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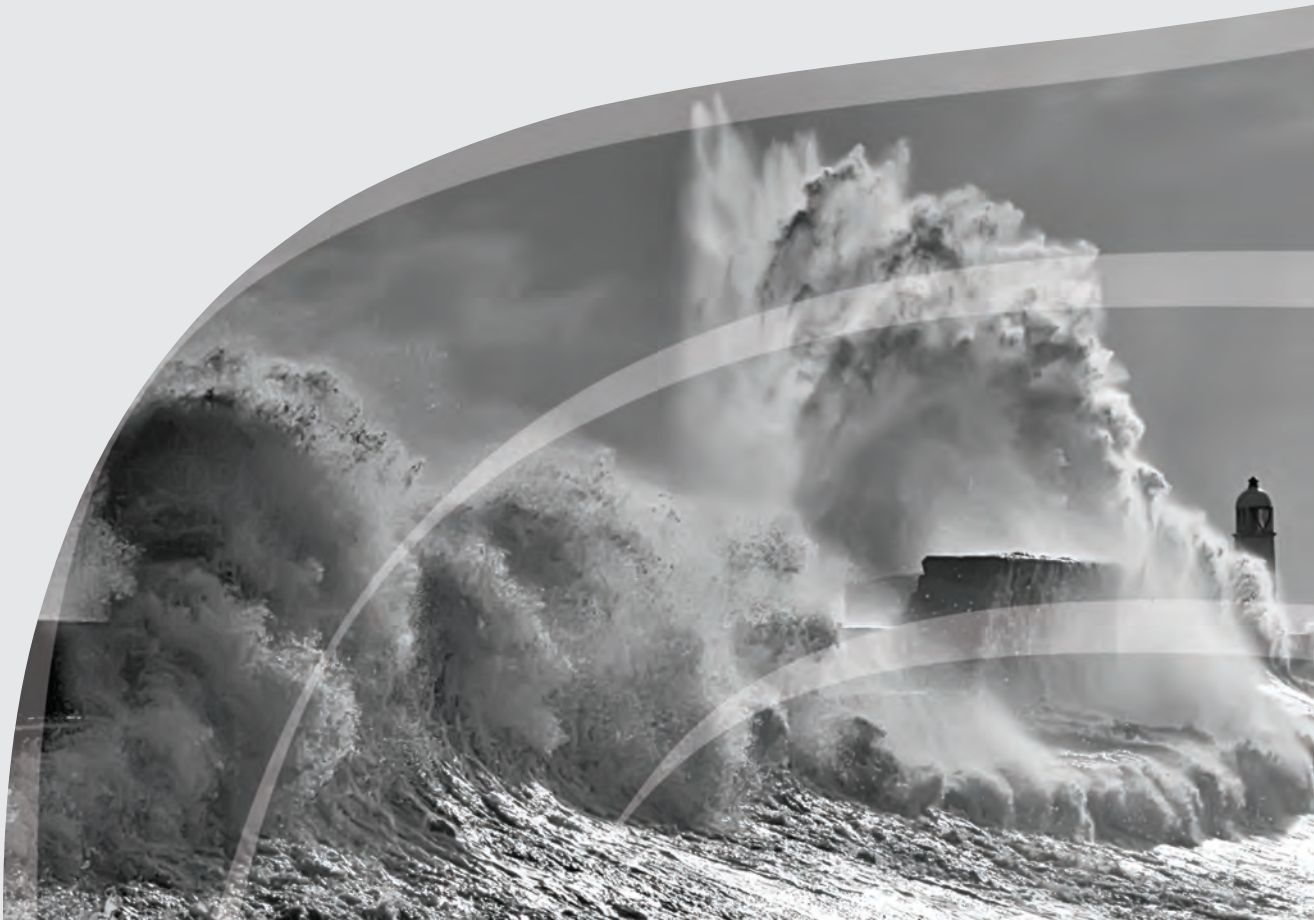
Coastal Erosion and Tidal Flooding Risks in Wales



Coastal Erosion and Tidal Flooding Risks in Wales

I have prepared this report for presentation to the National Assembly under the Government of Wales Act 2006.

The Wales Audit Office study team that assisted me in preparing this report comprised Katrina Febry, Helen Keatley, Jeremy Morgan, Susan Morgan, Alan Morris (Engagement Partner), Andy Phillips (Project Manager) and John Scrimgeour.

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Report presented by the Auditor General to the National Assembly on 29 October 2009

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Summary

1 The Welsh coastline has approximately 415 kilometres (km) of man-made sea defence structures that protect over £8 billion of assets from coastal erosion and tidal flooding. Defences enhance the protective capability of the natural coastline and replacing them would cost about £750 million. About 60 per cent of the population of Wales live on, or near, to the coast and these defences are of major significance in helping to safeguard life and livelihood. The magnitude of natural and commercial coastal assets, habitats and heritage means that effective management of coastal erosion and flooding is highly important to the economy of Wales.

2 Maritime local authorities spend public money managing the potentially damaging effects of coastal erosion. Environment Agency Wales (the Agency) also builds sea defences and undertakes other work that provides increased protection from tidal inundation in vulnerable low-lying coastal locations.

3 Strategic planning aims were recently set out in the Environment Strategy for Wales[1] and in People, Places, Futures - the Wales Spatial Plan[2] (the Spatial Plan) while a Technical Advice Note[3] (TAN) gives developers supporting guidance on building in locations where there is a risk of flooding. Shoreline Management Plans (SMPs) facilitate the detailed understanding of local coastal issues. They identify assets that erosion or tidal flooding could affected, monitor change, and set out objectives and policy for local coastal defence. Shoreline management plans are non-statutory and produced by each of the five voluntary coastal groups that cover the Welsh coastline. Local authorities lead in the production of these plans with Assembly Government funding used to engage consultants. The Agency, Countryside Council for Wales, the private sector and citizens all contribute to the plans.

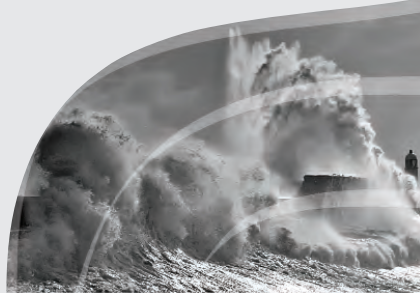
4 The desire to stimulate economic activity and to make more use of coastal land means that there is pressure to regenerate many coastal communities. Such economic development would be likely to site more activities and people in coastal locations that may become vulnerable to flooding or erosion.

5 The future extent and consequences of climate change are unknown, so initiatives designed to reduce the impact of coastal erosion and tidal flooding must consider risks rather than certainties. Consequently, stakeholders are increasingly seeing the advantages of moving to a more flexible approach that works more with nature and allows the anticipation of future risks. By doing this, better prioritisation of activities can occur and more sustainable preparations made to cope with the long-term impacts of increased erosion and tidal flooding. However, the change in approach is slow, with most stakeholders still practising flood defence based only on fixed infrastructure and flood

1 *Wales Environment Strategy*, Assembly Government, 2006

2 *People, Places, Futures – The Wales Spatial Plan*, Assembly Government 2004 (updated 2008)

3 *Technical Advice Note 15 - Development and Flood Risk* (2004), Assembly Government



warning systems. In an approach that responds to changing risks, activities that improve awareness and enhance emergency response and resilience will need to supplement defences and warning systems.

6 Estimates made in the *Foresight Future Flooding Project*[4] indicate that the cost of damage from flooding will double at least and could possibly increase twenty-fold in the next 80 years. If it is true that the world will continue to become warmer, then coastal assets and the livelihood and safety of many people in the coastal zone are at increasing risk.

7 No one has a legal duty to build defences to protect people or assets from the effects of coastal erosion and tidal flooding. The powers of the Agency and local authorities are, in the main, discretionary and they usually make progress through collaboration with the Assembly Government, public sector bodies and certain private stakeholders.

8 The Assembly Government has recognised the need for change and has initiated the *'New Approaches Programme'*. This project will tackle the problems of both inland and tidal flooding, and coastal erosion. It will set out an approach that takes more account of changing risks and encourages use of a wider range of solutions than just increasing flood defences. The *New Approaches Programme* aims to do much more to manage the inevitable consequences of flooding and erosion as climate changes occur. For those living in vulnerable areas, this means that they should have a better understanding of the risks, remain more engaged in discussions about the issues and solutions, and be able to develop a greater resilience to flooding events.

9 Launch of the *New Approaches Programme* coincided with some of the worst summer flooding experienced in England, and to a lesser extent in Wales, in 2007. The *Pitt Review*[5] of the disruption caused by these floods led to the Assembly Government acknowledging the implications for Wales. This widened the flooding agenda, with actions set out for the *New Approaches Programme* such as the review of policy and legislation, taken forward elsewhere. Similarly, the opportunity to bid for EU Convergence Funding also progressed partnership working, public engagement and guidance on risk management. These initiatives have taken forward many of the changes planned as part of the *New Approaches Programme* but have drawn resources away from, and resulted in less progress being made on, the formal programme. This occurred at the time of our investigations between May 2007 and August 2008.

10 We examined whether the *New Approaches Programme* could provide the Welsh public sector with a way to manage the future threat of coastal erosion and tidal flooding.

11 We found that in developing the *New Approaches Programme*, the Assembly Government is on the right track to providing an effective means of managing the future challenges of coastal erosion and tidal flooding, provided the Welsh public sector addresses known gaps in capacity, clarifies roles, engages more effectively with local communities and speeds up its approach.

4 *Foresight Future Flooding* report on flood and coastal defence, The Office of Science and Technology, 2004

5 *Pitt Review* – Lessons learned from the 2007 floods

Current arrangements cannot keep pace with environmental changes but evidence suggests a risk-based approach offers more sustainable solutions

12 Damaging weather events that have occurred over the past couple of decades have shown that the current precautions to defend parts of the Welsh coast do not sufficiently manage the existing risks posed by erosion or tidal flooding. It is widely accepted that climate changes are occurring and will further reduce the effectiveness of sea defences. This means that to continue in the traditional way defending against the progressive rise in sea level and more severe storms anticipated in the next century will require flood and erosion defences to be substantially increased. The cost and environmental impact of such defences would be enormous.

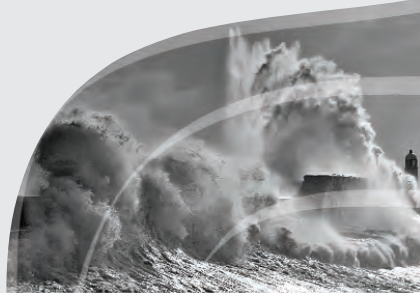
13 There is limited good practice for decision makers to follow but there is some evidence from research that an approach which also contemplates the consequence of tidal flooding and erosion risks, and which considers defence along with other solutions, can be effective and sustainable. The Assembly Government's *New Approaches Programme* has the potential to manage the inevitable transition towards a more risk-based approach. The *New Approaches Programme* could allow the management of flooding and coastal erosion to be more sustainable and effective but it could also deliver wider benefits for the environment and for communities.

14 Some sustainable solutions are available that can allow adaptation to climate changes by working more with nature and by managing the impacts on the environment. There is also some potential for communities to benefit from the regeneration associated with sustainable solutions. If these solutions are used, it may still be possible for coastal land that is at risk of flooding or erosion to be developed, provided full consideration is given to managing the risks, appropriate activities and resilient design.

New Approaches could help develop an effective integrated response but has been constrained by a lack of capacity and by objectives, roles and processes that are unclear

15 The *New Approaches Programme* has the potential to provide stakeholders with a sustainable and effective response to the future risks from coastal erosion and tidal flooding.

16 The *New Approaches Programme* is dependent on public, private and community stakeholders understanding the project and future coastal risks and collaborating effectively. Progress has been slow because the Assembly Government has not clearly established the high-level objectives of the project or the responsibilities of the main stakeholders. Improved project management is required if these issues are to be rectified, and stakeholders are to overcome their reluctance and engage in the change process.



17 The lack of clarity about direction and responsibilities in the *New Approaches Programme* has also meant that coastal communities are not sufficiently aware of the likely changes to policy and have not become engaged in discussions about the future response to erosion or tidal flooding. The Assembly Government needs to do more to inform stakeholders, and in particular local authorities, about coastal risks and to focus on plans with a much longer horizon.

18 The successful development and implementation of the *New Approaches Programme* relies on the availability of sufficient capacity. Development of the *New Approaches Programme* has been constrained, at least in part, for this reason. This is because the Assembly Government has chosen to direct most of the limited capacity available to actions arising from the Pitt Review of the summer floods of 2007.

19 Capacity limitations and inexperience will also mean that local authorities will struggle to engage and lead communities through the changes that are necessary to implement the *New Approaches Programme.*

20 Fragmented or poorly co-ordinated management processes and systems also present a barrier. At strategic level, there is insufficient integration of flood and erosion risk management with a more holistic approach to coastal management. Data and information systems for coastal monitoring, asset management and assessing risk levels do not support the consistent management of risks across Wales.

21 Clearer and more effective processes are needed for targeting, approving and allocating the grant funding for local authority-led capital schemes to mitigate coastal erosion risks. The *New Approaches Programme* alters the balance between capital and revenue expenditure and puts much more pressure on revenue-funded local authority services. There are no policies to compensate those with property and other assets threatened by coastal erosion or tidal flooding, or mechanisms to encourage relocation from areas at highest risk. It is important that the Welsh public sector continues to develop the way it calculates the social, environmental and economic value of assets, activities and the impact of new schemes. Such valuations will enable it to prioritise funding and assess the overall affordability of new policy.

The current strategic leadership and levels of citizen engagement are not sufficient to meet increasingly pressing coastal management challenges facing Wales

22 Residents living on the Welsh coast know from experience that severe weather is destructive and can overwhelm existing coastal defences. The current protective measures are designed to a performance standard that can have limited success in dealing with the present conditions; hence with the anticipated changes to the climate, there is a clear need to begin the change in approach.

23 We found that the Assembly Government is not providing sufficient strategic leadership to prepare for the increasingly pressing coastal management challenges. In particular, the Assembly Government has not made the strategic direction for the *New Approaches Programme* clear to organisations that it expects to deliver the changes. Limited progress made so far is due to the Assembly Government's slow pace of translating high-level objectives into practice.

24 The absence of supplementary guidance from the Assembly Government on how SMPs will deliver the *New Approaches Programme* in Wales has also caused delay. Local authorities are now making some progress in anticipation of this guidance.

25 The role of the Agency is to provide advice on flood risk, build flood defences and provide warnings. However, there is no firm policy on how this organisation can best use its expertise, including that gained from Agency activities in England, in supervising and supporting the Assembly Government in flood risk management.

26 The current pace of change may not be rapid enough to manage the increasing frequency of severe coastal erosion and flooding events with future climate changes. If progress continues to be slow, time may be insufficient to deliver the longer-term changes required in the *New Approaches Programme*. Local authorities may be tempted to choose short-term solutions to spread limited resources further and to buy time while residents understand the inevitable consequence of risks. This delay may perpetuate risks, increase the consequences of erosion and flooding, and use up valuable time when the change to longer-term sustainable solutions should have begun. Many citizens living in areas threatened by coastal erosion and tidal flooding do not understand that risks are increasing and they need to become involved in the *New Approaches Programme*. The Assembly Government has given early indications that policy may require citizens to take more responsibility for their predicament. However, many residents of coastal areas still believe coastal defence to be entirely a responsibility of the authorities.

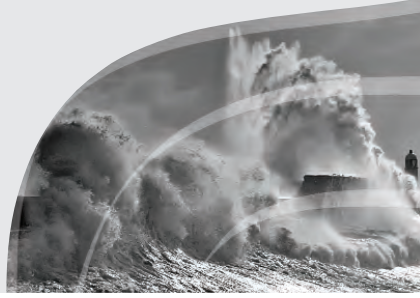
Recommendations

The Assembly Government and main stakeholders face the challenge of delivering the changes required with very limited resources and to a demanding timetable. There is a need to become more organised, more focused on long-term sustainable outcomes and to accelerate the pace of change. To support this aim, we make the following recommendations:

1 The Assembly Government should strengthen collaborative working with the Agency in England to improve efficiency and benefit from the sharing of skills, capacity and good practice. The Assembly Government could help to achieve this objective by giving the Agency a clear role to supervise the implementation of coastal erosion and tidal flood risk management policy on their behalf, and to use its expertise to support the implementation of the *New Approaches Programme.*

2 The Assembly Government needs to show stronger and more inclusive leadership in the shaping and delivery of the *New Approaches Programme*. It should:

- **a** integrate the *New Approaches Programme* effectively with its other strategies for the management of the coastal strip, such as Integrated Coastal Zone Management;
- **b** provide clear project aims that will lead to the development of policy and a future strategic direction that is understood and owned by stakeholders;
- **c** collaborate with the main stakeholders to develop an inclusive approach to the early engagement and leadership of communities at current or future risk from coastal erosion or tidal flooding;



d develop a strategy to relocate existing assets and people away from parts of the coast where the risk or cost of protecting against coastal erosion or tidal flooding is unacceptably high; and

e consider how it can overcome financial and other barriers that may prevent the success of this strategy.

3 The Assembly Government, the Agency and local authorities need to develop a methodology to more accurately evaluate the social, environmental and economic cost and benefit of coastal defence schemes, assets and activities: The Assembly Government should use this assessment to check the affordability of the *New Approaches Programme* and rebalance the funding provided to stakeholders. Investment should follow the direction of policy and, in particular, grant funding for local authority capital schemes targeted to allow appropriately sustainable and revenue-intensive activities to develop.

4 The Assembly Government needs to produce the clear policy and guidance necessary for local authorities to implement the *New Approaches Programme* and to plan for climate changes. In particular, local authorities need better guidance to control inappropriate development.

5 The Assembly Government should provide the supervision, expertise and additional capacity local authorities need to complete the review of SMPs, and to obtain better information on coastal erosion and tidal flood risk so that local elected members focus more on the longer-term risks and benefit for communities.

6 The Assembly Government must give public and private sector stakeholders, citizens and the insurance industry, a clear understanding of strategic direction for the *New Approaches Programme* and the roles and expectations of each stakeholder.

7 The Assembly Government needs to ensure that investment in coastal infrastructure and activities to protect citizens provides more than just short-term solutions. The *New Approaches Programme* also needs to provide sustainable and long-term solutions to the risks posed by climate change.

Part 1 – Current arrangements cannot keep pace with environmental changes but evidence suggests a risk-based approach offers more sustainable solutions

Current precautions to defend parts of the Welsh coast do not adequately manage the existing risks of erosion or tidal flooding

1.1 The need to protect Wales' 1,498km of coastline from the risks of flooding and coastal erosion is widely accepted and understood. Around 60 per cent of Wales' population live near to the coast and some of the most important commerce and industry on which the Welsh economy relies. Coastal tourism is reliant on the preservation of many heritage sites of historical importance, and intertidal and marine habitats recognised as unique sites of scientific importance.

1.2 Throughout history, Wales has been subject to numerous coastal flooding events (Figure 1).

1.3 There are many advantages to developing assets on the coastline, but there are also significant risks because the coast is a dynamic environment affected by tide, weather and some minor geological movement. These risks are mainly from tidal flooding and coastal erosion (Figure 2).

1.4 The Agency has a key role to play in protecting people and assets from the risk of flood protection systems failing through forecasting and warning systems. The Agency manages the probability of flooding on the basis of three risk categories (Figure 3).

Figure 1 – Significant flooding events in Wales' recent history

Aberystwyth 1938

A flooding incident that changed history occurred in 1938 at Aberystwyth when a devastating storm, together with tidal wave surges, caused the promenade to be washed away, seafront houses to be destroyed and the town's pier to be shortened by 65 metres. The cost of replacing sea defences was equivalent to £2.5 million by today's standards.

Towyn 1990

During February 1990, a large storm coincided with high tidal conditions along the North Wales coastline breaching sea defences and causing widespread tidal flooding including to Towyn and Kimnel Bay[6]. The incident became an emergency with the evacuation of residents, many elderly and not readily prepared or able to escape the danger without assistance from other residents and the emergency services. The anxiety and disruption of the evacuation and loss of belongings is believed to have contributed to the premature death of about fifty persons[7].

Source: BBC website, Wales homepage

1.5 Coastal defences typically have a life of up to 20 years, but without adequate maintenance, failure will commonly occur within the next 20 to 50 years. Changes will be rapid and the number of properties affected will increase dramatically unless there is significant intervention to repair defences during this period. Infrastructure, heritage environment and useful and attractive features will also be similarly affected. If there is no intervention to manage these changes, the coastline will quickly return to its natural state.

6 The Towyn flood of 1990 led to improved coastal protection for North Wales and the formation of coastal groups of local authorities to look at coastal defence issues more strategically.

7 Paper reviewing the impact of the Towyn Floods, Welsh Consumer Council, 1992

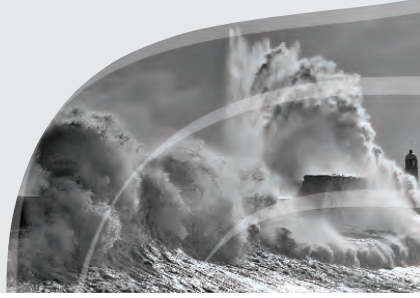


Figure 2 – Coastal risks

Coastal erosion is a natural process, arising from the action of wind or wave against natural coastal features or man-made coastal protection structures put in place by local councils or the private sector. Coastal erosion is occurring along 346km (23 per cent) of the Welsh coastline[8]. Recent estimations for Wales[9] need further clarification but indicate that the coast protection structures currently in place delay coastal erosion to about 1,200 properties with a value of about £1.5 billion. Estimations show that about 9,000 properties are at risk of coastal erosion over the next 100 years.

Tidal flooding occurs when low lying ground is flooded by the sea as a result of the height of the tidal cycle. Environment Agency Wales working on behalf of the Assembly Government constructs most of the sea defences designed to prevent tidal inundation. There are approximately 415km of man-made sea defences with an asset replacement value of about £750 million and protecting over £8 billion of assets. A separate estimation is not available for properties at risk of tidal flooding, although the National Flood Risk Assessment undertaken in 2006 estimated annual damages for all types of flooding should an extreme flood equivalent to a one in 1000 chance in any one year. Seven Welsh local authorities are in the top 15 authorities likely to suffer the greatest damage in the UK. Conwy heads the list, where risks are mainly due to tidal flooding, with potential damages of over £63 million. Storms of the magnitude capable of this level of destruction are infrequent and in risk terms, their likelihood is low.

Coastal risks are a consequence of several interacting factors. The highest risks occur when prevailing weather conditions produce storm conditions that coincide with a high tide, allowing waves to impact high up the shoreline and at the top of sea defences. The low atmospheric pressure that often accompanies storm conditions can raise surges that lift sea level by a metre or more. Given this scenario, the design specification of coast protection and sea defence infrastructure in place around Wales is likely to be exceeded and protection compromised.

Source: National Flood Risk Assessment, Environment Agency, 2006

Figure 3 – The Agency's flood risk probability

Risk	Probability of flooding in each year
Low	1 in 200 chance or less
Moderate	Between 1 in 75 and 1 in 200 chance
Significant	Greater than 1 in 75 chance

Source: National Flood Risk Assessment, Environment Agency, 2006

1.6 The absence of a major storm for almost two decades has led to low levels of capital investment and insufficient maintenance of defences with revenue directed to needs that are more obvious, including reducing the consequences of inland flooding. Misplaced confidence in defences and systems to prepare and recover from severe coastal incidents has led to complacency. Our survey of maritime local authorities[10] shows that the condition of coast protection assets is variable, suggesting that some local authorities give the inspection and upkeep of their assets a lower priority (Appendix 1).

1.7 Our survey of local authorities in Wales also indicates that coast protection services have small capacity and budgets for managing and maintaining the assets that protect their residents. The frequency of maintenance inspections varies greatly, with some local authorities only inspecting assets at intervals of three years or more. This can mean assets require early replacement or, in extreme cases, fail to provide the intended protection. Many local authorities do not have asset management plans. They do not know the condition or replacement value of their own

8 *Marine Climate Change Impacts Partnership,* Plymouth University, 2008

9 *Estimation of coastal erosion risk, Final Report*, Halcrow Group Limited, 2007

10 The 15 maritime local authorities included in the Wales Audit Office survey are: Flintshire County Council, Denbighshire County Borough Council, Conwy County Borough Council, Isle of Anglesey County Council, Gwynedd Council, Ceredigion County Council, Pembrokeshire County Council, Carmarthenshire County Council, City and County of Swansea, Neath Port Talbot County Borough Council, Bridgend County Borough Council, Vale of Glamorgan County Borough Council, Cardiff County Council, Newport County Council and Monmouthshire County Council.

assets or manage maintenance and replacement effectively. In addition, more than half of the local authorities we surveyed did not know the condition of coast protection or sea defence assets owned by other organisations in their area. This means there may be weak spots in the defences[11].

1.8 Local authorities report annually to the Assembly Government through five voluntary coastal groups. The report responds to high-level targets[12] agreed by the Assembly Government in 2001, which include the condition of coastal defence assets. However, this information is not collated to form an overall picture of the state of coastal defence assets in Wales. Even with so little known about the condition of coastal defences in Wales, almost half the local authorities surveyed said that their coast protection assets do not currently provide satisfactory protection for the coastline, property and livelihood.

Climate change is very likely to make the existing approach to managing the impact of the sea undesirable and unsustainable

1.9 Climate change adds a new factor that is already starting to impact on the coastal environment through extremes of weather and tide. Since the last Ice Age some 12,000 years ago, the climate in Wales has been relatively stable but this is now changing. Seven of the 10 warmest years have occurred in the last decade. It is now widely accepted that the climate is changing and is likely to increase coastal risks in the following ways:

a more frequent and severe storms; and

b a progressive rise in sea level caused both by warming and expansion of the world oceans from greater solar radiation and the melting of polar ice.

1.10 The Assembly Government recognises an 'expected increase in flood risk due to climate change impacts'[13] for the coastline of Wales. In 2007, the Assembly Government developed the *New Approaches Programme* in response to this challenge. The programme aims to set out a possible way forward that will prepare communities for both isolated freak weather incidents and more progressive climate-driven changes.

1.11 The *New Approaches Programme* aims to change the way that all types of flooding, namely inland, surface water drainage and coastal flooding, and coastal erosion are addressed, so as to widen the options and to manage on the basis of risk. For Wales, with much of the population and development confined to the coast, coastal flooding and erosion poses the greatest risk. Inland and surface water flooding incidents are more common, but the potential severity of a major coastal incident means that coastal issues need to be prominent within the *New Approaches Programme*.

1.12 Figure 4 shows the alignment of the main drivers and strategies and the policy context of the *New Approaches Programme*.

1.13 The *New Approaches Programme* is based on the key messages of the Office of Science and Technology's *Foresight Future Flooding and Coastal Defence Project* which concluded that:

11 Since we conducted our survey, the Agency has commenced development of a new asset management system that local authorities will be able to use. This is mentioned in more detail in Paragraph 2.43.

12 There are 14 high-level targets in England and Wales. They aim to encourage the use of adequate and cost-effective warning systems, the provision of adequate, economically, technically and environmentally sound and sustainable flood and coastal defence measures and to discourage inappropriate development in areas at risk from flooding and coastal erosion.

13 *Environment Strategy for Wales*, Assembly Government, 2006

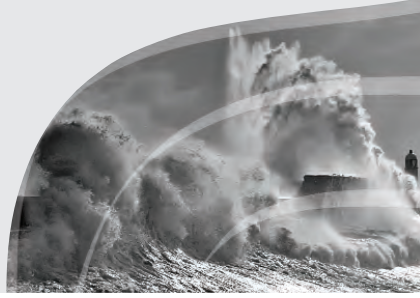
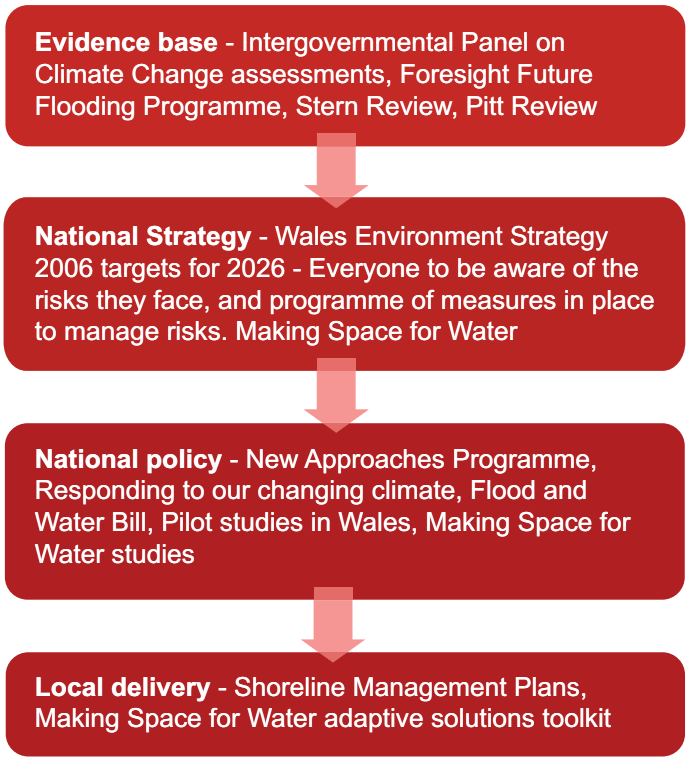


Figure 4 – Policy context of the *New Approaches Programme*



Source: Wales Audit Office

a Continuing with existing policies is not an option, as in virtually every scenario considered, the risks grow to unacceptable levels.

b Risks need to be tackled across a broad front, and whereas reductions in global greenhouse gas emissions would reduce the risk substantially, this is unlikely to be sufficient in itself.

c Hard decisions need to be taken. There is a need to invest more in sustainable approaches to flood and coastal management, or communities need to learn to live with increased flooding.

1.14 There are parallels between the *New Approaches Programme* for Wales and the policies being developed by Department for Environment, Food and Rural Affairs (DEFRA) and the Agency in England. Both England and Wales have comparable coastal risks. In both countries, central government provide the strategic lead, with the Agency and local authorities implementing this policy as the principal operating authorities.

1.15 There are obvious advantages to collaborative working between England and Wales, sharing ideas, skills and developing solutions to common challenges. We found that while this is increasingly happening, there is scope for more effective cross-border collaboration.

Defending against the progressive rise in sea level and more severe storms requires flood and erosion defences that are enormously costly

1.16 Due to climate change, coast protection and defence structures will be tested to their design standards more frequently and require more maintenance. They will probably need to be replaced earlier than envisaged when they were built and with more substantial, and therefore, more costly structures. Neither local authorities nor the Agency have calculated the financial impacts of the increasing risks of climate change on their coast protection and sea defence assets. According to the National Audit Office, the maintenance of sea defence assets held by the private sector is also a weak link in England[14].

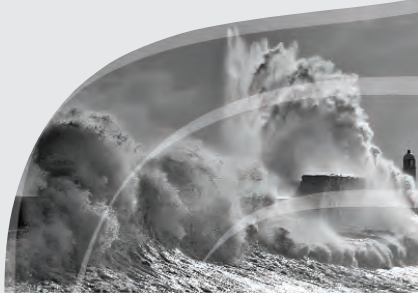
1.17 It is possible to protect against the impacts of climate change through engineering solutions. But, in many situations, this approach would be an enormously expensive solution of relatively short duration and poor value for money.

1.18 However, for some locations, such as centres of economic activity in Cardiff, the long-term value of maintaining and enhancing the effectiveness of defences is already evident. The Cardiff Bay Barrage is an example of the commitment to this approach where appropriate. However, there is no legal right to protection, and for many coastal communities, the investment needed to provide adequate protection into the future might be disproportionately large.

Network Rail is an important stakeholder for the management of the Welsh coastline (Photograph from Rod Jones, Countryside Council for Wales)

1.19 The topography of Wales also means that much of the essential infrastructure including railways and roads, is located along the coast and is almost on the shoreline, as in the case of major arterial communications for West and North Wales. An example of this is Penmaenmawr, on the North Wales coastline, where the A55 trunk road and adjacent railway line run only a few metres from the tideline making these essential communication links highly vulnerable. This is already a considerable risk that can only be reduced by undertaking significant engineering or by retreating services and communities inland to safer ground. Increasing defences is an option that would involve enormous cost but retreating will also

14 The Agency: *Building and Maintaining River and Coastal Flood Defences in England,* National Audit Office, 2007



Some defences do little to improve the quality of the coastline (Photograph from Rod Jones, Countryside Council for Wales)

be very difficult to achieve. However, with the increased risk associated with climate change, doing nothing is not an option, and these hard decisions will be needed in the near future.

Increasing the scale of defences is likely to impact on amenity and the environment

1.20 Coast protection and sea defences are designed to withstand the rigours of the natural environment. Due to tight budget constraints, many local capital projects have been delivered to the most basic functional level and are unlikely to add to the aesthetic appeal of the shoreline. They may even deny access to the shore for many residents and tourists, or pose a safety risk to those encouraged to try.

1.21 Coastal tourism is vital to the economy of Wales and may become more so in the prevailing economic climate. It makes sense to manage the landscape and environment to enhance Wales' reputation as a high-quality tourist destination.

1.22 However, as storms increase in intensity and sea level rises, many existing structures, such as Victorian promenade walls, that preserve beaches and attract tourists will cease to be effective. Building on existing defences provides a solution only for a limited period because of the progressive nature of climate change.

1.23 New structures need to be designed to cope with the greater future risks but larger structures can have a detrimental effect on nearby natural shoreline features and delicate habitats that are a part of the value of the protected coastline. Solutions that will endure extreme weather events into the future, but also enhance the quality and amenity of the coastal environment, can be very costly. It is a difficult balance to strike.

1.24 The Assembly Government needs to grasp the issue, avoid interim solutions that just prolong the inevitable, and introduce longer-term sustainable solutions where possible, that gradually reduce the level of assets at risk. The Stern Review (Figure 5) suggests that, the later we act, the more it will cost.

Figure 5 – Extract from the *Stern Review on the Economics of Climate Change*

The benefits of strong, early action on climate change outweigh the costs

'The evidence shows that ignoring climate change will eventually damage economic growth. Our actions over the coming few decades could create risks of major disruption to economic and social activity, later in this century and in the next, on a scale similar to those associated with the great wars and the economic depression of the first half of the 20th century. And it will be difficult or impossible to reverse these changes. Tackling climate change is the pro-growth strategy for the longer term, and it can be done in a way that does not cap the aspirations for growth of rich or poor countries. The earlier effective action is taken, the less costly it will be.

At the same time, given that climate change is happening, measures to help people adapt to it are essential. And the less mitigation we do now, the greater the difficulty of continuing to adapt in future.'

'An important corollary is that there is a high price to delay. Delay in taking action on climate change would make it necessary to accept both more climate change and, eventually, higher mitigation costs. It is still possible to avoid the worst impacts of climate change; but it requires strong and urgent collective action. Delay would be costly and dangerous.'

Source: Stern Review: The Economics of Climate Change 2006

There is some evidence that using more sustainable solutions as well as defence, on a risk-prioritised basis, can be effective and bring some incidental benefits

1.25 The change from a traditional coastal defence approach to that of risk management is not unique to Wales. In DEFRA's 2005 strategy '*Making Space for Water*'[15] all aspects of flooding and erosion are considered with the aim that risks will be managed by employing an integrated portfolio of approaches.

1.26 Previous strategy for flood and coastal defence was published in 1993 and pre-dates both the Assembly Government and the Agency. Climate change, planning policy and the aims of sustainable development mean that this strategy needs updating. For England, DEFRA began to develop a new strategy for flood and coastal erosion risk management in 2003 after the serious flooding events in 1998 and 2000, and the publication of the *Foresight Future Flooding* report.

1.27 *Making Space for Water* places particular emphasis on ecological enhancement and non-structural solutions. It features enhanced flood warnings, making the public more aware of flood risk and discouraging inappropriate development. The coastal risks for England and Wales are similar and the DEFRA strategy is informing the Assembly Government's thinking as the *New Approaches Programme* develops. The Assembly Government is also contributing to a programme of projects established in *Making Space for Water* that will develop the different aspects of flood and coastal erosion risk management, including assessing risk, managing coastal flooding and erosion, and raising awareness and supporting those at risk.

1.28 In England, substantive powers to implement the strategy are devolved from DEFRA to the Agency. In Wales, the Assembly Government has not yet clarified the role for the Agency in the *New Approaches Programme*. If the role were to be similar and involve the supervision

15 *Making Space for Water* is the government programme taking forward the developing strategy for flood and coastal erosion risk management in England. Department for Environment, Food and Rural Affairs issued the first government response to the *Making Space for Water* consultation exercise in March 2005.

Dunes can provide effective natural defences that are in keeping with the landscape (Photograph from Rod Jones, Countryside Council for Wales)

of coastal issues, then there would be operational benefits and valuable shared learning opportunities. The need to change has only become clear relatively recently as a better understanding of the consequences of climate changes develops. As yet, there is limited good practice for the Assembly Government to follow from countries that are also trying to change their approach. However, the Netherlands, where 60 per cent of residents live in coastal areas, has had to deal with the issue of tidal flooding for many years and has made good progress in implementing approaches that work with natural patterns as much as possible (Case Study 1).

Case Study 1 – Flood risk management in the Netherlands

With a third of its total area below sea level, the Netherlands is particularly prone to erosion during storms that lead to tidal flooding. The flood in 1953 was particularly infamous with considerable loss of life, property and agricultural land. As a result, large areas of the North Sea coastline were protected with sea defences. Where necessary, such as in the political (The Hague) and economic centres (Amsterdam and Rotterdam), barriers and dams were built to protect the coastline and to ensure human safety.

In 1990, the Dutch introduced a national policy to 'hold the line' in coastal areas to protect low-lying land. A system of 'dynamic preservation' was introduced to maintain the coastline by sand nourishment to prevent the further loss of land. Stronger measures such as groynes and dams are now used only where sand nourishment is insufficient or where important functions of the coastal zone are threatened.

More recently, natural processes have been permitted in the coastal zone including permitting erosion and breeches of fore dunes and allowing tidal inlets to form. The cost of protecting the coastline by sand nourishment and the resulting loss of natural dune dynamics and the loss in conservation value have led to a more flexible approach. It was decided that more sustainable solutions were needed that would safeguard the natural functioning of wetlands, coasts, rivers and estuaries.

Adapting for climate change is now an important part of Dutch national and regional plans, public safety arrangements and the further development of the natural environment. They are 'giving room to water' by restricting human activity within the floodplain rather than to try and control the water system under all circumstances. Other policy elements play an important part by avoiding or relocating inappropriate development away from vulnerable coastal areas, and enhancing early flood warning systems and monitoring of defences.

Source: www.SafeCoast.nl and Wales Audit Office

Sustainable solutions are available that can allow adaptation to climate changes by working more with nature and managing impacts on the environment

1.29 Rising sea levels, coupled with the high cost of maintaining coast protection and defence structures, mean that the traditional 'hold the line' policy cannot be regarded as a feasible long-term coastal management option for many locations.

1.30 The construction of coastal defences can immobilise natural systems so that coastal habitats are unable to adapt by migrating inland. This 'coastal squeeze'[16] leads to a loss of intertidal habitats. The Assembly Government sets the coastal policy but acknowledges that the local authorities, the Agency and other stakeholders need to consider a mixed approach of engineering solutions to managing the coastline. In this mixed approach, protection focuses on strategic and high-value areas, with other areas left to adapt to change through more natural, 'softer' approaches that provide long-term sustainability (Figure 6).

1.31 Soft coastal engineering solutions work well in some areas but they are a part of the range of solutions rather than a universal approach. There is a risk that local authorities will be reluctant to use soft coastal engineering solutions because it may require a decision to move people and assets from areas of risk. Residents in this situation may want defences maintained but a soft engineering approach would be more effective and provide a sustainable and safer solution.

Figure 6 – Soft coastal engineering solutions

There are already many examples of 'softer' coastal engineering practices in Wales where schemes are designed to work with natural processes to protect the coast from erosion. Techniques used include **beach re-nourishment** where sand is used to raise the height and therefore the natural defence capability of beaches.

Managed realignment is a more radical option and is less commonly used but is an important soft engineering coastal defence technique which aims to achieve sustainable flood defences that reduce the impact of wave action on coastal defences by recreating eroded saltmarsh and mudflat habitat. This is done by creating new defences further inland and allowing the existing defence line to breach and the land to be tidally inundated. Managed realignment is also known as 'setback' and 'managed retreat'. Presently, there are no examples of managed realignment on the Welsh coastline, although consideration is expected in future decades as climate changes take effect.

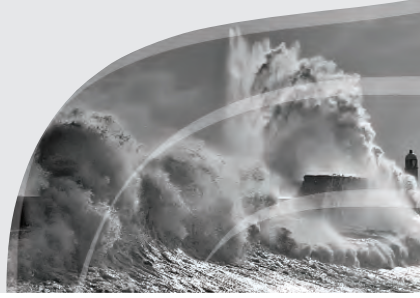
Managed realignment can also allow the creation of intertidal wetland habitats that support a wide variety of life. The new habitats created by managed realignment schemes may offset the loss of natural intertidal habitats from development pressures, pollution and land reclamation.

1.32 Future policy for Wales is currently not clear about when to use softer engineering solutions. The Assembly Government intend to clarify this during the three-year duration of the *New Approaches Programme*.

An approach that is more closely informed by risk is inevitable but can bring advantages

1.33 Flooding and erosion cannot be entirely prevented but it is possible to improve the management of flooding and erosion risks. Climate changes are predicted to increase these risks, but in many instances, the likelihood that flooding will recur can be reduced if there is better management of coastal land and defences. When flooding is

16 Coastal squeeze – As sea levels rise, coastal habitats such as salt marsh, if in an entirely natural situation, would respond by moving landward or 'rolling back' to adjust their position. Fixed man-made structures such as seawalls prevent or severely limit this landward movement. The coastal habitats are therefore 'squeezed out' between rising sea levels and fixed defence lines. Therefore, where sea defences are maintained, there is likely to be a loss of habitat in front of the defences.



unavoidable, the consequence and damage that occurs can be minimised if those at risk are better prepared and able to recover quickly. A new approach that also places emphasis on managing the consequence of flooding and erosion is different from the existing system that is primarily reliant on coastal defence structures.

1.34 The policies that are developing through *Making Space for Water* and the *New Approaches Programme* aim to manage risks by integrating approaches that reflect both national and local priorities. This places flood and erosion policy within the bigger picture by seeking solutions that deliver the greatest environmental, social and economic benefit, and are consistent with the sustainable development principles. This is particularly important for Wales, where promoting sustainable development is a duty for the Assembly Government.

1.35 Improving the management of risk needs better information including on the consequences of flooding and coastal erosion events. Information drives risk management, making risk mapping and predictive modelling an important science. There must also be improved awareness of risks and the means of improving resistance and resilience to flooding, and coastal flood warning systems must have greater coverage. The *New Approaches Programme* will also need a range of techniques to take better account of environmental and social consequences.

1.36 There are some examples throughout this report that show the advantages that more sustainable and risk-based approaches bring. These include the managed realignment with natural protection and habitat creation on the Dutch North Sea coastline, the realignment of Mullion harbour in Cornwall, and the use of advanced flood risk mapping to give residents at Llandudno in North Wales more information so they can be better prepared for the consequences of tidal flooding.

1.37 Good practice is also developing from projects in the *Making Space for Water* programme (Figure 7).

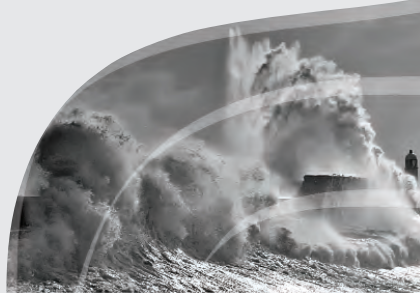
1.38 The effects of climate change will be increasingly countered with the more flexible advantages offered by managed realignment. This approach also requires less investment to set up and maintain than the sea defence structures traditionally used to hold the existing defence line. Managed realignment is a risk-based approach that can also bring other benefits, although communities may initially be more concerned at the loss of their land, property and protection from the sea. Opposition to managed realignment is often localised to the affected area, but it can also bring benefits. This includes reducing flooding elsewhere on the coast and economic, environmental and navigation benefits. There may also be little choice but to retreat if, in the long-term, maintaining existing sea defences is not viable or practical.

1.39 This means the change to a new approach that closely responds to risks as they increase will be inevitable rather than an option. Difficult decisions will be needed about the loss of land and property and to retreat communities from the sea. The Assembly Government recognises that this is foreseeable and must now use the *New Approaches Programme* to lead this transition so that the impact is sustainable and communities can gain the advantages of a risk-driven approach.

Figure 7 – Good practice examples from *'Making Space for Water'*

Good practice examples	Risk management aspects featured
Eamont Bridge, Cumbria. Review of Permitted development rights for flood risk management.	Using spatial planning, planning guidance and collaboration with partners, to help manage flood risk.
Fenstanton, Huntingdonshire. River bank lowering works to ensure an equal flood risk.	Stakeholder engagement, innovative solutions.
Flood Resilience DVD. Third in a suite of DVDs aimed at reducing flood risk. It promotes appropriate action and highlights resilience measures available to members of the public.	Encouraging uptake of resilience measures. Better engagement and risk communication.
Community Flood Wardens Handbook. A handbook developed offering generic advice and support for scheme's community flood wardens in responding to flood situations.	Better stakeholder engagement and communication of risk to the community, empowering the community to understand and respond to risks.
Furze Brook Catchment Study, Devon. Using rainfall and flow data to validate the design flows for a new flood defence scheme.	Better land use management to reduce run-off and flood risk. Community engagement.
Groundwater Study, Hampshire.	How the Agency strategic overview might be delivered. Community engagement, risk communication and collaboration with councils.
Multi-agency flood exercises, Cornwall. Joint response to inland flooding with 'Exercise Treffry', and tidal flooding exercise 'Hager-Vor' (Cornish for 'Foul Sea').	Better emergency planning using capabilities of other partners. Engagement and risk communication with a wider range of stakeholders and partners.
'Northumberland 4shores Project'. Delivering sustainable flood risk management whilst at the same time reducing maintenance costs.	Restoring natural coastal processes and habitats. Providing a more sustainable approach to flood risk management. Also stakeholder engagement.
Pagham to East Head Sussex, Coastal Defence Strategy 2007.	Stakeholder engagement and risk communication.
Celebrating and Conserving Peatlands in the North Pennines and changing attitudes and beliefs.	Effects of land use on the environment and managing flood risk, developing engagement with a range of stakeholders, achieving multiple benefits to flood risk management, water quality and the environment.
Pevensey Bay Sea Defences, Sussex. Handing over responsibility and improving coastal protection through PFI working.	Innovative funding arrangements, stakeholder engagement and risk communication.
Shaldon Tidal Defence, Devon. Managing flood risk through people power.	Effective stakeholder engagement in decision making and communication of risk.

Source: DEFRA projects under 'Making Space for Water'



There is potential for communities to benefit from regeneration associated with sustainable solutions

1.40 Gaining public acceptance of sustainable solutions can be difficult. Communities are accustomed to, reliant on and may consider that they entitled to, the protection offered by coastal defences such as sea walls. Such a reaction from communities at risk from the coastal flooding in Wales is already in existence (Case Study 2).

1.41 The Wales Audit Office held focus groups with coastal residents and local authority elected members as a part of this study. There was little support for any strategy other than ongoing protection through engineered sea defences. It was also apparent that few local members were prepared to consider the longer-term risks from the sea and the focus was firmly on the 'here and now'. A challenge for the *New Approaches Programme* is to ensure that local decision makers become sufficiently informed and guided by policy to consider plans with a much longer timescale, certainly over several decades.

1.42 DEFRA has made more progress than the Assembly Government in developing and communicating coastal policies for managing the risks of climate change. The risks faced by low-lying parts of England are similar to comparable areas in Wales, but the scale of the issue is greater in England with large areas including Norfolk, The Wash and Humberside already threatened by the sea. Case Study 3 illustrates the reality of communicating coastal risks and possible solutions. Even though DEFRA anticipated and prepared for the likely reactions to the new policy, the reaction of residents and the local authority may have been underestimated.

Case Study 2 – Flood risk management in the Gwent Levels

The Gwent Levels are the low coastal flatlands between Cardiff and Chepstow. The levels are formed from tidal deposits and alluvium, and have been recurrently inundated and reclaimed from the Severn Estuary since Roman times. About 800km of artificially created channels, known as 'reens', drain the Gwent Levels into the Severn Estuary. Newport City Council manages the drainage of the intervening Mendalgief Level lying within Newport City. Elsewhere, the Caldicot and Wentlooge Levels Internal Drainage Board manage drainage of the levels. It is one of the most extensive and valuable areas of reclaimed wet pasture in Great Britain and the largest area of its kind in Wales, with 56 per cent of the area protected through SSSI status.

More than 34km of sea defence walls, managed by the Agency, defend the levels from tidal inundation. These defences protect various communities containing more than 7,000 homes, businesses and a number of nationally important strategic economic assets such as Uskmouth Power Station, Cardiff to Paddington main line railway, the second Severn crossing, the M4 motorway and a significant number of agricultural holdings.

Local residents have recently formed the Gwent Levels Flood Defence Alliance to generate a single voice for individuals and businesses that could be affected by flooding in the area from overtopping of the existing sea wall. The alliance is concerned about the threat of climate change and the increased risk to life, property and assets, and is pressurising the Agency and the Assembly Government to heighten the sea wall to protect the area from the one-metre rise in sea level predicted by the end of the century. Recent works have indicated that regular overtopping of the defences can be expected within 20 years if the current situation prevails.

The Agency estimates that increasing the height of the wall by one metre would cost more than £70 million. However, the Agency considers that this does not represent good value for money and that, instead, the risk needs to be managed. The Agency plans to maintain the existing sea wall to the required standards and upgrade where necessary. However, the Severn Estuary Strategy and the SMPs will determine the overall strategy for the area. This may well advocate a different approach to the current practice of 'maintaining the line' and/or the crest level of the sea defences.

Case Study 3 – A lesson in communicating change

In April 2008 Natural England announced on behalf of DEFRA that nine miles of sea defences between Eccles and Winterton on the North Norfolk coastline are unsustainable and will not be maintained beyond the next twenty years.

As a consequence DEFRA propose to 'realign' the coast by allowing sea defences to be breached and for the sea to flood the land behind. This is likely to be a progressive process with flooding advancing and claiming assets over subsequent decades. Amongst the assets that will be lost with time as the sea moves inland are 600 homes, six villages, five medieval churches, four Broadland lakes, historic windmills plus other valuable environmental and agricultural assets.

DEFRA had anticipated the problems of communicating managed realignment policies in studies undertaking in 2006 as a part of the research for '*Making Space for Water*'. This study concluded that local people might interpret managed realignment as a reversal of previous option, policy or decisions.

The proposal to realign this part of the Norfolk coast has proved, just as the research indicated was likely, to be unacceptable to communities. The local authority appreciates the need to take action and to seek to support DEFRA's policies, but local members are accountable to residents and are unprepared to support the plans. As a result, progress is thwarted and a stalemate has developed.

Source: The Guardian[17] *and DEFRA*[18]

Tidal flooding of Stackpole Quay, Pembrokeshire © NTPL/Richard Ellis

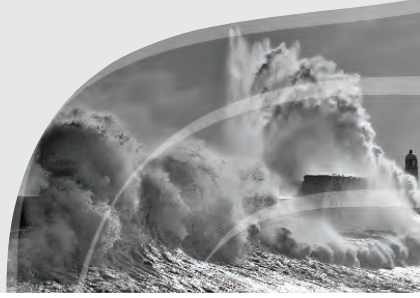
1.43 The Assembly Government needs to be proactive and communicate the risks facing Wales and the costs and benefits of a range of solutions.

1.44 History shows that coast protection schemes can be a catalyst for regeneration. Victorian engineering has created coastal features that add to the local economy and culture. This investment has allowed coastal resorts to develop and become the primary income source for tourism in Wales. Cardiff Bay Barrage is an example of a large-scale project, that not only provides protection from coastal erosion and tidal flooding, but also has considerable positive impact on the growth of the city. There are examples where local authorities faced with the need to manage the current and future risk posed by coastal erosion are working collaboratively and considering their needs as a part of wider objectives to regenerate local communities (Case Study 4).

1.45 The Assembly Government needs to work with the Agency and local authorities to find a better way to consider the viability of schemes in terms of whole-life costs and take full account of social and environmental impacts. While sustainable solutions may look expensive, if viewed only in the short term, they often represent better value when considered over a longer return period and quantified against the cost of lost opportunities to sustain and improve social

17 '*Waves of destruction*', Patrick Barkham, The Guardian, April 2008.

18 *Adapting to Changing Coastlines and Rivers,* Preliminary Report, DEFRA, July 2006



Case Study 4 – Local authorities providing local regeneration through flood protection schemes

Conwy County Borough Council has a progressive approach to coastal protection, having developed the service since the severe flooding incident that damaged Llandudno, Towyn and Kimnel Bay in 1990. The local authority recognises that in its current state the seafront at Colwyn Bay is inadequately protected from the sea and much more could be made of the seafront as an amenity feature. Extensive public consultation has led to a proposal for the '*Bay Life*' project that is designed to be a catalyst that will have a regenerative impact in terms of local economic development and social and environmental enhancement that can benefit the area in the long term. Schemes of this scale are designed to be of a high quality but they are costly to deliver and rely on accessing very limited Assembly Government funding.

Aberaeron is a recognised and iconic feature for Welsh tourism but much of the town and in particular the scenic harbourside, is threatened by the rise in sea level associated with climate change. Ceredigion County Council has collaborated with the Assembly Government and Environment Agency Wales to commission work to increase the height of the harbour walls and surrounding defences. Negotiations with local residents and businesses and the need to preserve visual amenity determined that a compromise was needed, and this work will now not provide protection as far into the future as was originally intended.

Ceredigion County Council's work with the Assembly Government provides a good example of innovation. The local authority proposes to include a subtidal reef in a coast protection scheme at Borth, near Aberystwyth. The scheme is designed to provide additional protection to a part of the village that has developed along a shoreline sandspit. The proposed reef is part of a large scheme that will both reduce the energy of waves to help protect the fragile low-lying coastline community and provide a surfing amenity attraction to improve this aspect of local tourism. A similar surfing reef is being constructed at Boscombe near Bournemouth and even before it has been completed is identified as an important part of the regeneration of the area with house prices already raised and 10,000 additional visitors anticipated annually[19]. Ceredigion's aims for the scheme are also ambitious and designed to meet short to medium-term coast protection needs.

A common feature of all of these schemes is that by improving coast protection, the likelihood of coastal erosion or tidal flooding is reduced and there can be some more confidence in development. However, the scheme may not deliver longer-term sustainability criteria due to the impact of progressive sea level rise, which points more towards progressive adaptation and managed retreat. Eventually the risks, and in particular the consequence of flooding, will again become too great and only appropriate developments will be able to withstand this in due course. However, the schemes should give the local communities time to plan and migrate in an orderly fashion.

Source: Wales Audit Office

and environmental assets. The method for this type of long-term and in-depth cost and benefit analysis is insufficiently developed to support balanced long-term planning.

Coastal land that is at risk of flooding or erosion may be developed but only if full consideration is given to the guidance on managing risks, appropriate activities and design

1.46 Wales is hilly and land that is ideally suited to economic regeneration or housing development is limited. Most available land is on the coastal plain alongside existing development and infrastructure. Flood risk mapping is a developing science led by the Agency and the insurance industry but it can already show with some detail, that due to climate changes, a large proportion of coastal land will be at risk from flooding.

1.47 Effective development control that reduces inappropriate development can ensure that fewer people and properties are at risk. The *New Approaches Programme* needs to reinforce existing development control guidance and make sure that improved risk information is available for potential developers and planners to consider. At the

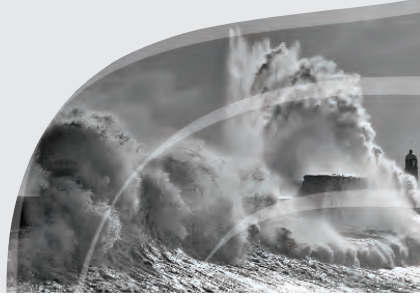
19 Bournemouth Borough Council commenced work on the construction of the surfing reef in July 2008, with work now recommencing after a winter break. The council considers that the reef is a major economic driver for the Boscombe Spa Village development. Consultants reported to the council in April 2005, estimating that the image value would be worth £10 million, also that 60 full-time and 34 part-time jobs will be created and income gained directly from the reef will be about £3 million per year, plus secondary spending.

very least, this information should guide development to areas of little or no risk. Development proposed in areas where there is some risk should be limited to activities and designs that are capable of withstanding erosion and tidal flooding episodes.

1.48 Local authorities have a responsibility to both promote economic development and to determine planning applications, and must consult the Agency on the flood risks to any planned development. However, the role of the Agency is advisory and the Agency does not have the power to prevent development. There is pressure on local authorities to regenerate local economies and to gain quick returns within a short-term political horizon. Findings from our focus groups suggest that elected members do not have a long-term focus on the risks posed by climate change. They need to focus more on the long-term benefits for the community and be prepared to control inappropriate development, even if this has an impact on short-term economic activity.

1.49 In 2004, the Assembly Government issued TAN 15 on development and flood risk, issued as land use planning policy. The Assembly Government expects local authorities to use their powers to guide development away from areas that may be affected by flooding, and to restrict development that would itself increase the risk of flooding or would interfere in the ability of the Agency or other bodies to carry out flood control works or maintenance.

1.50 Shoreline management plans are important in identifying current and future coastal erosion and tidal flooding risks, and need to be included as a part of spatial planning and development control considerations. These plans are also where the national policy response to climate change will be applied locally. Appendix 2 illustrates the pressures to develop coastal land in Conwy, and in particular, the apparent conflict between spatial planning objectives and flood risk.



Part 2 – *New Approaches* could help develop an effective integrated response but has been constrained by a lack of capacity and by objectives, roles and processes that are unclear

The Assembly Government's *New Approaches Programme* has the potential to secure the agreement of stakeholders on a sustainable and effective approach

2.1 In May 2006, the Assembly Government launched a new *Environment Strategy for Wales* which highlighted the need to change the way that flood risks are managed. It acknowledged the conclusion of the *Foresight Future Flooding* report that, if the traditional response to flooding and erosion continues, risk will increase to an unacceptable level. The strategy aims to ensure that, by 2026, everyone is aware of the risks they face and that a programme of measures is in place to manage them.

2.2 The Assembly Government's *New Approaches Programme* commenced in July 2007 and aims to facilitate the change to a risk management approach for all types of flooding and coastal erosion risks in Wales. The *New Approaches Programme* seeks to:

- **a** define the actions that could be taken to manage flooding and erosion risks, and how they could be delivered;
- **b** refresh policy, and provide clear objectives and role definition; and
- **c** set up systems to ensure that funding supports the delivery of this policy.

2.3 The *New Approaches Programme* relies on partnership working involving the public, private and voluntary sectors. It includes strengthening emergency response capability and, where appropriate, defence infrastructure complemented by higher risk awareness and enhanced resilience within communities.

Progress is slow because the Assembly Government has not clearly established the objectives or responsibilities of the main stakeholders

The lack of clarity has contributed to reluctance by key stakeholders to own and to engage with the *New Approaches Programme*

2.4 Stakeholders do not yet own the programme, which they need to do if it is to succeed. They understand the risks and agree that a new approach is required but they are still unclear about the objectives, direction and success criteria for the *New Approaches Programme*. They are unsure of the expectations that the Assembly Government has for them and how, in practice, they will be able to contribute. Appendix 3 illustrates these concerns.

2.5 The Assembly Government made assumptions about the availability of resources, particularly within local authorities, and assumed that local authorities would voluntarily release these resources to lead the work streams for the project. However, local authorities were reluctant to release skilled

engineers to the Assembly Government with no financial incentive and to a project that lacked clarity. The Assembly Government did not anticipate resource issues nor make plans to deal with them and other barriers to progress.

2.6 The structure, management and resource capacity of the project is weak and there is little evidence that the Project Steering Group and Programme Board have intervened successfully to rectify the situation. Some additional funding is now available to recruit project work stream leads for the *New Approaches Programme* in the open market. The delay and disjointed progress made so far has affected the confidence of stakeholders in the Assembly Government's ability to lead this project.

2.7 Unclear project aims and work streams also mean that an efficient use of resources is not occurring. There are also examples of duplication of proposed national systems by individual local authorities. For example, the Assembly Government has not effectively communicated its intention to develop a national system for asset management planning[20], resulting in some local authorities seeking to develop local systems. This is wasteful and may even make the transition to a national system more complicated.

2.8 Stakeholders view the *New Approaches Programme* with some caution as it confirms that the responsibility for decisions relating to coastal issues is more widely spread than is currently perceived. Acknowledgement of the full extent of responsibilities will have an acute impact on local authorities. It also emphasises the personal responsibility of individuals at risk on the coast. The project could be considered a move by the Assembly Government to shift responsibility given the lack of resources and the future long-term risks. Recent experiences in Norfolk (already mentioned in Case Study 3) over the interpretation of DEFRA's policy illustrate the need for clarity and careful risk management. The Assembly Government needs to clarify whether putting such a heavy burden of responsibility onto local authorities and individuals is the intention of the *New Approaches Programme*.

Progress with increasing collaboration between public, private and community stakeholders has been slow

2.9 There are many stakeholders with responsibilities for managing coastal defences. They are listed along with the other main stakeholders in Table 1, below and roles and responsibilities are set out in Appendix 4. Responsibility of the major stakeholders for coastal management is fragmented with some stakeholders unaware that their assets play a part in the continuity of coastal defences.

2.10 The *New Approaches Programme* aims to secure the collaboration of all stakeholders so that they have ownership of coastal issues and can work together to deliver its objectives. To achieve this, the Assembly Government must deliver clear direction, strong co-ordination and effective leadership. Only limited progress has been made to develop the partnership working that is needed to implement the *New Approaches Programme*. The Assembly Government has responded to the recommendations of the Pitt Review[21] following the summer floods of 2007, with pilot studies at Barry, Prestatyn and Pwllheli that aim to develop better collaborative working. This will also benefit the *New Approaches Programme*.

20 The Agency is currently procuring Asset Management Information Technology (AMIT), a national asset management system that will record the condition of coastal defence assets, set up inspection programmes, and provide financial information on managing and replacing assets. The Assembly Government is contributing £1.2 million of the £12 million development costs. Asset Management Information Technology will become operational during 2012. The Assembly Government has yet to confirm if local authorities are expected to use this system.

21 *Pitt Review – Lessons learned from the 2007 floods*, interim report December 2007, final report June 2008

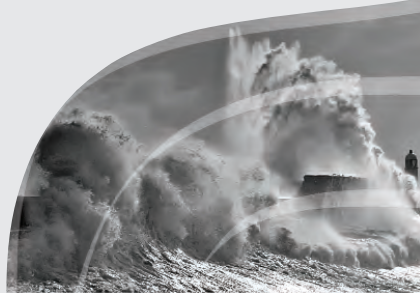


Table 1 – Main stakeholders with roles and responsibilities for managing coastal risks

Organisation
European Union
Central government/DEFRA
Assembly Government
Environment Agency Wales
Local (maritime) authorities
National parks
National Trust
Coastal groups
Flood Risk Management Wales
Countryside Council for Wales
Internal drainage boards
MoD and other public sector landowners
Private sector
Insurance industry
Residents

Source: Wales Audit Office

2.11 Flood Management engineers and other practitioners in the Agency and local authorities already have quite a good understanding of coastal risks, that should continue to improve as better data and information becomes available. However, at corporate level and particularly within local authorities, awareness is lower and the significance of coastal risks is less well acknowledged. This may result in low prioritisation within the diversity of local authority activities.

2.12 The Agency and local authorities are working collaboratively in some instances to manage coastal erosion and tidal flooding. Examples include a joint scheme to protect the coast from erosion and limit tidal flooding at Aberaeron, systems for the early warning of coastal flooding and the management of coastal flooding incidents. However, collaborative working on operational issues is patchy.

2.13 The Assembly Government co-ordinates the Wales Coastal Forum that has representation from local authorities including the chairpersons of the five coastal groups, the Agency and Countryside Council for Wales. Network Rail also attend the forum as a representative of the private sector and as an important stakeholder with assets that, although not by design, provide defence along large parts of the North and Mid Wales coastline. The Assembly Government also chairs the Wales Flood Group, which aims to increase awareness of flooding and to improve emergency response and recovery. These groups provide the Assembly Government with an opportunity to engage many of the main stakeholders and develop a working partnership with a clear understanding of direction and responsibilities. However, the Assembly Government could do more to use these groups to clarify the arrangements for the *New Approaches Programme* and to engage the private sector.

2.14 Collaboration is also required with a number of private sector bodies. As well as local businesses at risk from flooding, the insurance industry is a vital private sector stakeholder. After the flooding in the summer of 2007, the insurance industry became acutely aware of the risks and the difficulties of providing adequate insurance cover for properties in flood risk areas. The Association

of British Insurers has already stated that it will review its position with regard to flood risk cover over the next five years and that it expects flood defences to improve. The Assembly Government has acknowledged that for some locations, for example Prestatyn, existing defences cannot be sustained placing insurance cover at severe risk. The Assembly Government is working with the Association of British Insurers through the Wales Flood Group to agree ways of securing continuity of insurance cover for those with properties at risk. There is a need to ensure that all stakeholders understand the implications of the *New Approaches Programme* for insurance cover and that the insurance industry is included as a part of any *New Approaches Programme* partnerships.

There has, as yet, been little effective communication with coastal communities at risk

2.15 There has been little communication so far with coastal communities at risk from erosion or flooding about the objectives of the *New Approaches Programme*. We held focus groups with residents in several areas where coastal risks are significant. They indicated that residents were unaware that the Assembly Government was developing a new approach based on risk management, although in several instances, communication with the local authority was good[22] (Figure 8). The Assembly Government's view is that, before these potentially difficult consultations take place, both SMPs and the 'toolkit' of adaptive solutions to help communities manage erosion and tidal flooding risks need to be developed.

Figure 8 – Main findings from focus groups of residents and members

Focus groups held with residents and local authority members at several locations with a history of coastal erosion and tidal flooding found that:

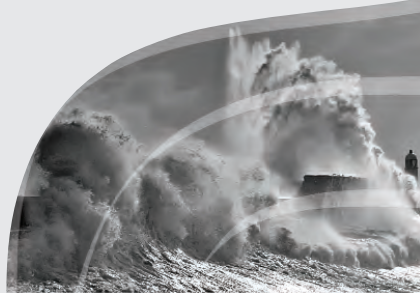
- **a** not all communities are well informed about the risks and many are unprepared for emergencies;
- **b** residents have not been given the opportunity to put forward their case for better defences to the Assembly Government;
- **c** residents felt 'talked at' but not really consulted;
- **d** the Assembly Government does not understand how climate change could affect communities, has insufficient resources and considers it a low priority; and
- **e** citizens are not yet involved in the *New Approaches Programme*.

Source: Wales Audit Office focus groups

2.16 It is understandable that the Assembly Government wants to be well prepared before engaging communities faced with the need to take actions over the next few years in a new approach. However, withholding from communicating more openly with stakeholders and communities carries significant risks. Establishing a dialogue with communities that consider they are already disengaged from the decision-making process will be difficult. This approach is unlikely to make citizens consider that they 'are at the heart of decision making', an aspiration of the *Making the Connections*[23] agenda. There is also a risk that policy changes already revealed in England could be interpreted as likely to also apply to Wales. Residents drawing their own conclusions based on perceptions about their safety and the future of their property and communities will lead to unnecessary concern. The Assembly Government and key stakeholders need to use a more inclusive approach and find a way to begin the

22 Focus groups held with residents and local authority members from Borth and Tywyn, both communities already acutely threatened, indicated that a good dialogue was already occurring with the local authority. However, even though these communities were becoming quite aware and engaged about coastal risks, but there was little understanding of impending policy changes.

23 *Making the Connections* policy for public service reform has four main principles: citizens at the centre, public engagement, working together as the Welsh public service and value for money.



engagement of communities without further delay[24]. This is so that the Assembly Government is proactively leading change rather than reacting and defending policy that become headlines for a misinformed media.

2.17 From the outset, local authorities and the Agency considered that engaging communities would be the *New Approaches Programme's* most significant challenge. The early project documentation did not acknowledge this risk, but only later on was a communications work stream added in response to the concern of stakeholders. This underlines the evolving nature of the project, and that even many months after the launch of the *New Approaches Programme*, the need to add significant additional work streams was still being realised.

2.18 The difficult consultation with local communities about their response to the risks they face remains, in the main, for local authorities as a part of the review of SMPs. For these plans to be useful for the Assembly Government, local authorities will need to have made good progress to engage communities soon after the completion of SMPs in 2011.

2.19 With policy arising out of the *New Approaches Programme*, the development of radically different options is unlikely until strategic direction is clear and change delivery arrangements are in place. The Assembly Government therefore views this as an opportunity to put short-term holding measures in place while local authorities continue to build community engagement. However, there is a risk that by introducing short-term measures there will be further delay in the progress of the longer-term sustainable solutions. In some instances, short-term solutions may be a necessary step, but the risk is that they delay the inevitable longer-term changes causing these vital changes to be hurried because of escalating risks.

Insufficient capacity currently exists for the *New Approach* to be successfully developed and implemented

Progress is slow because the Assembly Government prioritised actions arising from the summer floods of 2007

2.20 The launch of the *New Approaches Programme* coincided with the summer floods of 2007. The exceptionally heavy rain that caused these floods led to extensive inland flooding across England. Wales was affected in several areas although the impact was localised and there was no coastal erosion or tidal flooding. These flood events led to the Pitt Review, a fundamental Government review of the management of flooding. The Assembly Government recognised the potential implications to Wales and agreed to implement the review's findings where they are appropriate.

2.21 The impact of the Pitt Review on the *New Approaches Programme*, a project that encompasses both inland and coastal flooding, was to widen the agenda. This meant that actions set out for the *New Approaches Programme*, such as the review of policy and legislation and projects to explore how community engagement could be built, were taken forward elsewhere. The Assembly Government's response to the Pitt Review[25] also over-extended the limited

24 *Flood and Water Management Bill* – consultation with stakeholders and the public commenced 21 April 2009.

25 *The Pitt Review - interim report December 2007, final report June 2008.* The report focuses on inland flooding events of 2007 when rain caused both fluvial and flash flooding, overwhelming surface water drainage systems. Recommendations focus on inland flooding issues with few on coastal flooding. There are a number of recommendations that could apply to tidal flooding risks, such as the demarcation of roles, clarification of legislation and ways that communities can become more engaged.

capacity available. The Assembly Government acknowledges that this slowed significantly the progress of the *New Approaches Programme*.

2.22 The launch of the programme also coincided with the opportunity to bid for additional European funding. This has resulted in a programme of projects that provided a mechanism for embedding many of the changes required to underpin the *New Approach*. The programme includes projects that include elements of partnership working, public engagement and help to develop guidance on risk management. These initiatives have taken forward many of the changes envisaged as part of the *New Approaches Programme* but have drawn resources away from, and resulted in less progress with, the formal programme.

2.23 Our investigations occurred between May 2007 and August 2008, falling at a time when the Assembly Government was anticipating the outcome of the Pitt Review and preparing for the convergence programme.

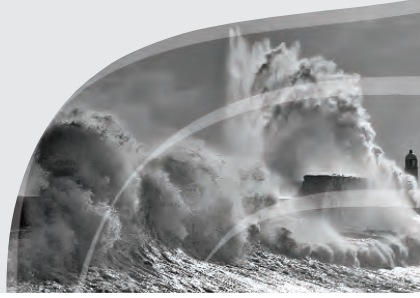
Inexperience and competing priorities mean local authorities will struggle to engage and lead communities through the changes needed

2.24 The emerging model for the *New Approaches Programme* is for the Assembly Government to set the strategic direction, allocate funding and monitor progress, with the Agency providing technical support. Local authorities will have a main role in implementing the *New Approaches Programme* at a local level and especially for community engagement. Under the *Civil Contingencies Act 2004*, they have a statutory duty to make citizens aware of known risks and to build resilience, and the *New Approaches Programme* will place a considerable responsibility on local authorities to lead their communities through the difficult changes that lie ahead.

2.25 The leading role for local authorities in Wales includes working with communities on decisions that, for example, could include the loss of property, heritage and assets to the advancing sea. DEFRA and the Assembly Government are compiling a 'toolkit' of options for local authorities for adapting to flood risk. The Assembly Government told us that this should help local authorities manage changes and implement the *New Approaches Programme*.

2.26 This role will require local authorities to further develop the facilitation skills necessary to lead communities through change and to manage engagement with communities. Previously, SMPs were substantial technical documents designed for engineers. The *New Approaches Programme* and the revised SMPs will also include information on climate change and so have the potential to raise concern in communities. The *New Approaches Programme* is benefitting from pilot studies set up with several communities in Wales. Of particular relevance for coastal communities and for public engagement are the pilot studies at Barry, Prestatyn and Pwllheli. These communities suffered some flooding from the heavy rainfall during the summer of 2007.

2.27 With the *New Approaches Programme* only considering public engagement at a high 'strategic' level, the Assembly Government wants the pilot projects to explore how engagement can occur at grass-roots level and how citizens could be more central to decision making. Good practice gleaned from these pilot projects and a wide range of similar work including at Mullion Cove (Case Study 5) will help local authorities and other stakeholders engage communities and be a part of the developing 'toolkit' of solutions.



Case Study 5 – Working for a sustainable future at Mullion, Cornwall

Mullion is a tiny village in Cornwall where storms have damaged the harbour walls resulting in expenditure on rebuilding totalling about £10m in the last 10 years, a cost that is unsustainable in perpetuity. The National Trust ('the Trust') owns Mullion Harbour and recognised that it needed to find a new future for the people who live there, for the people who use it as a tourism draw, and for visitors.

The Trust found that engaging the community in discussing the options was crucial as they involved difficult decisions, such as doing away with the harbour walls altogether even though the walls and associated buildings are Listed Buildings. The Trust considers that Mullion is 'a microcosm of a protected area' and a case study of working with a range of stakeholders about how to negotiate changes.

The Trust was encouraged by the positive response of the community even it is now proposing to remove the harbour walls when irreparably damaged by the next serious storm. This will in effect eventually return Mullion Cove to the natural bay and beach that it was before 1860 when the harbour walls were first built.

The Trust said 'We expected people to be adamantly against change but given the presentation of facts and options, we have had sign up from them'.

Source: National Trust[26]

Case Study 6 – Towyn flood of 1990

After the flooding subsided, the reality of the disaster became apparent. There was damage to approximately 2,800 properties but 15 per cent had no buildings insurance, 40 per cent had no contents insurance and 50 per cent were uninsured. It was surprising that there were no fatalities during the incident given that 36 per cent of the resident population were over 65 years old, many living in bungalows and with few options to help themselves during the flood. Many residents were poor and had limited resources and even if they understood the risk of flooding, they had little ability to prepare, become resilient or recover from the trauma. Yet often these victims were blamed for their predicament, particularly if they did not have insurance.

The review highlighted that mismanagement after a flood can put the focus on existing community divisions and stereotypical attitudes and concluded:

'Managing flooding in a local community context requires an acknowledgement that the different social make up of communities will necessitate different types and levels of support and will generate different responses. These need not only to be acknowledged but also planned for.'

Source: Flood Disasters – Dividing the Community

2.28 Local authorities face tough challenges if they are to be successful in leading their communities through the changes necessary to implement the *New Approaches Programme*. A review undertaken by the Welsh Consumer Council[27] after the 'Towyn flood' of 1990 showed some of the problems faced by the organisations working to help this community recover (Case Study 6).

2.29 Focus groups during this review identified examples of good proactive community engagement. In particular, residents felt that Ceredigion County Council had worked closely with them to seek a solution for properties, land and natural features at Borth. These residents are already aware of acute coastal risks as there are many properties threatened by erosion of a sandspit to the north of the village. The local authority is working to find a solution and proposes a major coast protection scheme that will cost about £25 million to deliver[28].

New Approaches alters the balance between capital and revenue expenditure, and puts much more pressure on local authority services

2.30 The Assembly Government accepts that affordability is a major risk for the *New Approaches Programme* and will shape much of what can be delivered. While the consequence of the shift towards adaptive and more sustainable solutions may eventually take some of the pressure off the capital programmes, it will put additional

26 *Protected Landscapes and the Coastal and Marine Environment – What Challenges Lie Ahead?* Rob Jarman, National Trust, Seminal Paper, March 2006.

27 *Flood Disasters – Dividing the Community,* paper by Fordham and Ketteridge for the Planning Conference, Lancaster, 1995

28 In March 2009, the Assembly Government confirmed funding for the first phase of the coastal protection scheme for Borth.

pressure on revenue-funded service delivery. Increasing awareness and engagement, preparedness, incident response, resilience and recovery are all revenue-funded issues, and particularly so for local authorities and the Agency.

2.31 Local authority revenue budgets for coastal management invariably reflect the perception that coast protection is a low priority. They are very small and are already under pressure. Local authorities told us that budgetary pressures are already limiting local capacity to monitor the upkeep of existing assets and to progress new schemes. For Ceredigion County Council, where some parts of the coast have acute erosion and flooding risks, the capacity of the service is less than a single person[29]. In Newport City Council, there has been no expenditure for three years on managing coastal erosion and tidal flooding. In addition, the current local authority Revenue Support Grant is calculated in accordance with the length of artificially protected coastline and this does not fit well with the *New Approaches Programme* where more revenue-intensive options are likely to be proposed.

The progress of *New Approaches* is constrained by the lack of engineering capacity and skills in the public sector

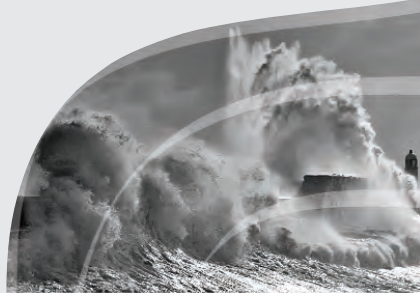
2.32 The summer floods of 2007 and the subsequent actions initiated by the Pitt Review have meant that the Assembly Government has also prioritised actions to manage inland flooding. This has meant that the Assembly Government's Flood and Coastal Risk Management Department, already reduced to just two engineers, is faced with an extremely challenging workload. The technical capacity of the department is spread very thinly, which is constraining the development, project management and implementation of the *New Approaches Programme*.

2.33 The increased profile of flooding and the emergence of climate change as a major issue for stakeholders mean that there is now a recognised shortage of coastal engineering skills across Welsh public sector bodies. This is most evident in local authorities, where it is difficult to recruit suitably qualified coastal engineers given that reward levels and job opportunities fall some way below that offered by the private sector. The Assembly Government has also experienced significant difficulties in recruiting engineers to project manage the work streams of the *New Approaches Programme*, one reason why the project has faltered so far. A lack of capacity within local authorities to undertake and complete the review of SMPs is also likely to slow the progress of the *New Approaches Programme*.

2.34 The delay in securing the funding to commission private sector consultants to undertake the review of SMPs means that they will not be completed until 2011 at the earliest. The Assembly Government needs these plans so that it can model the whole-life cost of providing and maintaining the coast protection assets required across Wales with some certainty. The effects of climate change will need to be included within this calculation.

2.35 In 2007, the Assembly Government estimated that the cost of returning existing defences to satisfactory states of repair was nearly £70 million. However, consultation with local authorities conducted by the Welsh Local Government Association (WLGA) at the same time suggested that the investment required

29 With recent approval of the coast protection schemes at Aberaeron and Borth, the council has recently employed an assistant to increase capacity.



to secure longer-term improvements was nearer £120 million. The WLGA calculation is likely to be a more accurate estimation of needs because it was based on a survey of local authorities at that time rather than the limited historic data that is available to the Assembly Government. Costs calculated with more certainty after the review of SMPs, will enable forward planning that considers the financial deliverability of the *New Approaches Programme*. The Assembly Government does not propose to engage in discussions about the funding needed to implement the *New Approaches Programme*, and in particular affordability and the need to prioritise, until the review of SMPs is completed and headline costs are available. The Assembly Government anticipates that funding will fall short of needs, making capacity limitations likely to be a key factor that constrains the progress of the *New Approaches Programme*.

Processes and systems are not sufficiently clear or effective to deliver the objectives of *New Approaches*

Flood and erosion risk management are not sufficiently integrated into a more holistic approach to coastal management

2.36 The Assembly Government produced the first Integrated Coastal Zone Management Strategy for Wales '*Making the Most of Wales' Coast*' in March 2007. The process brings together all those involved in the development, management and use of the coast to help ensure that, in future, it is managed in an integrated and informed way.

2.37 The principles of Integrated Coastal Zone Management are very similar to those emerging in the *New Approaches Programme*:

- **a** take a long-term perspective;
- **b** involve a broad, holistic approach;
- **c** use adaptive management;
- **d** work with natural processes;
- **e** support and involvement of relevant administrative bodies;
- **f** participatory planning;
- **g** use of a combination of instruments; and
- **h** reflecting local characteristics.

2.38 A progress report published by the Assembly Government in March 2008 showed that the Agency is well placed to contribute and is involved in many of the crosscutting partnerships for integrated coastal zone management as well as gathering data on the effect of climate change. However, although the Assembly Government has a key role in delivering the strategy, its input on coastal erosion and flooding risk is minimal, suggesting that there has been little consideration of the *New Approaches Programme* as a part of the Integrated Coastal Zone Management Strategy. The obvious parallels between these two initiatives offer the potential to help balance the competing pressures on the *New Approaches Programme* but the Assembly Government is not exploiting this opportunity.

Data and information systems do not support the consistent management of coastal erosion and flooding risks across Wales

2.39 The Agency identifies the current coastal flooding risks and their remit extends to managing both inland and coastal flooding risks across England and Wales. The Agency has developed strategies, and plans to minimise and to manage flooding risks and events. It prepares and makes available to the public flood risk maps that show land that, due to its elevation and proximity to watercourses or the coast, is likely to flood. This means that the data currently available can be used to make reasonably well-qualified assessments of flood risk and the occupiers of property likely to be affected can be informed of this risk (Case Study 7).

2.40 More advanced techniques, such as high-resolution surveys undertaken from aircraft, are now more widely used and are capable of providing increased accuracy and ease of coverage. The Agency has surveyed most of the Welsh coastline and main river floodplains, and this provides excellent data for use in risk management modelling. This is a major step forward in the ability to show current risks but it relies on keeping data up to date, something that local authorities and the Assembly Government had not previously achieved. Quality data and information on how the tide and weather affect the coast should be set out in detail in SMPs.

2.41 The Assembly Government has appreciated the need to add structure to this process by recently appointing Gwynedd Council as the lead authority for coastal monitoring. Local authorities in Wales will continue to undertake monitoring under the supervision of the Wales Coastal Monitoring Centre, but it may take up to five years before decisions are informed by robust data trends. There are also delays in establishing the centre caused by difficulties in recruiting a suitable coastal engineer to manage operations.

Case Study 7 – Flood risk mapping in Conwy

Conwy County Borough Council looked in, more detail, at the particular tidal flood risks in Llandudno and the surrounding coastline. The data and information from this work has informed the local authority and local communities about flood risk by more accurately defining the properties that are likely to flood against several test scenarios. There are also instances of property and land, previously indicated as at risk of tidal flooding, that is now shown to be unlikely to flood. This is helping residents and businesses to be more informed and able to make better preparations for flooding incidents. It has also allowed some land previously thought to be at risk to be released for appropriate development. In the longer term, and as sea level rises, the locality will be better prepared to adapt, and if required, progressively retreat the coastline.

Source: Wales Audit Office study

2.42 There are no established national systems for the monitoring, maintenance and replacement planning of coast protection and flood defence assets. Consequently, each local authority has developed a means of managing their coast protection assets, although only four have considered their systems effective as an asset management plan. A national database of asset condition[30] promised by the Agency in 2001 is only now available for local authorities in Wales. The Agency has operated this system for inland flood defence assets in England and in Wales for several years, but the system was until now unable to hold information on coastal assets. The Assembly Government has recently made funding available to allow local authorities to undertake training and to input coastal data.

30 The National Flood and Coastal Defence Database (NFCDD) is a database operated by the Agency that has the capability to hold large amounts of information on the condition and local authority and private sector assets. The NFCDD is not an asset management system but can hold much of the data required to drive such a system.

Dilapidated sea defence assets at Amroth Beach, Pembrokeshire

2.43 A national asset management plan would enable the supervisory public body to assess the condition and ongoing viability of coast protection, sea defence and other relevant infrastructure such as sea defence assets owned by third parties. A plan is widely requested by stakeholders who view it as essential for strategic management, qualifying resource needs, and prioritising schemes and activities. However, although the Assembly Government told us that a national asset management plan would be considered if the *New Approaches Programme* points to this need, we were advised by the Agency that such a plan is already being developed[31]. The absence of a national asset management plan has been frustrating for local authorities as information on the condition of their coast protection assets has been required in Assembly Government annual targets since 2001, but there is little evidence that the Assembly Government has collated, analysed or used this information.

Complex guidance and inadequate management processes mean that grant funding for coastal protection lacks transparency

2.44 Prior to the *New Approaches Programme*, the Assembly Government provided grant-in-aid to local authorities for coast protection and inland flood prevention schemes. The Flood and Coastal Risk Management Department has secured increased funding as knowledge of climate risks improves. Funding has doubled within the past five years to the present position where local authorities receive £5.8 million per year between them for capital projects. However, in some years this grant was not spent in full, indicating the apparently low demand to fund proposed local authority flooding and erosion schemes. Until 2008-09, funding was sufficient to meet the schemes proposed by local authorities and the Assembly Government has not needed to prioritise. The Assembly Government told us that the inability to draw down the full grant available was more to do with delays in the application and appraisal processes, and not with delivering projects to programme. The Assembly Government is working with local authorities to improve their performance in delivering schemes.

2.45 In contrast, The Flood Risk Management Wales Committee prioritises and allocates funds on behalf of the Assembly Government to the Agency to manage inland and tidal flooding. Active programme and budget management and good project management ensure that funds are committed over a five-year programme, and that by planning and approving slightly more work than can be

31 The AMIT asset management plan is in development by the Agency and already referred to in Paragraph 1.7. In England, where the Agency has a strategic overview of coastal matters, AMIT will be used for coastal assets. In Wales, the role of the Agency and use of AMIT has yet to be determined.

Figure 9 – Evaluating and justifying candidate schemes

The Assembly Government has no obvious system for prioritising the use of grant-in-aid for flood and coastal risk management. This is because the rate at which the Assembly Government approves schemes submitted by local authorities as meeting the qualifying criteria for funding did not exceed the resource available. This has led to under-spending of funding in previous years.

Guidance originally issued by the Ministry of Agriculture Fisheries and Food in 1993 but now by DEFRA, sets out the techniques which local authorities are expected to follow in appraising and justifying schemes. The guidance stresses the importance of maximising value for money in benefit-cost terms. The quantification of all costs and benefits is encouraged, including environmental impacts where practicable. Techniques for assessing the benefits of flood and coastal defence, including for recreational benefits are further explained in the 'Multi-coloured Manual' published by Middlesex University in 2003. Project Appraisal Guidelines and a separate addendum outlining the different rules for Wales have also been issued.

Source: Wales Audit Office, Martin Wright Associates

delivered in each year, the committee provides a buffer that rolls forward to fill any gaps that appear and ensures grant is fully spent. The Assembly Government has provided delegated powers to the committee, although the Assembly Government may review schemes of over £2.5 million and always assesses proposals where the value exceeds £5 million.

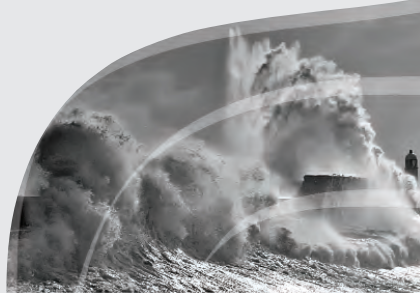
2.46 Stakeholders told us that the assessment and selection criteria used by the Assembly Government to appraise their applications for coast protection grant-in-aid under the Coast Protection Act 1949 are very complex, not transparent nor clearly understood and that the process used means that the progress of applications can be very slow. The result is that some local authorities had to make a substantial financial commitment towards capital projects without assurance that the project will eventually receive grant-in-aid. This delay risks wasting public funding on abortive schemes. For example, Ceredigion County Council felt that the Assembly Government delayed the grant assessment for the coast protection scheme they proposed for Aberaeron[32], which pressured the authority into taking financial risks. Similarly, Gwynedd Council has spent in excess of £750,000 so far on the Tywyn coast protection scheme but has so far received just £150,000 in grant funding from the Assembly Government[33].

2.47 Until recently, a points-based system was used in England to evaluate candidate schemes, allowing for very much higher delegated spending powers than in Wales (Figure 9). In Wales, consideration of cost and benefit of a scheme is wider than was possible with the English points-based evaluation. This is so that other issues, such as wellbeing, can be a factor into the complex calculations that underpin the decision process. This is the right way to move forward and is progress towards a genuine 'multi-criteria assessment'. However, to stakeholders observing the process, it can appear to be unstructured and not an equitable means of distributing funds.

2.48 The Assembly Government is aware that the proposed funding work stream within the *New Approaches Programme* and the new SMPs will confirm the widely held view that there are significant gaps between what is technically feasible, economically viable and desirable. Future demand for new schemes means that the pressure on the small amount of funding available in Wales will increase dramatically. Consequently, the Assembly Government must ensure that application and approval processes are transparent and equitable.

32 Aberaeron coastal protection enhancement works commenced in late 2008, funded by Assembly Government grant-in-aid.

33 Gwynedd Council is unsure of the actual cost so far for the Tywyn scheme, so this figure (also in Appendix 3) is an estimate.



2.49 European Convergence Funding provides a unique one-off opportunity for flooding and coastal erosion schemes to progress, with £63 million earmarked for environmental risk management and infrastructure in West Wales and the Welsh Valleys. The Assembly Government is bidding for £30 million of this for flood risk management, and if it can be secured[34], match funding has the potential to raise this total to £65 million. The Assembly Government has based criteria used on DEFRA's *Project Appraisal Guidance* but with the added flexibility that can allow for a different approach to economic appraisal and environmental and risk management considerations.

2.50 The limited timeframe of the Convergence Funding Programme means funds must be spent before 2013. Large coast protection and tidal flooding schemes take around two years to design and set up before the main capital spending occurs. This time lag means that, even if schemes can be assessed quickly, the ones that will receive approval will be those that can spend Convergence Funding before 2013. Nearly 60 projects registered for Convergence Funding with a total value of £214 million, but recently reduced to a shortlist of 15. This means that alternative funding needs to be found if many of the schemes that local authorities consider are necessary to reduce flooding and erosion risks are to progress. Even though funding falls short of what local authorities say is required, information gained during the application process will help the Assembly Government gain a better understanding of the needs of Wales and in developing the *New Approaches Programme*.

2.51 In recognition of the increasing need for funding, and in response to the Pitt Review, the Assembly Government has committed a further £8 million over 2009-10 and 2010-11 to projects that support a broad approach to flood risk management including defences, raising awareness and increasing resilience. Additional allocation can help match fund capital schemes or be directed towards the more traditional revenue-intensive activities that may not otherwise qualify.

2.52 To manage the existing portfolio of assets, the Assembly Government has estimated that funding will need to increase threefold, to about £15 million per year. This assumes that assets are designed to last 50 years and a replacement cost of £2 million per km. Current asset replacement value is approximately £750 million for Wales. Significantly, this estimation does not include costs caused by climate change. Clearly, there is much work to do within the *New Approaches Programme* if affordable asset plans are to be established. If funding plans are irreconcilable with needs, then the Agency has power to supplement grants and gain additional funding from local authorities through levying a precept. This approach would put an additional burden on local authority funds and therefore is unlikely to be used.

2.53 Convergence Funding is awarded only where economic, social and environmental benefit can be shown. This is difficult because no widely accepted method exists to assess, with accuracy, the economic value of natural habitats, heritage and amenity. There is a need for a more flexible approach to the use of grant funding that considers the full range of costs and benefits of coastal schemes.

34 This Convergence Funding was secured in March 2009, and includes large coast protection schemes at Borth, Colwyn Bay, Tywyn and Rhyl.

High tide flooding roads in north Gower (John Weston, Wales Audit Office)

In particular, a comprehensive multi-criteria assessment considered within the framework of integrated coastal zone management would help to bring together stakeholders and aid the implementation of the sustainable solutions of the *New Approaches Programme*.

Systems to compensate those with property threatened by coastal erosion or tidal flooding and to encourage relocation are not developed

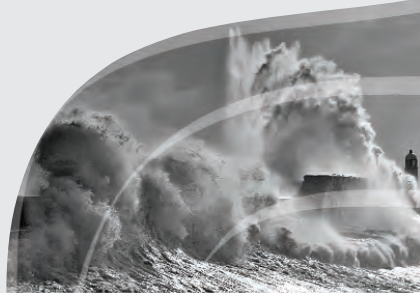
2.54 Residents with properties blighted by erosion and flood risk have already seen the value of their properties reduce significantly and are likely to have had trouble obtaining insurance cover. Without compensation, it is unlikely that they could sell their property and move on.

2.55 There is very little provision to compensate those affected by coastal erosion or tidal flooding, or for those affected by decisions not to maintain coast protection and sea defences. The *Coast Protection Act 1949* established this approach but it remains current legislation, and it has the potential to hold back any action to relocate or retreat communities in a managed way. It is a concern that the *Flood and Water Management Bill*[35], published in April 2009, does not include a review of compensation arrangements.

2.56 The need to put in place an equitable system for compensation is widely supported by stakeholders, and in August 2008, Lord Smith, Chairman of the Agency urged government to consider using public funds to rehouse those who are affected by managed realignment. The issues are complex and raise several fundamental issues including:

- **a** the appropriate use of public funds to compensate for what are now, with knowledge of climate changes and risk predictive skills, quite predictable natural processes;
- **b** the setting of a compensation precedent which public funds may not be able to afford as climate changes gather momentum;
- **c** if compensation is not offered then the adaptive, more sustainable and ultimately affordable long-term solutions of the *New Approaches Programme* might not become a reality because residents will not relocate; and

35 *Flood and Water Management Bill* - The draft bill was released for public consultation in April 2009 and aims create a simpler, more effective regime for flood and coastal erosion risk management. The bill also seeks to clarify roles and responsibilities, and will introduce measures for the improved sustainability of water resources, including the avoidance of water scarcity.



d if compensation is not offered then residents may have to stay put, caught in a poverty trap with the associated social costs, and the risk to person and property will increase.

2.57 Not all of the coastal risks for Wales are due to the gradual effects of climate change. Damaging storms will continue to occur and there are locations in Wales where coastal erosion risks are acute and are already threatening properties. The situation affects fewer properties than in England where, for example, there is rapidly progressing erosion of soft cliffs at Happisburgh, Norfolk where residents are already seeking financial compensation. However, there are properties near Cardigan that could be lost to erosion within the next few years. The local authority is concerned, not only about the lack of compensation, but also that the *New Approaches Programme* has no focus on acute short-term erosion risks and those affected could fall outside any new policy. The Assembly Government is currently mapping the erosion risks in Wales with the findings from this work available for the review of SMPs. Results will be available to the public to coincide with the launch of a 'toolbox' of solutions that is designed to help communities adapt to increasing coastal risks.

2.58 It is also critical to value assets that are likely to be damaged or lost. Valuing properties is relatively straightforward but the worth of land in terms of amenity and future food production, and the cost of social upheaval and impact on the wellbeing of communities, is more complicated. There is reasonable protection for habitats in current legislation, with requirements to compensate for detriment or loss. However, there is very little statutory protection offered for people and their personal assets. Much work remains before calculation of the true costs, and therefore the affordability of delivering the *New Approaches Programme,* can be made.

2.59 The Agency, local authorities and other landowners have no obligation to maintain sea defences and residents have no right to ongoing protection. This can raise equality issues with some communities, such as those protected by the Cardiff Bay Barrage or perhaps in the future, by the Severn Barrage, benefiting by their location from much greater assurance that protection will be lasting. In the past, protection from coastal erosion and tidal flooding depended on location and the defences in place. In future, the need is for an appropriate local solution, which may not involve defences, for communities that are at risk. A risk-based approach, such as the *New Approaches Programme*, has the potential to allow a range of responses to the problem, not just protection.

Part 3 – The current strategic leadership and levels of citizen engagement are not sufficient to meet increasingly pressing coastal management challenges facing Wales

The Assembly Government's strategic leadership for coastal management is not currently effective

3.1 The Intergovernmental Panel on Climate Change is to report its fifth assessment of the impacts of climate change in 2009. Global emission reductions are lagging behind the targets set and this suggests that climate changes could be more rapid than previously predicted. The loss of polar sea ice is also faster and more extensive than previously predicted. Total loss of polar ice is an extreme scenario that few believe will occur, but it could raise sea level around the UK by about six metres and drastically redefine the coastline. The consensus to plan for a scenario where sea level will rise by one metre on the Welsh coastline over the next century appears to meet the 'precautionary principle' but this will have to be regularly reviewed as climate changes are monitored and remodelled. The *New Approaches Programme* and supporting policy, such as SMPs, will need to track these changes closely.

3.2 The predictive model that supports the 2004 Foresight Future Flooding report shows that, if the most likely scenario for economic growth is used, flooding risks will increase by as much as twenty-fold over the next century. This means the value of assets at risk from inland and coastal flooding over the next 100 years will increase from £70 million to about £1.4 billion per year[36]. The Assembly Government believes that the existing approach cannot continue beyond the next 30 to 80 years because the risks become unacceptable.

The pace of translating high-level objectives into action has been slow

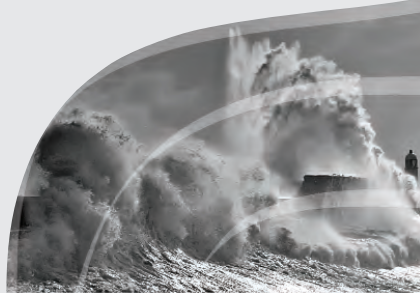
3.3 The Assembly Government is developing a *Climate Change Action Plan for Wales* and consulted during February 2007[37]. This action plan remains unfinished, awaiting consideration of the *Climate Change Act 2008*, which became law at the end of November 2008.

3.4 Within its three-year lifetime, the *New Approaches Programme* aims to clarify strategic direction and the leadership responsibilities needed to deliver the new policy. However, there has been slow progress with the programme since its launch in July 2007.

3.5 The basis of the programme is still evolving, leaving stakeholders confused over the strategic direction and project objectives, their part in its delivery and the capacity of the Assembly Government to lead the changes required. The *New Approaches Programme* commenced before sufficiently clear project objectives, success criteria and the capacity to make progress had been secured. These are basic requirements of effective project management but were only recently considered in the project documentation.

36 *Foresight Future Flooding* report on flood and coastal defence, The Office of Science and Technology, 2004

37 *Responding to our changing climate – consultation on a climate change action plan*, Assembly Government, 2007



3.6 The slow progress made by the Assembly Government with the *New Approaches Programme* has also been due to the focus on responding to the findings of the Pitt Review. Although many of the findings of this review are relevant to the *New Approaches Programme*, they are more particularly about inland flooding.

3.7 Strong and inclusive leadership is now required from the Assembly Government to build and retain the confidence of the *New Approaches Programme* stakeholders, yet there is little tangible evidence of this so far. The Assembly Government has not established a robust and detailed understanding of coastal risks and their management in Wales.

3.8 The low priority given in the past few years to coastal management and policy development means that the Welsh public sector is not ideally placed to move forward. The first phases of the *New Approaches Programme* require a degree of catching up. The fragmented understanding of coastal processes, lack of a national approach to asset management and very limited use of the data available, particularly by local authorities, is evidence of this issue. The situation calls for closer collaboration between stakeholders and a clearer definition of leadership roles.

The publication of shoreline management plans may be delayed by a lack of supplementary guidance

3.9 The Assembly Government acknowledges the need to move to a strategic position for coastal erosion and flooding. However, the shift relies upon local authorities completing new SMPs (Figure 10) by 2011 to inform the Assembly Government's overall strategic perspective. Through the five coastal groups, local authorities in Wales have recently embarked on a review of SMPs. Coastal groups are following guidance jointly produced by DEFRA and the Assembly Government. The Assembly Government has also agreed to provide specific guidance for Wales so that the review can reflect the strategic objectives of the *New Approaches Programme*. This supplementary guidance is important because it will show how to achieve the transition from the current defence-led approach to the management of risk, and in particular, the consequences of erosion and tidal flooding. Coastal groups have begun the review even though the Assembly Government has not yet provided this guidance and has only recently committed the funding needed for coastal groups to engage consultants to progress the review. Because of these delays, the review of SMPs in England will now be completed a year before Wales.

3.10 Without explicit and overarching national policy, local decisions are unlikely to fit with the national strategic direction. The flood and coastal erosion solutions proposed in the new SMPs may never be put into effect if they do not meet Assembly Government funding or prioritisation criteria.

3.11 There is also a heavy responsibility on local authorities to take the lead in brokering the changes of the *New Approaches Programme* with communities. The Assembly Government emphasises the need to preserve local decision making, but local authority stakeholders say the Assembly Government should provide stronger leadership, and support this with clear policy and guidance.

Figure 10 – Shoreline management plans

Shoreline Management Plans (SMPs) provide a large-scale assessment of the risks associated with coastal processes and present a long-term policy framework to reduce these risks to people and the developed, historic and natural environment in a sustainable manner.

SMPs set out a strategy for coastal defence for a specified length of coastline taking account of natural coastal processes and human and other environmental interests and needs. First introduced in 1995 by the Ministry of Agriculture, Fisheries and Food, revised guidance was issued in 2001. The plans should define, in general terms the risks to people and the developed, historic and natural environment and in particular:

- identify the preferred policies for managing these risks over the next 50 years, (although for the current review of SMP the planning horizon is 100 years and the plans are to consider climate changes);
- identify the consequences of implementing the preferred policies;
- set out procedures for monitoring the effectiveness of the SMP policies;
- ensure that future land use and development of the shoreline takes due account of the risks and the preferred SMP policies; and
- comply with international and national nature conservation legislation and biodiversity obligations.

Shoreline Management Plans are not statutory documents but their policies have the same status as supplementary planning guidance.

For each length of coastline there are four possible generic policy options:

- **hold the existing defence line** by maintaining or changing the standard of protection;
- **advance the existing defence line** by constructing new defences seaward of the existing defences;
- **managed realignment** by identifying a new line of defence and, where appropriate, constructing new defences landward of the original defences; and
- **no active intervention.**

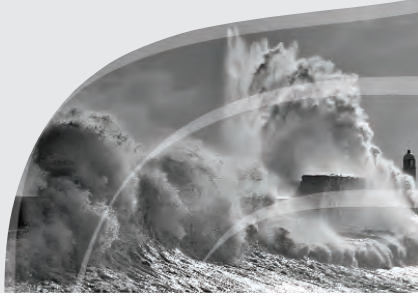
Source: DEFRA website and Martin Wright Associates

The Assembly Government is currently not benefitting in full from the supervision and expertise available within Environment Agency Wales

3.12 In England, the Agency has an overarching 'strategic overview' across all coastal flooding and coastal erosion risks. This role was taken up in April 2009, and means that the Agency is directly accountable to DEFRA for the management of tidal flooding and coastal erosion. This allows the Agency to hold the entire capital budget for flood and coastal risk management on behalf of DEFRA, and to allocate this to local authorities, internal drainage boards and to the Agency itself, so that capital schemes and other investments on flood and coastal erosion risks can be delivered.

3.13 The Agency already has a 'general supervision duty' in all matters relating to flood defence in England and Wales, underlined in a national flood risk protocol agreed in April 2003[38], but the extent of this duty is poorly defined. In England, the strategic overview responsibility enhances this role considerably, reinforcing the Agency's position of overall responsibility to oversee operating authorities and be accountable to government for the management of coastal flooding and erosion management through the allocation of capital funding and approval of SMPs.

38 *Management of Flood Risk, Working Better Together Protocol Series*, April 2003. Introduced to support the joint Agency and Local Government Association/ WLGA memorandum of understanding 'Working Better Together 2003'



Tywyn promenade, Gwynedd (John Weston, Wales Audit Office)

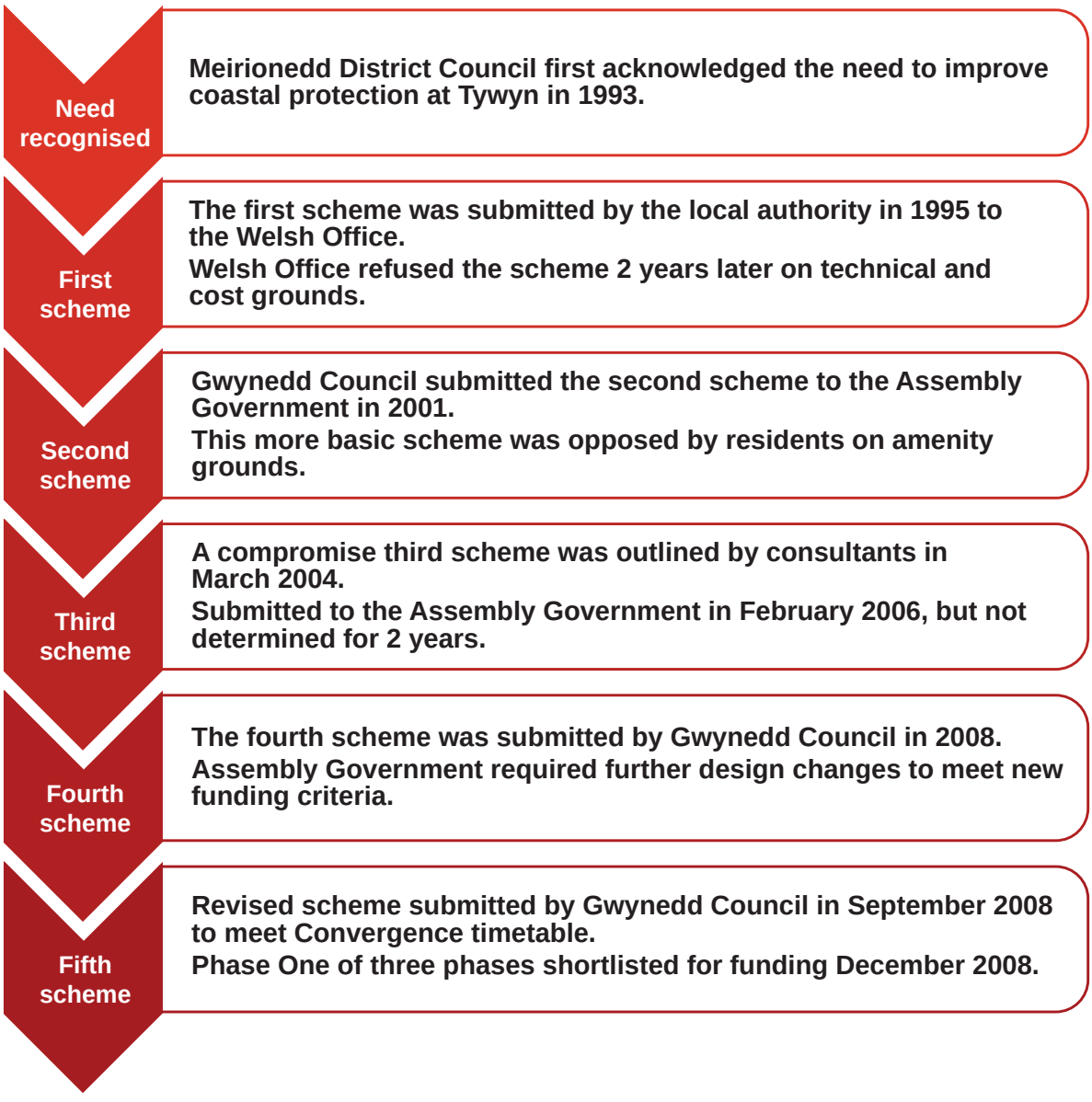
3.14 In Wales, the Assembly Government retains overall policy and strategic responsibility for flood and coastal erosion risk management, and they provide almost all of the funding including through grant-in-aid to local authorities to enable them to lead on coastal erosion management. Similarly, the Assembly Government provides the Agency with funding to enable the management of tidal flooding. The Assembly Government wants to manage coastal erosion and tidal flooding in a more strategic, integrated and sustainable way but is reluctant to change the existing accountability arrangements. The Assembly Government is realistic about its capacity to undertake the future roles expected of the *New Approaches Programme* and is considering a more formal and clearly defined supervisory role for the Agency. Such a role would recognise their expertise and the many advantages of links to good practice available with the Agency in England. The Pitt Review recommends that the consultation on the *Flood and Water Management Bill*, that commenced in mid 2009, included a review of powers and roles.

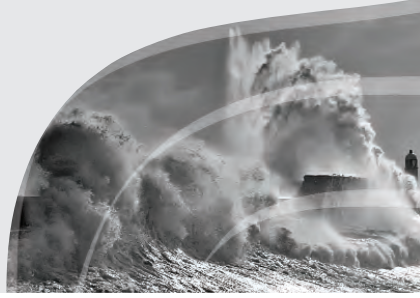
3.15 Following severe inland flooding in 2002, the Assembly Government put in place unique arrangements to manage flood risk, and in particular, the Agency's capital programme for 'main rivers' and coastal flooding. In April 2006, a single statutory executive committee of the Agency called 'Flood Risk Management Wales' became operational. This committee comprises stakeholder representatives and local authority elected members, takes decisions on the prioritisation of flooding schemes and allocates Agency funding, including for the construction of defences to manage tidal flooding.

3.16 The committee has no remit to consider or prioritise funding applications for local authority coastal protection schemes designed to manage coastal erosion, as the Assembly Government still allocates these funds directly. However, we found that local authorities are unclear about the criteria used by the Assembly Government to assess and prioritise candidate schemes, and are concerned that applications can take many months or more to determine.

3.17 Figure 11 shows an example of the delays that occurred between a local authority recognising the need to improve coastal protection and the commissioning of the works required. In the example shown in Figure 11, the decision was particularly protracted, but it illustrates the complex application and approval process and the value of community engagement.

Figure 11 – Timeline for the construction of coast protection at Tywyn, Gwynedd





3.18 Clarifying the supervisory role of the Agency would provide new impetus, strengthen structures, and support the development of streamlined and transparent systems to prioritise and progress the *New Approaches Programme.* Having one organisation with a supervisory role for the whole coastline would make it easier to bring together the partnerships necessary for effective coastal zone management. Such partnerships could take into account the variety of interests in land use and the pressures communities face while maintaining a clear vision for the coast.

Citizens are largely unaware of increasing risks and the need for their involvement in the new approach

3.19 Our focus groups with residents from communities where flooding risks are significant showed that not all were aware that they live in an area of high risk. The experience of the Agency in managing flooding incidents shows that residents are often poorly prepared for flooding, and have not taken the precautions that could reduce its consequence and help them recover more effectively.

3.20 It is vital that local authorities appreciate and understand the coastal risks in their area so that they can effectively lead the *New Approaches Programme* at a local level. However, our survey and more detailed work we have undertaken with several local authorities suggested that the understanding and appreciation of coastal risks varies greatly between local authorities. The priority that authorities assign to coastal erosion and tidal flooding risks reflects the variable level of baseline information, understanding of risks and the relative priority that each organisation considers is appropriate.

3.21 The type of accommodation and the vulnerability of occupants contributes significantly to increase the consequence of erosion and flooding. With a focus in Wales on affordable tourist accommodation, there are many temporary dwellings such as chalets and caravans, located in accordance with temporary planning consents and in very close proximity to the shoreline. Restrictions have recently relaxed to allow greater use and occupation can now extend to 10 and a half months of the year, placing many residents at a significantly increased risk (see Case Study 8).

Case Study 8 – Evacuation of residents from Lighthouse Park caravan site

A storm on the night of 9th March 2008 led to the precautionary evacuation of 170 residents from a coastal caravan park in St. Brides on the Gwent Levels. This was due to concern that sea defences would not prevent tidal flooding during the period when the storm coincided with a spring high tide. An evacuation rest centre was set up at Newport Leisure centre and the majority of residents found accommodation at nearby hotels.

Source: Newport City Council Press Release

3.22 Temporary accommodation in coastal areas is also increasingly used outside the holiday season to house more deprived social groups. The transient nature of occupation and disengagement means that residents are unlikely to have much awareness or be concerned about the risks of coastal erosion or tidal flooding.

3.23 Flood risk maps and more detailed risk assessments are now available from the Agency and the insurance industry, and these can help citizens to improve their understanding of the risks of erosion and flooding. Technological advances are leading towards very detailed predictive models[39]. This will be a powerful tool, not only for helping residents to understand risks and become more involved, but also in emergency planning and incident management, and in the prioritisation of flood risk management works.

3.24 The Local Community Resilience Forum has a duty to communicate risk, and encourage better awareness and involvement through flood risk exercises. Emergency planning is particularly important for coastal flooding incidents as there is likely to be widespread impact and a large emergency area with disruption of infrastructure and thinly spread emergency services. The Agency is now operating the 'Triton'[40] early warning system and this telemetry system is extending across Wales. Flood warning is a statutory function of the Agency and similar systems are successfully established in known areas of inland flood risk. If the Triton system is backed up with robust information on risks and improved weather forecasting, the system has the capability of alerting coastal residents about storm events and abnormal tidal conditions so that they can be more able to help themselves. We identified that more residents could be part of a warning systems if the service was operated on an 'opt-out' basis.

3.25 For the *New Approaches Programme* to succeed, citizens must take a larger share of responsibility and take appropriate action to help mitigate the effects of erosion and flooding. Early indications of Welsh policy appear to reinforce this shift in emphasis. However, responsibility should not sit only with communities and individuals. The *New Approaches Programme* needs to show clearly that it will adjust and rebalance responsibilities across the full range of stakeholders.

3.26 The Assembly Government has given assurance that 'the needs of people at risk of flood will be at the heart of the *New Approaches Programme* and our whole approach in future'[41]. However, our focus groups with residents found that their awareness of issues is parochial with some disregard for wider and longer-term issues that could directly affect them.

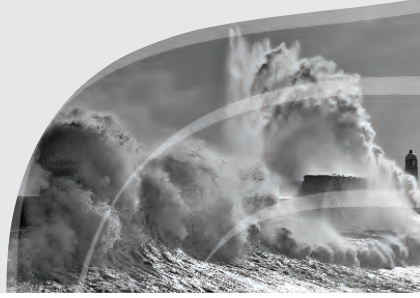
There is limited time to adopt a new and more sustainable approach before climate changes have significant impact

3.27 Current weather patterns can already be destructive. They can overwhelm existing coastal defences, underlining their limited effectiveness and the need to begin the change in approach. The current pace of change may not be sufficient to make changes in time to manage the increasing frequency of severe coastal erosion and flooding events anticipated with future climate changes.

39 In the future, flood modelling could show how a flood will develop from a breached defence and how it will progress across land given all of the defences and constraints in place. Eventually, it could show in 'real time' the depth and speed of flow, and allow for much better predictions about the consequences of a flood.

40 Triton is a coastal flood warning system that uses automated telephone messaging to advise participating residents when a tidal flood is expected. The system is operated by the Agency and is now becoming more widely available in Wales.

41 Cabinet Statement by Jane Davidson, Minister for Environment, Sustainability and Housing, September 2007.



3.28 As risks increase with climate change, the opportunity to implement managed changes to the coastline decreases. Therefore, it is important to prepare for longer-term changes as soon as possible. In particular, a policy that simply intervenes and increases defences is ultimately unsustainable for small rural communities with low-perceived economic value. Such a policy can make the consequence of erosion or tidal flooding more severe by promoting additional development in known risk areas and putting more people at risk. Many stakeholders told us that more sustainable 'managed adaptive' actions need to be considered far more quickly than the Assembly Government appears to be considering in the *New Approaches Programme.*

3.29 A distinct lack of urgency is evident so far in the *New Approaches Programme*. However, the Agency and the local authorities we spoke to do not share the Assembly Government's lack of urgency and told us they have concern about both the very slow pace of change so far and the timeline for future changes.

3.30 Only a relatively small rise in sea level is likely to occur in the period until 2042, but subsequently, predictions used by the Agency show that there would be a progressively much greater rise. This gives the Assembly Government and the other stakeholders involved some valuable planning time. This opportunity needs to be recognised and progress made to embed the *New Approaches Programme* in local communities, for residents to accept that the level of protection they have may not be economically or practically viable and for sustainable longer-term solutions to be initiated. In the latter half of the century, sea level rise is expected to be a far more visible and dramatic climate change-driven effect, causing impact on the coastline that will be difficult to keep pace with if early preparations are not started in the next few years.

Figure 12 – Managing flood risk through 'epochs'

This adaptive approach uses improving monitoring data and knowledge to help flood management actions track risks as they develop. It allows a range of 'multiple interventions' to be applied to keep up with changing risks. Policy intentions have not been clearly communicated to stakeholders but the guidance suggests local decisions undertaken during Shoreline Management Planning are to be considered within a planning framework of three 'epochs' with sequential planning horizons of 0-20, 20-50 and 50-100 years. This means that the length of time schemes are designed to last can be tailored to local needs, funding and modelling of future risks. In theory, this allows more of the smaller capital schemes, that have the capability to be added to, to be progressed, so that their effective life can be extended. This could allow funds to be spread more widely and give stakeholders and residents time to begin to accept and adjust to other more sustainable options.

3.31 Guidance produced by DEFRA[42] and the Assembly Government is in use for the review of SMPs. This guidance also suggests that future strategy and funding should be based on a planning framework with three sequential planning horizons termed 'epochs' (Figure 12).

3.32 Given that the funding made available by the Assembly Government for coastal erosion and tidal flooding is now outstripped by spending needs, the management of flood risk through 'epochs' allows a sense of progress. It will take some years to develop robust data and information or a clear future policy but there is pressure to show progress in the face of climate changes.

42 *Shoreline management plan guidance Vol 1: Aims and requirements*, DEFRA March 2006

3.33 The proposed framework of 'epochs' buys time, but there are also real risks that little will change and the traditional defence-dominated approach will persist for a further 20 or even 50 years. The success of the *New Approaches Programme* depends upon careful strategic management by the Assembly Government and brave leadership of change by local authorities.

3.34 Limited funding means the Assembly Government needs to spend wisely and in a way that ensures longer-term aims become increasingly achievable. In reality, and because of climate change, one of these options is for communities that face acute risks to begin to relocate. DEFRA reviewed the success of the first SMPs, finding that the absence of more flexible funding arrangements was limiting the progress of relocation.

3.35 Our work has identified some ideas from stakeholders that could help to unblock the problems associated with relocating residents (Figure 13).

3.36 Budgets need to become more flexible to reflect the aspect of risk targeted and the type of solution sought. Coastal and sea defences are constructed to reduce the likelihood of erosion or tidal flooding, as is relocation to land that has a lower risk. Conversely, preparing a community for flooding by building up resilience so that the impact is minimised and the recovery and return to normal life is made more quickly, is an approach based on dealing with the consequences of flooding. In effect, Assembly Government capital programmes mostly cover 'likelihood' and 'consequence' is, in the main, covered by local authority and Agency revenue budgets.

Figure 13 – Ideas to help relocate residents away from high-risk areas

Funding spent on defence could be redirected into compensation packages to encourage relocation

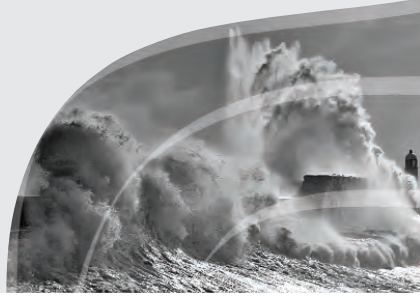
As an example, the Environment Agency estimate that it costs about £2 million a year just to maintain 15 kilometres of existing sea defences between Eccles and Winterton in East Anglia. If a method can be found to redirect funds to compensate for relocation, and to ensure that adequate protection remains in place during the transition, this funding can be reinvested in creating more sustainable communities. There would also be no need to spend on maintaining defences after the move is completed.

Assembly Government funding could be made available for local authorities to buy properties that are at risk, and lease the property back to their present owners

The advantage of this approach is that the financial risk would transfer from the individual and the local authority would have more flexibility to start retreat policies. For such a policy to succeed the funding arrangements for the New Approaches Programme need to be flexible and have sufficient capacity to settle compensation issues at an early stage.

To avoid short term solutions, as properties become vacant they should be replaced with more sustainable developments that have resilience to flooding

Examples include parkland that can recover from flooding. Developments need to be of sufficient quality to help compensate the community.



3.37 The low local priority given to coastal erosion and tidal flooding risk by local authorities means that revenue budgets are very low, and this is an area where the *New Approaches Programme* needs investment. If the *New Approaches Programme* aims to bring about the change from the current defence-dominated approach to one where a much wider range of more sustainable options are available, and to do this within the time available, the balance must be altered. There is also a need for insurers to support more obvious initiatives that reduce the consequence of coastal erosion and tidal flooding.

3.38 Throughout Welsh history, there are many examples of communities forced to move by the power of the sea but there is limited recent experience of our ability to live with nature on this scale. The *New Approaches Programme* proposes a future where sustainable solutions are in place to manage these increasing risks.

3.39 In January 2007, an All Party Parliamentary Group on Coastal and Marine Issues[43] considered the evidence for coastal flood and erosion risk management, and concluded that there is no turning back (Figure 14).

Figure 14 – Conclusions of the All Party Parliamentary Group on Coastal and Marine Issues

The Group concluded that:

- **a** there is no turning back from the current pro-intervention policy where Government decides whether intervention is justified on social, economic and environmental grounds;
- **b** a move away from past 'hold the line' policies to those more aligned with natural processes is inevitable;
- **c** new policy must allow adaptation through a gradual process, recognising that the legacy of past policies cannot be discharged overnight; and
- **d** a toolkit of measures will be needed to facilitate this process.

The Group asked how much time is required to implement this policy, noting that a decision made for 10 years will be different from one made for 100, because the extent of change will differ considerably. Current spatial planning is based on 10-20 year timetable, coastal flooding and erosion management on 50-100 years.

They acknowledged that it is not known how long adaptation through a 'gradual process' will take and were unsure if 100 years would be enough for major cities to adapt.

Source: CoastNet Briefing Paper

43 All Party Parliamentary Group on Coastal and Marine Issues – *Social justice and coastal flood and erosion risk management.* CoastNet Briefing Paper No. 3, January2007

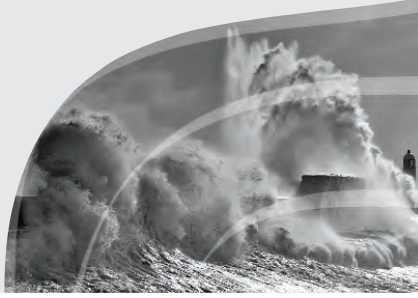
Appendix 1 – Summary of results from the survey of local authorities

In a survey of local authorities undertaken by the Wales Audit Office for this study, the following responses were given:

Question	Response
What is the current risk posed by the sea, including during severe weather events, for coastal communities within your county?	Four authorities (Gwynedd, Pembrokeshire, Denbighshire and Ceredigion) said the risk was 'high', six said medium risk, and five said low risk.
What is the authority's expenditure for each of the past three years on the management of coastal erosion and tidal flooding risks?	Three-year trend shows eight authorities with revenue expenditure of less than £50,000 per year and five with more than £50,000 per year.
Is the current replacement value of the assets held to manage the risks of coastal erosion and tidal flooding known?	Of 10 authorities responding, only five knew the replacement value of assets.
Is there an asset management plan in place for assets held by the authority for the management of coastal erosion and tidal flooding risks?	Of 14 authorities responding, only four had an asset management plan.
Is the authority made aware of the condition and effective life of the assets held by other stakeholders that provide protection against erosion or tidal flooding?	Eight authorities are aware of the condition of assets held by other stakeholders but six are not aware.
Do these assets currently provide satisfactory protection for the coastline and for property and livelihood?	Seven authorities responding said assets provided satisfactory protection but six said they did not.

How often is the condition of assets routinely assessed?	
Monthly	2
Quarterly	6
Yearly	9
Three-yearly	3
Less than three-yearly	3

Overall, how would you describe the condition of assets held by the authority for the management of coastal erosion and tidal flooding risks?	
Poor	2
Adequate	7



Appendix 2 – Balancing flood risk with pressure to develop coastal land at Conwy

1 Conwy has a history of flooding with significant coastal flooding incidents occurring in the past few decades. These incidents have caused extensive damage to land, property and the local economy. A storm and tidal surge caused the coastal flooding of Towyn and Kimnel Bay in 1990. This caused breaches in the sea defences and allowed inundation onto a large area of land that is below sea level. The flooding was potentially life-threatening and led to a major emergency incident requiring the evacuation of about 5,000 residents, many of which were elderly, disabled and not able to react appropriately to the emergency. The extent of the flooding worsened due to flooded drainage systems and that many residents live in bungalows making retreat to higher level impossible. Large areas of the coast and many communities are now dependant on the extensive sea defence structures erected since 1990.

2 Since its formation in 1996, Conwy County Borough Council (the Council) now has a much better understanding of risks and the limitations of existing coastal defences. The risks from coastal erosion and flooding remain significant and the Council continues to recognise this corporately. It is a concern, however, that in the absence of a major incident for almost two decades, it is likely that many residents are now less aware of these risks and are not well prepared.

3 In 2004, the Council commissioned the Conwy Tidal Flood Risk Study, an extensive review that used survey and computed modelling techniques to estimate coastal flooding and erosion risks more clearly. About 80 per cent of residents live on the coastal plain, and the risks from coastal erosion and tidal flooding remain significant. There will be a severe test of sea defence infrastructure in decades to come with more violent storms and a rise in sea level expected due to climate change. Therefore, it is realistic to expect that some of the existing flood defence infrastructure will become less effective.

4 The Council acknowledges that, even with the best available predictive risk modelling, it is not possible to estimate the extent of the impact of climate, although the evidence that significant change is occurring is increasingly compelling. The responsibilities to act are unclear and the many stakeholders that need to be involved have differing priorities. There are close links between available funding and the ability to deliver solutions. Funding currently falls far below the level currently required to deliver engineering solutions. This means there is a need to prioritise and to make difficult decisions about prioritisation.

5 The pressure to build and to regenerate the local economy means that development continues on the coastal floodplain. For Conwy, the Spatial Plan identifies that significant development is needed to regenerate coastal areas and to maximise

income from tourism. For this to occur, coastal resorts in the county need to reposition and adapt to changing markets, and develop a broader economic and social base. However, the Spatial Plan also notes that many of these areas are prone to coastal flooding and that the risk of flooding is recognised as potentially a significant limitation for the regeneration of the county and to the future development needed to lift the local economy. The Spatial Plan recommends that the Council avoids development in areas vulnerable to flooding in the light of estimates of future climate change and that they should follow the advice given in the planning guidance note TAN 15.

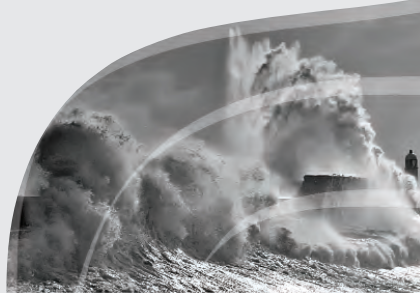
6 The result is that the Council is severely limited in meeting the need for an additional 5,000 houses identified in the Spatial Plan. Tension exists between the Council, the Agency and developers over the lack of suitable development sites. Councillors are also concerned that the coastal strip potentially remains a major source of untapped earning potential.

7 The position the Council finds itself in is therefore complex, with a need to support regeneration but with limited development land options. Engineering solutions are unlikely to provide the full answer to escalating flood risks and the funding available for capital schemes is very limited. In addition, the Council does not have a duty to provide flood defences or infrastructure to reduce coastal erosion, but it does have a duty to communicate information about risks and to provide community leadership. The challenge is for the Council, and others with a stake in managing the impact of flooding and coastal erosion, to put in place long-term and sustainable solutions. Such solutions need to recognise that it may not be sustainable to protect certain communities indefinitely and that they may need to consider a managed retreat programme.

8 Conwy recognises the need to change to a more sustainable and risk-based way of managing the future threat from flooding and coastal erosion, and supports the main ideas behind the Assembly Government's *New Approaches Programme*. However, the Council is concerned that national policy, future roles and responsibilities are unclear. Clear national policy would enable local plans to align and help to deliver national objectives.

9 The Council is now well placed to use the extensive information that it has gathered with the *Conwy Tidal Flood Risk Study* to better understand and communicate the risks, and to manage the consequence of coastal erosion and tidal flooding. The Council needs additional resources to gain the full benefit from this information. Surveys for other areas of coastline in Wales that are at significant risk of coastal erosion or tidal flooding could give the Assembly Government and councils the much improved understanding necessary to strategically manage national resources. Similarly, the Assembly Governments has only a fragmented understanding of shoreline dynamics and a co-ordinated approach to shoreline monitoring is only just being set up in Wales. Additional funding could make councils more able to make the changes necessary to deliver the emerging national strategy, and to meet future needs due to the increasing risks and expectation of the public.

10 The lack of clear national policy and guidance is also compromising local decisions made by stakeholders involved in flood risk management. This, together with economic regeneration aims, uncertain local



development policies and unclear national planning guidance means that, for Conwy, there is pressure to develop land that may be at risk of flooding. If the Council allows this to occur, the consequence of future erosion and flooding incidents will be even more of a concern.

11 The Council routinely inspects flood and coastal defence assets as a part of an extensive and well-planned maintenance programme that also enables objective prioritisation and targeted use of resources. Annual returns on the condition of assets are made via coastal groups to the Assembly Government, as a part of agreed targets, although this information does not appear to be captured and used by the Assembly Government to develop a strategic overview of the condition of defence assets or to prioritise defence schemes and the allocation of funding. A national framework for data and information and a national asset management plan need to be developed before the Assembly Government can operate strategically.

12 The Assembly Government also needs to be clearer about the role and responsibility of councils as community leaders for flood risk management. At Conwy, although there is acknowledgement of the role of community leadership, the accountability and expectation that accompanies this duty was poorly understood. The local community was also not as involved and influential as it should be in decisions about flood risk management.

13 In the *New Approaches Programme*, residents have an increasing role to help themselves, and for the new strategy to succeed, public engagement must improve across Wales.

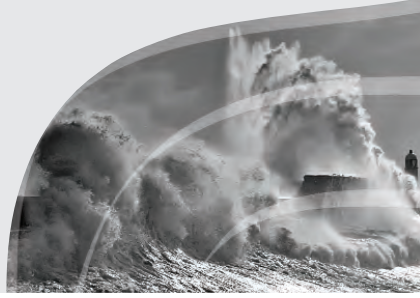
Appendix 3 – The coast protection challenges faced by Gwynedd and Ceredigion

1 The coastline of Gwynedd and Ceredigion has a long and traditional maritime association. Coastal agriculture industry is important to the region as is tourism and the fishing industry centred on the economic and culturally important ports and harbours. This coastline also has many historic settlements and heritage sites, and supports many rare plants and animals along its cliffs, estuaries, beaches and sand dunes.

2 Gwynedd and Ceredigion have more than half of the total coastline of Wales. The long west-facing coastline of both counties shares many of the risks posed by the sea, exposing many settlements and much of the coastal environment to a risk of serious erosion from high-energy waves arising far out in the Atlantic. The shape of the beaches, sand dunes and estuaries is constantly changing due to the action of waves, tides and currents that move sediment along the coast. Beaches and sand dunes are important natural coastal defences that absorb the sea's energy, reducing the need for artificial defences. Gwynedd has 23km of artificially defended coastline, and Ceredigion, a further 12.5km. In several locations, including Borth and Aberaeron, land and communities are already below the highest tide level and rely on the protection from tidal flooding provided by sand dunes or shingle banks. Occasionally, artificial defences supplement natural defences. Similarly, erosion of the shore by wind and wave action threatens to damage, not only land and buildings, but also infrastructure such as roads, railways and utilities that are essential to the economy of the area.

3 Almost half of the population of Ceredigion and Gwynedd either reside or make their livelihood on, or adjacent to, the coast. Locally, there is a high awareness of the destructive powers of the sea and the vulnerability of communities. Each year brings storms that erode the coast and test the purpose-made defence infrastructure provided by the local authority or other coastline structures such as road or rail embankments that provide unintentional defences.

4 The past year has seen widespread acknowledgement of the effects of climate change with predictions that storms will be more frequent and cause much greater damage to the coastline. Predictions are that sea level will rise approximately one metre over the next 100 years, overtopping existing flood defence infrastructure and inundating large areas of land previously protected. Coastal protection practitioners working for the local authorities in Ceredigion and for Gwynedd are very aware of this and the increasing vulnerability of the coast. For Ceredigion, there is an imminent need to bolster protection for Aberaeron, Borth and at Aberystwyth, which is to be regenerated as a strategically important commercial centre for Mid Wales. For Gwynedd, sea defences at Tywyn are dilapidated and at risk of breaching, and at Pwllheli, the existing coastal defences may not remain serviceable for more than a decade. A number of smaller coastal communities are also at risk in both counties.



5 Both local authorities clearly recognise that climate change will need to be a corporate priority, but at present, the translation of well-intended corporate aims into actions is only just beginning. Coastal protection officers are engineers with good technical skills but they currently operate in relative isolation to most of the local authority, not necessarily making the cross links to the other service areas that are likely to be affected by this aspect of climate change, such as regeneration and tourism.

6 At officer level, there is awareness of the Assembly Government's *New Approaches Programme* for flood risk management, acceptance of the issues and support for the need to take action. However, there is presently a lack of national policy to support the proposed change in approach towards more sustainable solution based on risk. This is already causing confusion at both Ceredigion and Gwynedd, with marked differences in approach, and in particular for the design life of major schemes, evident between these two neighbouring authorities. Interim design guidance that should clarify development criteria is missing. This will have a significant bearing on both the cost of schemes and long-term sustainability of communities and assets they protect.

7 Policy under the *New Approaches Programme* is likely to lead to additional protection that will last just 20 years. During this time, the local authority will undertake a review of the SMP and this review will include a benefits analysis to determine if additional protection is appropriate. If this analysis considers that additional protection cannot be justified, communities will need to migrate inland. These will be emotive and difficult decisions, and will need to commence within the time span of the existing community, regeneration and development plans. Guidance is also missing that would allow the multi-criteria assessments of cost and benefit to include other impacts to social, environment and economy necessary to apply the *New Approaches Programme*. There is no indication that either local authority has formally considered these changes, nor is there any indication of how they will lead communities to become more resilient and prepared.

8 Both local authorities have SMPs that set out the decisions made to defend each section of the coast. These plans now need to be significantly overhauled with the *New Approaches Programme,* and to take account of climate change and the risk management approach to sustainable coastal management. These new plans will enable the authorities to apply national flood policy at a local level, but for this to be possible, the plans need to align with national policy, which the Assembly Government has not produced.

9 Both Ceredigion and Gwynedd are active within their coastal groups. These are non-statutory bodies that operate across political boundaries to create SMPs that help the local authorities deliver effective coast protection. However, coast protection is a non-statutory power, and the coastal groups are voluntary and not funded by the Assembly Government. To continue their involvement with these groups, both Ceredigion and Gwynedd need additional funding, and at a time when essential services are cut back to meet a difficult budget settlement from the Assembly Government. Assembly Government grant funding for coastal groups has increased recently but supporting the groups with officers has a significant impact on service capacity. It is quite possible that, without more formalised status and direct

funding from the Assembly Government, these groups will wither. This is a risk for both the Assembly Government and for Ceredigion and Gwynedd, as the Assembly Government expects these groups to develop guidance for and to produce and manage the new SMPs.

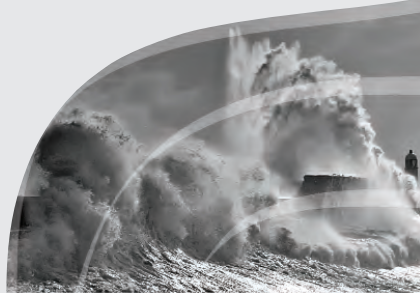
10 Driven by known risks to property and personal safety, both local authorities are progressing with the detailed design of major coastal defence schemes before Assembly Government grant funding has been secured. This is an acknowledged financial risk but the authorities consider that this is less of a risk than doing nothing and suffering the impact of a major storm.

11 For Ceredigion, the proposed scheme for Aberaeron includes elements of defence from tidal flooding (a responsibility of the Agency), which will threaten a large part of the town, and coastal protection. The local authority has already invested heavily in design works at Aberaeron, is developing a major scheme for Borth and plans a further major scheme at Aberystwyth. In Gwynedd, the local authority has already spent about £750,000 on design works since 1995 for a succession of three proposals at Tywyn, only to see Assembly Government criteria shift. The criteria for making a grant funding application is also outdated and both local authorities say that the Assembly Government takes an unduly long time to process grant applications, which does not assist authorities with budget and work planning.

12 The total value of coastal protection schemes proposed in Ceredigion total £46 million, and for Gwynedd, a further £18.8 million. The annual budget available from the Assembly Government for all local authority coastal protection and fluvial flood defence works is just £5.8 million. Local Objective One Convergence Funding could provide a further £30 million during the period 2007-2013, and if match funding is available from the Assembly Government, this could increase to about £65 million.

13 Revenue funding for coastal protection is also a major issue for Ceredigion and Gwynedd. Both services operate to very tight budget restrictions; annual revenue budget for Gwynedd is about £100,000 and Ceredigion just £41,000. Within the budgets, capacity must also be found to deliver beach monitoring and the inspection, repair and maintenance of local authority coastal defence assets. Storm events lead to the need for essential repairs to make assets safe and to restore their effectiveness. Services recognise that emergency repairs invariably exceed the revenue funding available and rely on emergency grant funding provided by the Assembly Government. Recovering this emergency expenditure is not certain and can be a protracted process. Both Ceredigion and Gwynedd are aware that storms of, or greater than, the magnitude seen in 1990 are likely to occur and would cause extensive damage to coastal defence assets across Wales. Climate change means that there is an increasing likelihood of such events. Local and national funds would not be sufficient and reserves would be needed to fund post-storm recovery and service delivery.

14 Both authorities rely on local knowledge held primarily by individual officers. Information systems including for asset management, the analysis of beach monitoring data and risk planning, are also underdeveloped. This is a Wales-wide issue, and although some annual returns are made, the Assembly Government has only a weak understanding of current condition of local authority assets and future needs. Beach monitoring data is also not

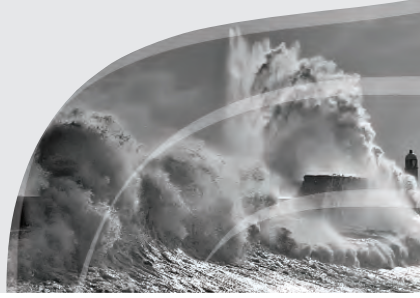


collated nationally, although Gwynedd will now lead on this for Wales and develop baseline data over the next five years. The absence of data means that the Assembly Government cannot inform strategic decision making and is unable to prioritise candidate schemes from the perspective of risk or form an overall plan that integrates the roles of all the necessary stakeholders. Currently, this also means that grant applications to support major coastal protection schemes, such as the scheme for Aberareon, are being evaluated and determined with little apparent regard for the bigger picture.

15 Both Ceredigion and Gwynedd are aware of the Assembly Government's *New Approaches Programme* and support the need for the proposed changes. However, the current state of local service delivery, organisation at the national level and the absence of clear policy and working guidelines could make this transition unnecessarily difficult.

Appendix 4 – Current roles and responsibilities of stakeholders

Organisation	Role and responsibility
European Union	The European Union has an increasing influence over management of the coastal zone through legislation, directives such the *Water Framework Directive* and *Marine Strategy Directive*, and supporting programmes including the European Regional Development Fund Convergence Programme 2007-2013.
Central government/DEFRA	DEFRA retains the lead role for Integrated Coastal Zone Management, the sustainable management of coastal waters and for new legislation such as the *Flood and Water Bill and Marine Bill.* Building Regulations contribute to increased flood resilience and quicker recovery.
Assembly Government	The Assembly Government has national policy responsibility for flood and coastal risk management, nature and heritage conservation, sustainable economic and community development, and setting the national planning policy framework for the coast. Provision of funding through grant-in-aid to the Agency and administers grants for capital projects to local authorities and internal drainage boards. The Assembly Government does not build or manage flood defences nor direct the authorities on which specific projects to undertake.
Environment Agency Wales	The Agency is an Assembly Government Sponsored Public Body with responsibility to protect and enhance the environment, and contribute to sustainable development. The Agency is the principal operating authority with powers to reduce the risks from tidal flooding by building and maintaining defences and other management measures, advising on coastal developments, providing flood forecasting, and warning and improving public awareness of flood risk. The Agency also has a general supervisory duty in all matters relating to flood defence.
Local (maritime) authorities	Maritime authorities have permissive powers to protect the land against erosion or encroachment from the sea by providing coast protection features such as defences. They also regulate planning and development control and promote economic development, coastal tourism and coastal management. Local authorities have a duty of community leadership and are the democratic bodies that have the lead responsibility for community engagement on coastal issues. They lead local and regional resilience forums in co-ordinating emergency plans, advising on risk and, with the emergency services, in leading the response during flooding incidents. Local authorities deal with the consequences of flooding such as support to affected communities, emergency housing, and managing the clear-up operations and the recovery stage.
Countryside Council for Wales	Statutory advisor to government on the environment and coastal waters as sources of natural and cultural riches, as a foundation for economic and social activity, and as a place for leisure and learning opportunities.



Organisation	Role and responsibility
National park authorities	Coastal national park authorities have planning, development control and coastal management responsibilities in partnership with local authorities.
National Trust	National Trust manages, and has stewardship of many, heritage assets and 230km of coastline.
Coastal groups	Coastal groups are voluntary groups made up of maritime authorities and other bodies with coastal defence responsibilities. They produce SMPs on behalf of local authorities.
Flood Risk Management Wales	This is a committee of the Agency's executive arm for flood risk management in Wales. The committee is responsible for managing the agency's budget for flood risk management in accordance with agreed priorities. The committee has no jurisdiction over local authorities and their coast protection activities.
Internal drainage boards	Independent bodies responsible for land drainage in areas of special drainage need (generally very low-lying land that requires active management of water levels).
MoD and other public sector landowners	There are many other public sector landowners and developers of property that may undertake coast protection or sea defence works with the relevant consents.
Private sector	Private sector landowners may undertake coast protection or sea defence works with the relevant consents.
Insurance industry	The insurance industry has an important role as a stakeholder and in their decisions to maintain insurance cover as the new risk management approach to flooding and coastal erosion develops.
Residents	Those living in coastal areas should become more aware of the current and future risks from erosion or tidal flooding, and take precautions to protect themselves and their property. Residents should also become involved in the decisions that affect their communities and any necessary actions.