

### Flood and Coastal Risk Management

#### Summary of Current ICE Position

In the UK 4.5M people and 2.5M homes are at risk from coastal and inland flooding<sup>1</sup>.

Flooding is a natural phenomenon which cannot be prevented but its impact can be reduced by flood forecasting, public warnings, engineered defences and by making urban areas more flood resilient.

ICE believes that ensuring that adequate defences exist and longer term improvement of the flood resilience of buildings and infrastructure is a key responsibility of government and engineering professionals. It is also the responsibility of government to ensure that the management framework for coastal defence and inland flood risk assets secures maximum value from the budget available.

There are numerous contributory factors to flood and coastal erosion risk including topography, change of land use, state of repair of water infrastructure and long term changes in weather patterns. As these factors and their associated risks change, so should flood risk management plans and infrastructure. The government's *Foresight* study into future flooding estimates that changing weather and development patterns could lead to a need to spend between £22B and £75B in the period up to 2080 on new engineered flood defences, although more intelligent and integrated approaches to flood risk management could control the increases required.<sup>2</sup>

It was therefore disappointing that the flood defence budget was cut in 2006 as a result of financial difficulties created elsewhere within DEFRA. These cuts, now partially reversed, follow a trend in which investment in flood defence has fallen back in real terms three times in the past decade, followed by significant increases<sup>3</sup>, in response to high profile flood events. The impact of this "stop-start" approach has been exacerbated by the Environment Agency's move in 2002 towards a "priority scores" based system for allocating monies for coastal and flood risk management, in which the "priority" threshold moves annually in response to budgets. "Stop-start" has also damaged the Agency's welcome efforts to implement plans to develop and retain the skilled engineering staff it requires to fulfil its flood defence functions.

The Environment Agency needs to improve the efficiency of the management of its capital programme. At present the proportion of spending on project development and management is unacceptably high.

Increasing development on flood plains increases the number of properties vulnerable to flooding and can exacerbate existing flood risks by reducing drainage opportunities for surface water. Where such development does take place, too little attention is paid to mitigating or avoiding flood risk through the detailed and innovative design of settlements such as in the Netherlands<sup>4</sup>, where capacity is also developed in all the stakeholders to better manage or live appropriately with flood risk.

Planning Policy Statement 25<sup>5</sup> provides guidance on development and flood risk but the "sequential" and "exception" tests within PPS 25 have provided "get out clauses" for Authorities and developers. Furthermore, there are concerns that Local Authorities lack the necessary technical expertise to make responsible decisions as Government has consistently forced Authorities to outsource.

<sup>1</sup> ICE (2006), *The State of the Nation 2006*, Institution of Civil Engineers, London, UK

<sup>2</sup> Office of Science and Technology (2004), *Foresight, Future Flooding*, HMSO, London, UK

<sup>3</sup> National Audit Office (2007), *Building and Maintaining River and Coastal Flood Defences in England*, HMSO, London, UK

<sup>4</sup> *Advances in Urban Flood Management*. Ed. Ashley R M., Garvin S., Vassilopoulos A., Zevenbergen C. Taylor & Francis. COST C22. ISBN 978-0-415-43662-5. pp 415-432.

<sup>5</sup> Communities and Local Government (2006), *Planning Policy Statement 25: Development and Flood Risk*, HMSO, London, UK

Longer term, in the context of climate change pressures, expert and public debates are required to establish if any areas of the UK will not be defensible either in financial terms or because the carbon footprint of the necessary infrastructure will prove unacceptable in an era of statutory carbon budgets. Whilst any crisis point may be decades away, planning for retreat from existing urban areas or the more widespread use of non-structural measures would need to begin now and political questions such as compensation for property holders resolved early.

### **What ICE wants to see happen**

- An end to “stop-start” development of flood and coastal defences. A clear, securely funded, long term, forward investment programme is required. Government must take a lead in brokering consensus on the level of defence that will be put in place and how the costs for its construction and maintenance should be divided up and how residual risks should best be managed.
- The Environment Agency should take steps to improve the efficiency of the management of its capital programme. To facilitate this process the Agency should move to contractual mechanisms that provide a long-term (5-10 years plus) commitment to investment.
- Local Authorities must be given the technical and political support to effectively implement PPS25 and ensure that development and its impact in areas of flood risk is minimised. Where development is approved, closer attention must be paid to detailed design for flood resilience. Local Authorities should also be the main providers of the key information and knowledge for all stakeholders to better engage in the process of flood risk management. This is logical, given the local authority role in contingency planning.
- The 2007 floods confirmed advice already given by the government’s Foresight programme and ICE/IMEchE on the vulnerability of water, road, rail and energy infrastructure to flooding. Owners and operators need to review their arrangements for flood risk management and where necessary invest in improvements. The planning process must ensure that new facilities are adequately protected or sited at lower risk locations.
- The definition of a single body with strategic overview responsibility, authority and accountability for all aspects of flood risk management together with the appropriate legislative authority and resources to deliver this.
- Longer term, professionals and government must engage with wider civil society to establish the level of flood risk management that will be sustainable in financial and carbon footprint terms and develop clear guidance as to when, where and how alternative or complementary non-structural measures may be utilised<sup>6</sup> in addition to any defences. If this requires a significant increase in already planned retreat from urban areas or different ways of living, planning must begin now and political issues such as compensation and incentives resolved at an early stage to prevent large areas of the UK suffering from blight.

### **Background and key issues**

#### **(i) Flooding and Flood and Coastal Defences in the UK**

The UK has suffered major inland floods in 1998, 2000, 2003 and 2007. There has not been a major coastal flooding incident since the 1950’s but erosion and rising sea levels remain a pressing issue. The 2000 floods caused damage estimated at £1B<sup>7</sup>. The 2007 floods led to 150,000 homes temporarily losing their water supply and a further 50,000 left without power<sup>8</sup>. The impact of climate change is predicted to increase the number of extreme weather events which is linked to flooding on this scale and with the attendant devastating impact on human health and happiness.

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<sup>6</sup> e.g. Cooper J., High H., Donovan B., Steel M. (2007). Management Of Residual Risk Using Non Structural Responses In The Thames Estuary. Defra Floods and coastal protection conference York. Paper 06-5.

<sup>7</sup> Environment Agency (2001). *Lessons Learned: Autumn 2000 Floods*, Environment Agency, Bristol, UK.

<sup>8</sup> *Flooding is a “wake up call” says Environment Agency*, New Civil Engineer, 26 July 2007

In England and Wales alone, over 4 million people and properties valued at over £200 billion are at risk from flooding<sup>9</sup>. In these two nations, responsibility for assessing flood risk and constructing and maintaining flood defences rests with the Environment Agency, using funding received from a levy on local Authorities and grants for capital works from the DEFRA or the National Assembly for Wales. In Scotland, the Executive provides grants to Local Authorities for flood defence scheme, whilst in Northern Ireland responsibility sits with the Rivers Agency within the Department of Agriculture and Rural Development. The Environment Agency alone is responsible for over 24,000 miles of flood defences and 46,000 physical flood defence assets<sup>10</sup>. Many of these date back to the 1970s and these ageing defences which will soon need urgent attention a situation exacerbated by the need for adaptation to cope with the impact of climate change. The Agency itself has identified the condition of a significant percentage of these structures as poor<sup>11</sup>.

#### (ii) Short Term Funding Issues

Current spending on flood risk management in England and Wales is £483M, down from £550M in 2005/6. This reduction was a direct result of DEFRA's financial difficulties over the Single Farm Payment scheme. Whilst the government has now promised to reverse this decision and boost flood defence spending by £200M in 2010, this forms part of a trend in which investment in flood defence has fallen back in real terms three times in the past decade, to be followed by significant increases.<sup>12</sup> This "stop-start" approach can endanger important capital projects, puts pressure on the maintenance of existing assets and significantly impairs a strategic approach to developing our flood defences. This situation has been exacerbated by the DEFRA's 2002 introduction of a "priority scores" system for allocating monies to coastal and flood management projects. In practice this has led to spending falling ever further behind the level of flood defences deemed cost effective, as the "priority" threshold has moved annually in response to budgets.

These fluctuations mask deeper questions of funding policy. There is a clear distinction between managed retreat, effectively walking away from unsustainable defences and the increasing backlog of schemes where the costs associated with identifiable risks are in excess of the costs of their mitigation.

#### (iii) Longer term sustainability of flood defences

In the short term, whilst ICE believes it is the role of government to ensure that adequate defences are in place, this does not mean that the entire financial burden should fall on the public purse. Government and particularly the Environment Agency must engage with landowners, insurers, developers and other interested parties to establish what, in the face of climate change will be affordable and how the costs can be fairly shared.

Longer term, expert and public debate is needed to establish what level of public spending on flood defences is acceptable, given other demands on the public purse. In addition, given the likelihood of the UK adopting compulsory carbon budgets,<sup>13</sup> the carbon footprint of a major expansion of "traditional" infrastructure may also be unacceptable.

This situation highlights the importance of improving the flood resilience of the built environment as discussed elsewhere in this paper. More fundamentally however, it may mean that it will not be sustainable to defend some significant areas of the UK. Whilst the crisis point may be several decades away, planning for retreat from existing urban areas would need to begin now, political questions such as compensation for property holders resolved at an early stage and the quality of public engagement improved vastly, to prevent whole areas being blighted by uncertainty.

#### (iv) Skills for Flood Defence

A further negative consequence of the "stop-start" approach to developing the UK's flood and coastal defences is that it has reduced the ability of the Environment Agency and its suppliers to invest in the necessary human resources. This has undermined the steps taken in recent years to ease the shortage in flood defence skills

<sup>9</sup> Office of Science and Technology (2004), *Foresight, Future Flooding*, HMSO, London, UK

<sup>10</sup> National Audit Office (2007), *Building and Maintaining River and Coastal Flood Defences in England*, HMSO, London, UK

<sup>11</sup> Environment Agency (2004), *Flood defence inspections and assessment of flood risk*, Environment Agency, Bristol, UK

<sup>12</sup> National Audit Office (2007), *Building and Maintaining River and Coastal Flood Defences in England*, HMSO, London, UK

<sup>13</sup> HM Government (2007), *Draft Climate Change Bill*, HMSO, London, UK

identified by ICE in its 2001 report to government, *Learning to Live with Rivers*<sup>14</sup> and taken forward in its 2004 report, *Engineering Skills for Flood Risk Management*<sup>15</sup>.

(v) Management of the Environment Agency Capital Programme

The National Audit Office has found that in 2005/6 29% of the Agency's capital budget for river and coastal defence was spent on programme management and planning<sup>16</sup>. This is well above the level one would expect in the utilities sector and suggests that the Agencies business processes need significant streamlining.

At present too much effort is spent on assessing the benefits of individual schemes and not enough on delivering these benefits. It should be questioned whether a three stage process of assessment and planning (Policy Development, Strategic Planning and Project Appraisal) is required before readily justifiable schemes can be implemented. Whilst proper assessment is vital, the current situation is leading to very drawn out process between identification of need and delivery on the ground. As an example, a new flood defence scheme in Marlow is due to be operational in 2009, six years after the flooding events which demonstrated it was needed. By contrast a scheme 5km away in Hambledon falling beneath the DEFRA/EA threshold for funding and supported by the local council was commissioned in 2003, less than a year after the need was identified.

We would like to see the delineation between asset maintenance and capital works that currently exists within the Environment Agency removed as a first step in improving overall efficiency in asset management. The Agency should also roll out the use of contractual mechanisms that provide a long-term commitment to investment at a rate that enables real planning and asset sweating.

(vi) Technical Expertise on Regional Flood Defence Committees

We are concerned about the level of technical expertise available to Regional Flood Defence Committees. These bodies take decisions about the annual programmes of improvement and maintenance work to be carried out by the Agency. Committees are quite rightly made up largely of local Councillors. Whilst this provides an important element of democratic accountability, we are concerned that many Committees do not have access to the expert, technical advice they need to make informed decisions.

(vii) Development in Flood Plains

The Government's July 2006 Housing Green Paper<sup>17</sup> increased the target for new homes to be built by 2020 to 3 million and reiterated that a proportion of these homes would be built on flood plains, notably in the Thames Gateway. Development in flood plains has obvious risks, both in terms of increasing the number of properties that are potentially vulnerable to flooding and in exacerbating existing risks by reducing the drainage routes for surface water. Planning Policy Statement 25 (PPS25) issued by government in December 2006 aims to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flood risk and to direct development away from areas of highest risk. Where such development is deemed necessary, PPS25 includes guidance aimed at making it as safe as possible without increasing the overall risk of flooding. Whilst ICE supports the intent of PPS25 we have concerns as to the whether local planning authorities have access to the skills to make proper assessments. We are also concerned that the "sequential" and "exception" tests in the document effectively provide "get out clauses" for planning authorities to approve inappropriate development.

(viii) Urban Design Issues

The June/July 2007 floods demonstrated that in extreme events the bulk of flood water is conveyed on the surface, meaning that in these circumstances SUDS and improved drainage will have little impact. Urban development thus needs to be designed to accommodate the passage of surface water. The technology also exists to make buildings themselves more resilient to flooding. In addition, as water flows downhill, low lying land in areas of flood risk should only be designated for low value development and definitely not housing.

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<sup>14</sup> Institution of Civil Engineers (2001), *Learning to Live with Rivers*, Institution of Civil Engineers, London, UK

<sup>15</sup> Institution of Civil Engineers (2004), *Engineering Skills for Flood Risk Management*, Institution of Civil Engineers, London, UK

<sup>16</sup> National Audit Office (2007), *Building and Maintaining River and Coastal Flood Defences in England*, HMSO, London, UK

<sup>17</sup> Communities and Local Government (2007), *Homes for the future: more affordable, more sustainable - Housing Green Paper*, HMSO, London, UK

(ix) Design of Highways, Drainage and Culverts

Initial indications are that the impact of the 2007 floods was exacerbated by poor drainage of surface water. In addition changes in land management and farming practices have increased the likelihood of “sheet run-off” and washed away sediment blocking drains. Local Authorities have responsibility for the maintenance of drains and culverts, a service which has been under funding pressure for many years. If, as predicted, torrential rainfall and flash flooding become more common in the UK, design and maintenance standards for both these facilities and highways will need to be revised, together with clearly designated funding streams. However in genuinely extreme events, the majority of water may be carried on the surface, so neither improved drainage or SUDS (discussed below) should be seen as a panacea for managing flood risk, rather there will be a need to manage these systems for ‘exceedance’, ensuring flows pass to areas where the least impact can occur.

(x) Sustainable Drainage

Traditionally, drainage of surface water in urban areas has been delivered via underground pipe systems which prevented local flooding by conveying the water away as quickly as possible. This alteration of natural flow patterns can however simply displace the problem, causing flooding downstream.

ICE is therefore supportive of the use of Sustainable Drainage (SUDS) systems which as far as possible mimics the natural drainage of a site and deals with runoff close to where rain falls. Such design can reduce the risk posed by development in areas where existing sewerage systems are close to full capacity. However, as noted above, SUDS are not a panacea for managing flood risk in the event of genuinely extreme events.

(xi) Availability of Data on Flood and Coastal Erosion

Much of the existing data on condition and residual life of defence assets is known to be of poor quality and/or out of date. It is unacceptable, at time of increasing risk of flooding and erosion to have an inadequate understanding of how our defence systems will respond.

(xii) An integrated approach to implementation of EU Directives and other legislative drivers

The forthcoming requirements of the EU Flood Directive, the EU Water Framework Directive and the increased focus on integrated Coastal Zone Management planning will need to be pulled together into a single streamlined approach to the planning and management of flood and coastal defences. Government can take a lead by developing, testing and communicating clear policies to industry, well in advance of the deadlines in the various directives.

(xiv) Division of responsibility for flood risk management and coastal erosion

The current responsibilities for management of flood risk emanating from drains and sewers, roadways and from watercourses to the sea are opaque to the person in the street. We believe a single regulatory body should be given oversight of flood risk management possibly in the context of sustainable water management in order to capture water quality issues. A single body with a strategic overview can also be expected to streamline the lengthy approvals process that often bedevils the sector. Similarly ICE supports calls by the Association of Chief Fire Officers for greater clarity for the public in respect to responsibilities and powers for emergency response and clear up.

(xv) Vulnerability of Critical Infrastructure

The Summer 2007 floods have reaffirmed the vulnerability of critical road, rail, water treatment and energy infrastructure to flooding. The companies and Agencies responsible need to review their arrangements for flood defence and where necessary invest in improvements. The planning process must ensure that new facilities are adequately protected or sited at lower risk locations.

### Principles

Flooding can be managed but not totally prevented.

Flooding damages property, businesses and national wealth. Coastal erosion permanently damages land, houses and businesses. Flooding and erosion also cause enormous human distress and health damage. Analyses of the costs and benefits of activity to mitigate flood risk must take this into account alongside traditional economic assessments.

The carbon footprint of flood defence assets should be taken into account when assessing the desirability of schemes.

Defences are not the only response at our disposal. Alternative or complementary measures are also available collectively termed 'non-structural' measures. Many of these do not require construction and are often overlooked by engineers because of this. Recently a combination of 'structural' and 'non-structural'; measures has been shown to be effective in planning flood risk management for London up unto the end of the century.

It should be a responsibility of government to ensure that an adequate level of defence is in place and that the Agencies responsible for assessing and managing flood risk are properly funded and managed effectively. However, it does not follow from this that all flood defence costs should be met from the public purse. Government should lead on facilitating agreement between stakeholders on meeting the costs of an agreed level of defences.

Delivery of flood defence requires the development and maintenance of a body of skilled engineers. Lay decision makers should make decisions based on advice from technically competent persons.

Development can have a significant impact on flood risk. Flood risk management should be fully integrated into all aspects of spatial planning, urban design and development control.

Clear plans should be in place to protect critical infrastructure including power stations and water treatment plants from the dangers of flooding.

ICE is supportive of Sustainable Drainage Systems where appropriate but does not believe they are a panacea to flood risk management