfolios of responses for the fluvial catchment, coastal and urban zones.

- Strategies and choices of both governance and response need to match the **scale** of the flood risk.
- Different elements of **governance** – both government and non-government – need to support the concept of a portfolio of

responses to increased flood risk, to allow its integrated implementation.

- The portfolio of responses, and its governance arrangements, need to be **adaptable** over time, in response to changing societal and climatic drivers.
- Much future flood and coastal defence, and the appropriate portfolio of responses, are likely to require **funding** by government, to promote long-term solutions, appropriate standards and equitable outcomes.
- While recognising the central role of all levels of government in flood and coastal defence, **market mechanisms** and **incentives** have the potential to play an important role in promoting risk reduction.
- There is a need for better **risk perception and public awareness**, coupled with close community participation, to inform and enable citizens to be active and supportive partners in all risk-management programmes.
- There is a need to maximise the use of **science and technology**, to support the development of appropriate social and economic analytical tools, and a need to ensure an adequate national skills-base for effective portfolio implementation.
- There is a need to **monitor** the implementation and effectiveness of measures, to re-evaluate risk and respond to shortfalls in the standard of protection.

8.4 Obstacles and opportunities

With reference to the general considerations described above, we highlight here a number of specific obstacles and opportunities that relate to the governance of the response themes. Table 8.2 indicates what forms of governance are likely to be effective in supporting the implementation of the responses in the five response themes identified in Chapter 2 (see also Appendix A).



Managing the Rural Landscape: It is only in the more community-orientated scenarios (Local Stewardship and Global Sustainability) that there will be the governance structures that allow effective management of the rural landscape through traditional regulation. Financial incentives to land managers provide a potentially powerful and effective tool for influencing land and management practices. However, there is the possibility of conflict with, for example, the incentives provided for agricultural and environmental goods and a need to make integrated assessments of use of the rural environment.

Managing the Urban Fabric: There is, again, the likelihood that this group of responses will be relatively ineffective under the World Markets and National Enterprise scenarios, except where it is considered to be highly cost-effective. Urban densification may preclude some response measures from this theme where urban greenspace plays a critical role in storage capacity and infiltration. In terms of storage capacity, surface storage is likely to be much cheaper, but there are issues of ownership, operational responsibility and health risk to be resolved. While integrated planning and design for flood management could bring social, economic and environmental benefits, the potential for integrated response is currently inhibited by fragmented governance structures.

Managing Flood Events: Chapter 2 highlighted that while there is scope for improvements in science and technology to unlock large reductions in risk through measures concerned with managing flood events, issues of governance and stakeholder behaviour will determine the extent to which flood-management measures in this theme can be implemented in practice. The key here is effective forecasting and warning, linked to education and public awareness.

Managing Flood Losses: These responses fall into two major categories (Chapter 2) – those designed to reduce levels of risk to existing assets, properties and their inhabitants; and those intended to limit the increase in risk that will accompany land-use change, including urban development and the building of new properties in flood-prone areas. These require individual stakeholders, communities and higher authorities to be effective, so there need to be clear and practical incentives to implement floodproofing and encourage wise land-use decisions. Even within market dominated futures – where they will be developed through the insurance industry – there is the strong potential and need for the

Table 8.2 **Governance and policy response themes under the four Foresight scenarios**

Response Theme	World Markets	National Enterprise	Local Stewardship	Global Sustainability
Managing the Rural Landscape	Limited other than in intensively managed agricultural areas	Limited other than in intensively managed agricultural areas; spatial co-ordination also problematic	Potentially strong but spatial co-ordination may be problematic	Potentially very strong as part of shift to less intensive agricultural support systems
Managing the Urban Fabric	Generally only where it is cost effective	Generally only where it is cost effective locally	Commitments to local SUDS schemes, but spatial coordination may be poor	Commitments to local SUDS schemes
Managing Flood Events	Effective forecasting but strong reliance then placed on local/individual floodproofing and temporary defences in the most economically important areas	Less co-ordinated forecasting; local/individual floodproofing and temporary defences in the most economically important areas	Possibility of asset removal and effective evacuation programmes in certain localities	Central government planning and awareness schemes linked to evacuation programmes and floodfighting
Managing Flood Losses	Mainly property level actions; self-insurance supplemented by charitable donations	Mainly property level actions; self insurance supplemented by charitable donations	Potentially strong local support networks; pooled insurance to share costs in flood prone areas; local floodplain charging schemes?	State compensation for losses; tax credits and strong land-use planning to steer development away from flood-prone areas; national floodplain charging schemes?
River and Coastal Engineering	Strong preference for large-scale schemes to protect nationally important economic areas	Strong preference for large-scale schemes to protect nationally important economic areas	Strong local opposition to large-scale schemes; limited government investment may curtail other large scale schemes e.g. realignment	Shift to softer approaches such as realignment, energy generation and where necessary surrender of the most flood-prone areas



development of rules and regulations. In terms of land-use planning, both the state and markets have the potential to play key roles in preventing development in flood-prone areas. The withdrawal of cover by the insurance industry, however, could create a major problem for existing properties within the floodplain.

River and Coastal Engineering: This will continue to play a major role in flood-risk management under all of the Foresight Futures, although coastal engineering is not considered a high priority under Local Stewardship, and there may be strong value opposition to large-scale schemes in Global Sustainability. Realignment of infrastructure, such as roads and railways, offers the potential to reduce the extent of coastal defences, but the funding mechanisms to achieve this are unclear except perhaps under Global Sustainability. The incorporation of renewable energy opportunities within coastal defence schemes could perhaps influence cost-effectiveness. Clearly, future infrastructure projects, such as airports, should take flood risk strongly into account.

Although engineering responses attract a number of sustainability penalties on the grounds of social justice and environment under World Markets and National Enterprise (Chapter 7), it is clear from their implementation under Local Stewardship and Global Sustainability that they could form part of a sustainable solution to flood risk. The question of governance will, however, be critical in delivering flexible and adaptable engineering schemes that are well integrated with natural systems and that do not exacerbate social inequality.

An assumption in our quantitative analysis was that the high-growth economy, the World Markets scenario, inevitably leads to further development in the floodplain and a consequent increase in the required standards of protection (Chapter 5). However, in this scenario there may be a real opportunity to use incentives and the insurance market to discourage development within the floodplain. These factors could possibly achieve similar results to the tightly controlled land-use planning in the Global Sustainability scenario. This essentially allows the response of land-use planning to be decoupled from the scenario and to provide a more effective response to flood risk than identified in Chapter 2.

In summary:

- There are likely to be difficulties in delivering some of the more community-based responses, such as land management, where there is a reliance on market or private mechanisms for policy delivery.
- Within the urban area, fragmented governance structures would inhibit the potential for integrated response.
- Education and increased public awareness will be central to the delivery of responses where stakeholder behaviour is important.
- There would need to be clear and practical incentives in place to encourage a number of responses such as floodproofing and appropriate land-use decisions.

This is not a comprehensive list. In the following chapter we explore the strategic choices that have to be addressed if we are to build successful portfolios of responses that will reduce the flood risk and maximise the sustainability benefits.