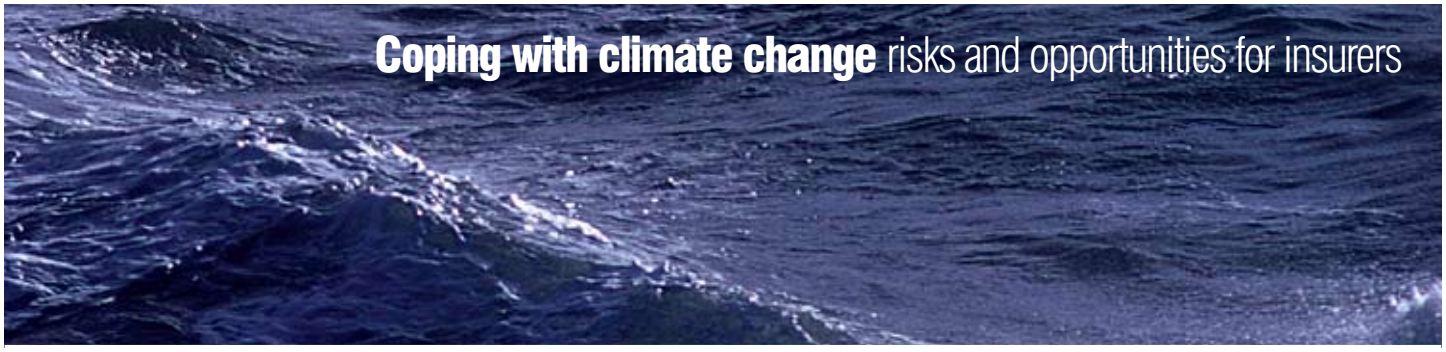

Chapter 7

Personal lines property business

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7.1 Introduction

This chapter deals with the impacts of climate change on the Personal Lines Property account in the UK. The key issues are obviously flood, followed by storm and subsidence. Freeze is a diminishing problem in the UK with climate change raising average temperatures, particularly night-time ones. Climate change could increase the incidence of damage or loss of buildings through other hazards, such as forest fires, insect infestation, or mould, but these are unlikely to be significant, because the number of losses will be relatively small, or cover is not provided.

Section 7.2 sets the scene. Flood is dealt with extensively in section 7.3. Sections 7.4, 7.5 and 7.6 look at storm, subsidence and briefly, extreme temperatures. Claims issues are covered more extensively in section 7.7, then reinsurance in section 7.8. Section 7.9 restates the main conclusions and recommendations.

Property cover and the respective regulations vary greatly from one country to another, as will the way that the climate changes in future, so this study focuses on the UK. Insurers in other countries may be able to adapt this analysis for their own markets.

7.2 Setting the scene

Social and economic factors

Since the last CII report on climate change, house owners have benefited from a stable period of low interest rates and an unprecedented lending boom. Combined with demographic factors such as smaller families, migration and longer life expectancy this has led to a significant increase in demand for new housing and in turn rising house prices.

There is a shortage of building land, particularly in the South. Current macroeconomic models of house prices and land supply such as the Barker Review[1], do not appear to take into account the growing risk of flood from climate change. Over the period 2003 – 2026, more than 2.3m new homes will be needed in the south east. Much of this is targeted for flood-prone zones, such as the Thames Gateway. In the past, when such properties flooded, any impact on house prices in the area tended to be short term, because insurance was available and housing demand high.

The Environment Agency (EA) has expressed concern about the essential environmental infrastructure needed to support the growth in new housing planned in the South East of England[2]. EA is particularly concerned about:

1. Floodplain development. Already 4.5m people are at risk of flooding in England and Wales.
2. Demand for water. It is expected to increase by 20 per cent in the South East, partly due to rising consumption per person in warmer weather, but mainly due to the increased number of households. The South East is the driest part of England with the highest population density. Four large new reservoirs will be needed and three will have to be expanded substantially.
3. Sewage disposal. Rising water consumption, more houses, and lack of sustainable drainage practices widely, will result in the need to spend £7.5billion on new sewage treatment works over the next 20 years in the South East alone[3].

EA reckons that the average environmental infrastructure cost per house in the South East of England would be over £20,000. This level of expenditure is unlikely. The consequences will be water shortages, flooding and sewage contamination at an increasing level of severity.

The role of planners will become increasingly important. Planners will have to balance competing demands of economic progress and environmental sustainability. They will need to work more closely with the private sector, local communities and NGOs, to create places that people care for and enjoy, planning areas and neighbourhoods which flourish while protecting the environment. A recent report contains the quotation: "Urban planning is, in short, facing a 'paradigm crisis' as its classical foundations are exposed as anachronistic, dangerous and intellectually spurious."[4]

Insurers' response to flood risk will be a crucial element in the housing market. The industry is fighting hard to get this message across since the continued availability of cross-subsidised flood insurance for domestic properties is still largely taken for granted by planners. The dynamics linking flood risk, insurance responses and society have major consequences for issues such as homelessness, vulnerable groups, provision for old age, stability of the housing market, survival of new small businesses, and social exclusion and cohesion issues.

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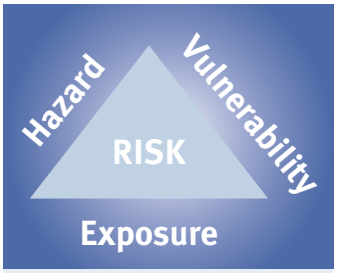
This is compounded by the end of the era of easy credit. In future lenders will take more note of insurability when allocating their funds. There is an additional challenge for the mortgage lending industry: there is increasing demand for interest-only "inter generational" mortgages to enable first time buyers to get on the property ladder. These very long term mortgages are based on the assumption that the underlying property asset will still be insurable many years in the future.

The Crichton risk triangle[5]

With a changing society and climate, it is no longer possible to rely on historical claims, experience to predict risk. Underwriters have to analyse each of the components of risk to understand how it is changing. Imagine an acute-angled triangle where the three sides are hazard, vulnerability and exposure. The area of the triangle represents the risk, so if any one of these components is missing, then there is no risk.



The Crichton Risk Triangle

This concept can be used for any type of risk but it is particularly relevant to flooding. For example, a sandbank in the middle of a river estuary may flood at every high tide, but if there are no vulnerable buildings on it, there is no risk.

To model risk also requires consideration of the concept of probability, in terms of both frequency and severity. This is usually associated with the hazard – how often it occurs and how extreme it is. However, exposure and vulnerability can also vary in frequency and severity. For example, a river bank has a higher exposure when it is full of campers in tents; a housing estate is more vulnerable at night when people are sleeping.

According to research at Manchester University the Crichton risk triangle concept works well with Geographic Information Systems. Each dimension can be used to assess the spatial aspects of the location from which the associated risk can be derived using overlay analysis. They stress the importance of creating databases with meaningful thresholds based on current knowledge[6]. One example is the National Flood Insurance Claims Database (NFICD), described later.

7.3 Flooding

Britain has a maritime climate which means it is one of the wettest countries in Europe. However, the topography and prevailing winds mean that the west is wetter than the east. Thus in the West Scottish Highlands, the average annual rainfall is 5100mm, while London's average is 600mm.

Just because the west is wetter than the east does not mean it is a higher flood risk. People have adapted; they build bigger drains and avoid flat roofs or building on flood plains. What matters will be the extent to which society, especially in the East and the South, will adapt to the increasingly severe flood risks predicted with climate change (see Chapter 3). The Foresight Programme has produced shocking predictions of how the costs of flooding could escalate in the future with climate change if action is not taken. One possibly helpful factor is the introduction of various European Directives.

England would certainly seem to have the biggest flood problem in the UK, as the comparative analysis shown later will explain. The ABI has pressed, with considerable success, for increased public spending on flood defences in return for a commitment to maintain flood insurance in protected areas, but it is increasingly difficult to obtain insurance for new build properties in flood hazard areas. There is anecdotal evidence

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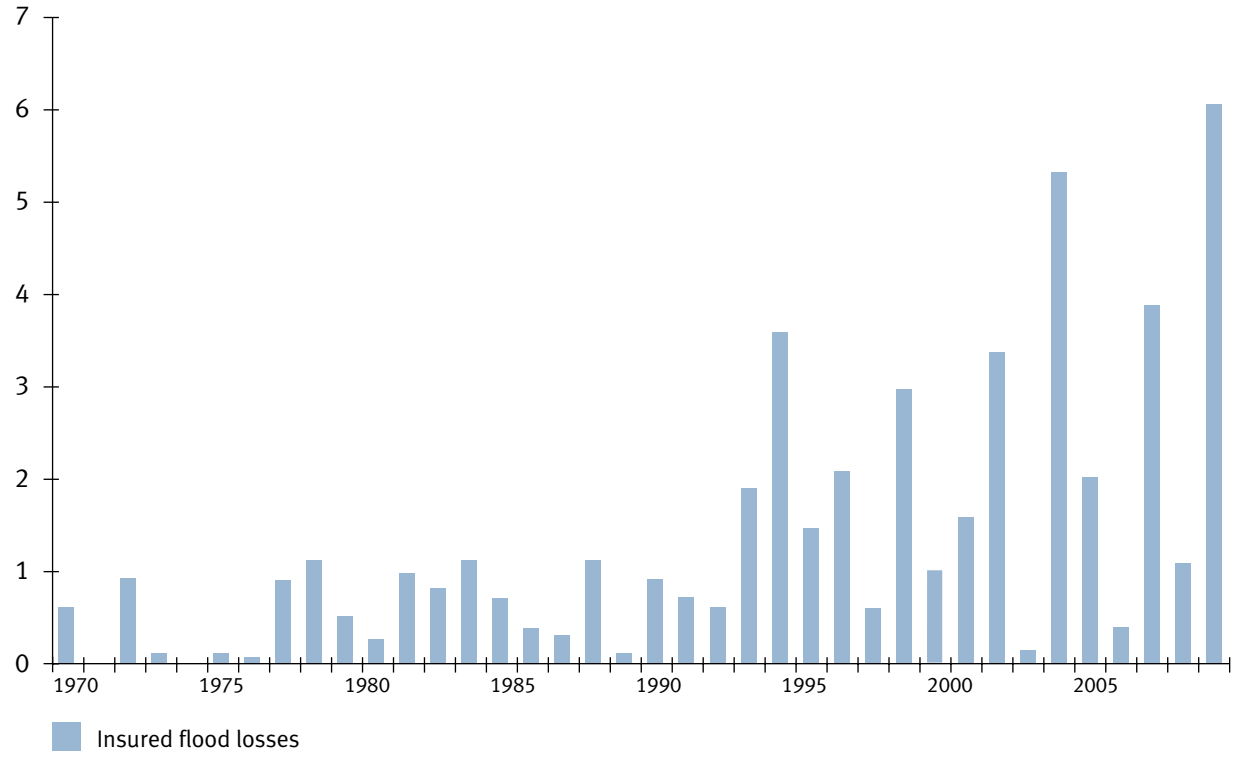
that such areas are increasingly used for developments which are not dependent on individuals with mortgages, like social housing including homes for the elderly and disabled. If so, it could mean that current insurance strategies at least in England, are indirectly leading to the most vulnerable members of society having to bear the brunt of future disasters.

Flooding cannot be considered in isolation; the impacts will depend on social and economic factors. Above all, the human factors are arguably the most important and most neglected area of discussions about flood. The author of this section has spoken with hundreds of flood survivors over many years and their mental and physical suffering has clearly made a lasting impression on them.

Recent events

There has been a dramatic increase in insured losses from flood globally in the past 50 years (Figure 1). Swiss Re acknowledges that much of this is due to socio-economic effects, like greater insurance penetration, and more vulnerable property, but they also assert that global warming has contributed: the hydrological cycle is more active, resulting in more precipitation.

Figure 1: Insured flood losses 1970-2007 in constant value 2007 $ billion



Source: Swiss Re, Sigma 1/2008 Natural Catastrophes and man made disasters in 2007

The United Kingdom has mirrored this experience (see Table 1). Most of these floods have been caused by severe or prolonged rainfall events which are predicted to become more extreme and uncertain with climate change. Many UK cities are low lying and exposed to flooding hazards from rivers or sea level rise including all of the biggest cities other than Birmingham. This means that major flood events can be particularly damaging in Britain.

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Table 1: Recent Catastrophic British floods

Year	Type	Place	Effects
1864	Dam break	Sheffield	250 deaths
1947	Snow melt	Widespread	Business and transport disruption. Little insurance
1952	Flash flood	Lynmouth	34 deaths
1953	Storm surge	East coast	£5bn property loss at current prices. 304 deaths. Little insurance
1993	Snow melt and rain	Perth	Highest ever river flow in UK. "Wake-up" call in Scotland. £50m insured loss
1998	Rain/river	Midlands and Wales	Some insurers unready to cope
2000 (twice)	Rain/river	England/Wales	Insured costs reached £1bn
2001 (twice)		England	
2005	Rain from "Kyrill"	Carlisle	£350m insured damage
2007 (twice)	River, surface water and sewer flood	England and Wales	42,000 properties flooded. Insurance cost around £2.5bn
2008	Rain	N. Ireland	Emergency services unable to cope

The Thames Estuary

The Thames Barrier is intended to protect central London from a repeat of the 1953 storm surge, in which 304 people died. This was the most costly flood event in the UK so far in terms of economic losses which are estimated at £5bn at current day values. Exposure has, of course, increased significantly since 1953 and the Environment Agency estimate that without the Thames Barrier, a repeat of the 1953 flood could now cost £30bn.

The Barrier will protect London against the 1,000 year flood until 2030, but it will have to be closed more often. In its first 18 years of operation it was raised twice a year on average. In winter 2002/3 it was used on a record 14 consecutive tides. By 2030, due to sea level rise and other factors, it has been estimated that it will need to be raised 30 times a year on average[7]. Further protection will be needed at some point in the next 30 to 50 years.

Upstream, along the non tidal stretch of the Thames, some 12,000 houses are within 500 metres of the river bank, and their riverside location adds £580m to the value of these properties[8]. Along the tidal stretch of the Thames, 800,000 people live within a ten minute walk of the river.

Autumn 2000

After a dry summer, in September 2000, a research report was published by the Association of British Insurers[9]. This predicted that the maximum probable loss for a fluvial flood could cost insurers as much as £1bn. The report was widely denounced as impossible. Three weeks later the critics were silenced when the autumn of 2000 turned out to be the wettest for England and Wales since 1766, bringing floods which cost the insurance industry almost £1bn, a record for UK river flooding at the time. However, it was not to hold this record for long.

Summer 2007

In 2007, England and Wales had their wettest summer since records began in 1766. The record downpour in June flooded 27,000 homes and 5,000 businesses in the Midlands, Yorkshire and Northern Ireland. Sheffield, Doncaster and Hull were particularly affected, because drainage systems could not cope, costing insurers up to £1.5bn. Hull was the worst affected with 9,000 insurance claims as 15,000 homes in 240 streets were flooded. Unfortunately many people in Hull were uninsured against flood as was the City Council itself, and the flood was made worse by badly maintained storm drains. The rain in July resulted in rivers overflowing and flooding 10,000 homes in Gloucestershire, Oxfordshire, Warwickshire, Worcestershire and Bedfordshire. It is estimated that this event alone could have cost insurers more than £2bn.

The insured costs could have been much higher. The July 2007 flooding in central and western England left at least 350,000

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homes without running water and 50,000 without power. A further 250,000 would have lost power and water if Gloucester's Walham substation had flooded, but emergency crews with help from the army worked overnight to save it. If it had flooded, the GCHQ base in Cheltenham would have had to cease operations. Antisocial elements of the population interfered with emergency water supply and temporary water barriers, but criminal damage to evacuated properties was light.

The local effects were severe. However, the affected areas account for less than 3 per cent of GDP so the impact on national GDP was only about £2bn to £3bn or 0.2 per cent. Ironically a flood event can even stimulate GDP in the short run, owing to increased sales of building materials and household goods.

One consequence was that several reviews of the floods were commissioned. The crucial one was the Pitt Review[10], which made a wide range of recommendations. The ABI also felt able to take a hard line in its negotiations with Government over flood insurance[11](see later on both).

Drainage and waste disposal problems

The EA report on the autumn 2000 floods[12] indicated that 14 per cent of the properties flooded were flooded by drainage surcharge or sewage overflows. Research by the author for the government[13] indicates that 40 per cent of inland flood claims in 2000 were outside the indicative floodplain maps published by EA, although this figure falls to 25 per cent if the floodplain map boundaries are extended by a 250m "buffer". This suggests that the remaining 15 per cent of inland flood claims are due to backup into combined sewers and small watercourses; similar to the EA's figure. Sewage flooding is a continuing concern: nearly 5,000 properties were flooded from sewers[14] in 2006. Not only does this type of flooding cause great distress, it can also cause illness, especially in warmer weather.

There will be particular problems in urban areas near the coast from flash floods in the summer, because as the sea surface temperature increases, this could lead to more frequent and severe thunderstorms. Such pluvial floods could happen anywhere, even on high ground as in the Llandudno floods of June 1993 and cannot be mapped in advance.

It is interesting that in recent court cases in Norway[15] it was held that insurance companies should be able to recover their flood claims' costs from the relevant water authority for any flooding events where the return period was more frequent than 1 in 100 years, regardless of European standard EN752 which only requires drainage for storms up to at most the 1 in 30 year event. Ashley et al. warns[16] that climate change impacts on drainage will mean "householders, for example, having to deal more explicitly with their own flood (and other) risk management." Ashley correctly points out that the relationship between storm return period and flood return period is not linear.

A serious issue with sewage is the cessation of weekly refuse collection in many places. This is likely to lead to greater use of toilets for disposal of unsuitable items, which in turn could lead to overloading of sewage systems and more blockages and flooding[17]. Also, the uncollected waste will add to pollution of flood waters.

European Directives

A number of European Directives will help to shape the UK response to flooding.

1. The Water Framework Directive has been transposed without qualification into the law in England, Wales and N. Ireland. Directive 2000/60/EC2 introduced the principle of cross-border coordination within river basins, with the objective of achieving good ecological quality for all waters, but it set no objective on flood risk management. It will effectively prevent the modification of rivers and lakes to adapt to the increased rainfall severity predicted by climate scientists. Thanks to prolonged and strenuous lobbying by the insurance industry and others, the Directive was transposed in Scotland subject to sustainable flood management taking priority.
2. The Flood Directive. This "Directive on the assessment and management of flood risks" has requirements on international cooperation in shared river basins (which in the UK of course will only affect Ireland) and preliminary flood risk assessment and mapping. More emphasis is placed on the role of flood plains and sustainable land use practices. Climate change adaptation will be considered in the first implementation cycle, starting in 2011.
3. The Solvency Directive[18] and the forthcoming Solvency II Directive will require closer control by insurers of risk accumulations in flood hazard areas. This latter Directive is likely to be a "tipping point" for some insurers in their provision of flood insurance in high risk areas. Other tipping points are outlined later.

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Flood risk in the four UK legislatures: a comparison

A survey in 2006 by ISL Ltd (a company which administers quotation systems for household insurance) found that householders in flood-risk areas in Aberdeen, Glasgow, Edinburgh and Perth could significantly reduce their annual building insurance premium by switching to one of the insurers which recognise that flood risks are being well managed in Scotland[19].

There are certainly major differences between the four parts of the UK[20]:

England

Exposure

- 10 per cent of the 22m households in England are in flood hazard areas[21].
- Since 2000, 11 per cent of new houses in England have been built in flood hazard areas[22].
- Spending on flood defences is rationed by a "priority scoring" method. This method means that the benefits have to be at least six times the costs to justify a scheme[23, 24]. There can be delays of many years before a scheme is built. Often, schemes only protect against small scale floods, and are poorly maintained.

Mapping

Flood maps for England are relatively crude. A better integration is needed of

- river, estuary and coastal flood models, and
- data on the efficacy and extent of flood management schemes.

Drainage

At present some 20,000 households in England are at risk of sewer flooding once in a ten year period[25]. Sewage and drainage systems are provided by privatised water companies and overloading or poor maintenance may explain why nearly 5,000 properties were flooded from sewers[26] in 2006. More than 50 per cent of drainage and sewage overflow problems in England take place in London (around 120,000 blockages each year in London alone).

On 7th August, 2002, an inch of rain fell in central London in 30 minutes during the evening "rush hour", resulting in the closure of five mainline railway stations, and sewage overflow. (The author had personal experience of walking ankle deep in sewage in Liverpool Street Station that evening.) There are now plans to build a "Tideway Tunnel" to take overflows from London's sewers. It will be 32.2km long, over seven metres wide, and will run up to 80 metres deep.

A more general solution is Sustainable Drainage Systems (SUDS) (see box 1).

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BOX 1
Sustainable drainage systems (SUDS)

A major cause of urban floods is the covering of the ground with impermeable drives, roofs, roads, and car parks. This speeds up the rainwater run-off from the site, causing potential flooding elsewhere. SUDS slow the run-off, allowing it to soak into the water table often using retention ponds and water detention basins thus simultaneously improving water quality. Many underwriters are unfamiliar with SUDS because these are relatively new, at least in England. They have been common in Scotland for many years[27], because there, new properties cannot be connected to the drainage system if there is insufficient capacity, so SUDS is a way of allowing more development without overloading drainage systems. In England and Wales, there is no such restriction and many drainage systems are overloaded and flood easily.

However, if SUDS are not designed or maintained properly problems can arise. For example:

1. Sometimes SUDS are used as an excuse to build in flood plains, as in Oxfordshire, but during a flood, they cannot operate because the ground is saturated.
2. Retention ponds and detention basins can become blocked with vegetation if not maintained. Not only does this increase flood risks, it can starve downstream local watercourses of water, leading to greater subsidence risks.
3. Drainage or conveyance "swales" (soakaways of stones) are often covered over by residents to provide more car parking.
4. Permeable paving in driveways may be grouted to reduce weed growth.
5. Insufficient land is allocated to absorb run off because land is so expensive. One SUDS retention pond in Scotland is estimated to have a site value of £1.5m for building.
6. If not properly designed, SUDS can lead to gardens being frequently waterlogged, posing a drowning threat to infants and a risk of flooding. As Ashley[28] points out, with climate change such standing water will also increase the risks of mosquito borne diseases.
7. Drainage legislation in England is complicated and it is not clear who will take ownership of SUDS or who will be responsible for ongoing maintenance especially for shared SUDS or SUDS serving affordable housing where the residents cannot afford maintenance. This makes their incorporation into developments difficult, and can increase the risk of flooding[29].

SUDS should only be used after a drainage impact assessment (as in Scotland) which assesses how they will perform in a severe rainfall event.

Planning

At present water scarcity or inadequate sewerage capacity is not a material consideration for planners in England. Planning guidance for England[30] still allows floodplain development, and insurance advice is rarely requested by local planners, though these negative aspects hopefully are about to change. The Government want to increase the rate of house building to 200,000 homes a year with four "Growth Areas" around London and 29 "New Growth Points" in the south of England. All of these locations are already subject to water stress: EA says that there is:

- Increased flood risk in 80 per cent of cases;
- Lack of sewerage capacity in 72 per cent of cases; and
- Potential breaches of water quality standards in 62 per cent of cases.

In a recent court case[31] a local council had decided to grant planning permission for 63 sheltered housing apartments at a site within the 100 year flood plain and which had been severely flooded in recent years. EA complained that the planning policy guidance had not been followed. The council took EA to court. There was no evidence that the properties were to be designed to be flood resistant or resilient or to have adequate evacuation routes. In effect the council seemed to want to defend the right to put old people at risk of flooding. Fortunately EA won.

Local Authorities

A recent report by Manchester University[32] concluded that in England:

- Local communities and key stakeholders are ignored when forming local planning policy.
- There is a tendency for flood risk to be assessed and mitigated on a site by site basis, inhibiting the potential for strategic mitigation solutions.
- There are difficulties balancing socio-economic and environmental priorities against flood risk concerns.

Ashley points out[33] that the lack of a joined up approach across all the key stakeholders precludes integrated approaches being devised.

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Scotland

Exposure

Scotland has around 40 per cent of the land area of Britain. There are at least 25 significant differences in legislation and practice between Scotland and England[34], which combine with differences in geography and population density to make the Scottish flood risk very much lower than in England. For example:

- Less than 4 per cent of properties are at risk of a 200 year return period flood[35].
- The Scottish Executive has set a target of defending all 100 year return period fluvial and coastal flood risk properties by 2008.
- No request for grant aid for flood defences in Scotland has ever been turned down on the grounds of lack of money, and benefits only have to exceed costs for grant aid to be provided.
- Since 1961, flood defences have been consistently built to a standard of service of the 100 year return period or better and are well maintained and in good condition[36]. More recent defences must take climate change into account.

Mapping

- River, estuary and coastal flood models are fully integrated;
- data on the efficacy, extent and condition of all grant aided flood management schemes are readily available[37],

Drainage

New development is not allowed unless there is already adequate capacity in the sewer and drainage systems. This rule has given impetus to SUDS. Local authorities such as Aberdeenshire require SUDS designs to meet a stringent "Drainage Impact Assessment" to test the impacts of a 200 year return period rainfall event. Insurers have assisted in developing an award winning methodology[38] for such assessments. Scottish Water is publicly owned and has a statutory duty under the Water Environment and Water Services (Scotland) Act 2003 to adopt and maintain such systems provided they are built to its specifications.

As in England the sewage infrastructure is largely Victorian. It will not be able to cope with increasingly severe rainfall events from climate change without considerable investment, which is now in hand.

Planning

In Scotland the insurance industry has been successful in spreading the message that insurance availability can no longer be taken for granted. By talking directly and regularly face to face with local land use planners across Scotland in every Flood Liaison and Advice Group (FLAG) and explaining the risks of blight from future insurance withdrawal, there has been a sea change in attitudes to flood plain development since 1994. Almost all local authorities have incorporated some or all of the "Insurance Template" (see Annex) into their strategic planning policies[39]. According to the Scottish Executive, since 2003, no properties have been built in flood risk areas in Scotland against Scottish Environment Protection Agency advice[40].

Local Authorities

- Local authorities in Scotland have a statutory duty[41] to maintain watercourses to prevent flooding and to publish regular reports on even minor floods, and the intended remedies.
- Insurance companies can sue local authorities in Scotland to recover flood claims' payments in certain circumstances and this ensures that local authorities take their duties seriously.

The Scottish Executive[42] outlined the key flood risk management goals for local authorities as:

- Reducing flood risk to a manageable level where the risk is known;
- Using the planning process to direct development away from flood risk areas;
- Seamless co-ordination with the emergency services in providing temporary flood defences and evacuation of people at risk;
- Promoting flood alleviation schemes (where cost-benefit analysis permits) with public involvement in the procedures from the earliest stages.

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Wales

Wales has a higher proportion of properties in flood hazard areas than England, at 12 per cent. However, planning policy in Wales is now in line with Scotland and prohibits any new building in such areas[43]. Wales uses drift geology maps to assess the areas at risk of an extreme flood. (The 1993 Perth floods showed that such maps can be an excellent predictor of extreme flood extents in glaciated areas.) The number of homes in Wales is forecast to increase by 20 per cent by 2026 with nearly 130,000 new homes around Cardiff and Swansea, but the Welsh Assembly's Spatial Plan will ensure the appropriate infrastructure is developed according to EA.

N. Ireland

Again, planning policy is in line with Scotland, but in NI it is centrally controlled from Belfast rather than by local authorities[44]. Flood maps were only published in 2007.

Future flood risk

As discussed in Chapter 3, climate change could proceed along different paths , depending on the way that society develops. This is generally explored by using scenarios of future social behaviour, technology, population growth, risk management and other relevant factors. Clearly those factors also affect the amount and vulnerability of assets at risk.

In 2004, the Foresight Programme[45] produced dramatic forecasts of future costs of flooding for the UK under four scenarios (Table 2). Scotland is on the path of the "Local Stewardship" scenario, with tight planning controls, aspirations for sustainable drainage and sustainable flood management[46], while England has followed the laissez-faire "World Markets" scenario.

Table 2: Annual average costs of UK flooding by 2080 (£billion at 2004 prices)

Socio - Economic Scenario	Drainage floods	River and coastal floods	Total
World Markets	7.9	20.5	28.4
Global Sustainability	1.9	4.8	6.7
National Enterprise	5.1	15.1	20.2
Local Stewardship	1.5	2.2	0.7
Current (for comparison)	0.3	1.0	1.3

When the above figures were published in 2004 they were somewhat undermined by the accompanying observation that even under the World Markets scenario, UK flood damage costs would just represent 0.3 per cent of GDP.

This use of averages is grossly misleading. Experience shows that flood damage occurs in concentrated bursts, geographically and in time. Flood events would be concentrated in high risk areas and would vary from year to year. Given that the insured cost of two events in 2007 totalled double the current average insured and uninsured cost of £1.3bn in Table 2, we could be looking at huge costs in some areas, with considerable human costs and long term economic decline. For insurers, it would raise issues of solvency, and challenge the claims-handling system, particularly if there were compulsory evacuations, as happened after Hurricane Katrina.

In fact, the Pitt Review revisited the Foresight predictions, and judged that the position is likely to be worse[47]. "..the latest work on climate change shows a small but plausible risk of much greater sea-level rise.", and "we may have to cater for bigger increases in river flows than we have envisaged to date."

In all scenarios, Foresight research shows that some places are particularly exposed: the Lancashire/Humber corridor, parts of the coast (particularly south-east) and major estuaries. Research for the ABI in 2006 produced some storm surge scenarios which demonstrated this[48]. The map below shows the effect of flooding from storm surges with a 40 cm rise in sea levels.

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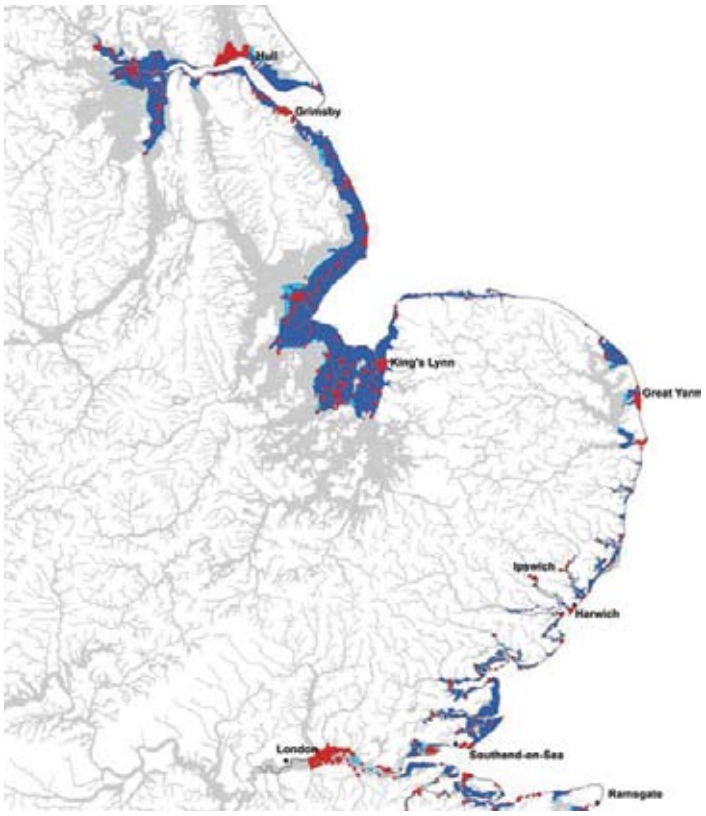
Figure 2: Future storm surge risk



Key:

Area flooded under modelled surge events

- One event only
- Two events
- All three events

Environment Agency Flood Zones

- Environment Agency Flood Zone 2
  Annual Flood probability > 0.1%

Critical infrastructure

- Sites at risk from flooding from at least one surge event

Emergency Services

- Ambulance Station, Fire Station and Police Station

Health infrastructure

- Hospital and Surgery/Health Centres

Education infrastructure

- Schools/Colleges/Universities/Nurseries

Other critical infrastructure

- Cemetry/Crematorium. Community Centres/Halls Electricity Asset, Hostel/Prison, Petrol Station, Sewage treatments works, Sports and Leisure centres and Superstore/Hypermarkets

Source: ABI, 2006

Other water-related hazards

Dams and reservoirs

The "elephant in the room" is the question of the 5,000 UK dams and reservoirs which will become increasingly vulnerable to failure due to climate change. Many were constructed during severe dry spells (1850s, 1880s, and 1890s) in order to provide water for power and textile processing[49]. 74 hydro electric dams were built in Scotland before 1965, when (manmade) climate change was unknown. Dams are being dismantled all over the world for safety reasons[50] but this rarely happens in Britain, and dam-break flood maps are not generally accessible in Britain. This means inadequate warning or emergency evacuation plans[51]. For insurers it conceals a real risk.

Some dams are designed only for the 150 year return period event, not taking climate change into account. Even if they were all designed for the 1 in 10,000 year event, this means a statistical probability of one failure every two years. The last major accidental escape of water from a dam in Britain was as recently as June 2005 (see Box 2). On 26th June 2007, 700 people were evacuated amidst fears of possible imminent collapse of the Ulley reservoir at Rotherham.

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There has been a number of dam failures in the USA and around the world since 2000, often due to climate change impacts[53]. As structures become unsafe or too costly to repair a number are now being demolished before they collapse. In the USA where hydro powered dams must be relicensed every 30 to 50 years, the rate of dam removal has exceeded the rate of construction for the last ten years with 80 dams removed in the last two years [54]. Australia, France and Japan are also removing dams for safety reasons. There is no such strategy in the UK, although following a major escape of water from a reservoir due to heavy rainfall in 2005, one dam has been modified to take it out of the Reservoirs Act (see box 2).

A major expansion of reservoir dams is envisaged in the South East of England due to population growth and reduced rainfall[55]. The biggest reservoir to be built for 25 years in England is planned by Thames Water at Abington. Reservoirs can have a positive effect in reducing flooding by storing rainfall run off to avoid peak flows[56], but what if any part of the reservoir collapses or a landslide into the reservoir causes catastrophic overtopping[57]? Risk management is particularly important for reservoirs[58].

All dams are becoming more vulnerable to failure due to climate change[59]. New levels of stress will arise from more extreme droughts and heat waves, causing subsidence or cracking, particularly with earth embankments[60, 61]. Most were built over a century ago, before heavy earth compaction equipment was available. Also, chemical grouting techniques to stabilise sub-soil foundations and prevent underground seepage were not available until relatively recently[62]. There will be unprecedented spells of very heavy rain which will challenge the original design standards. Older dams are not designed for the increased wave action of the greater storminess of climate change[63] which could create overtopping, leading to erosion and possible collapse. The Sheffield Star reported on 19th January 2007 that “high winds whipped off thousands of gallons of surface water from Dam Flask, sending it hurling over the dam wall, drenching walkers and cars”.

While UK earthquakes are usually of too short a duration to cause liquefaction[64], there is a case of an embankment dam failing altogether due to an earthquake, namely the Earl’s Burn dam[65] in 1839, fortunately with no loss of life. Just a minor earthquake could be the final trigger for a dam weakened by climate change. Many reservoirs are in valleys where a landslide into the reservoir could cause disastrous overtopping. Satellite technology called “PS InSAR” is an extremely accurate tool for monitoring ground movement but is so far only being used on one reservoir in the UK. It only requires a small number of transponders which cost under £100 each.

On average six reservoirs each year in England need to have emergency draw downs to prevent failure[66] but sluice gates can become jammed because of age and sediment. Pumps then have to be used. For example, a “near miss” in 2002 involved the leakage of a 12m high embankment retaining over a million cubic metres of water. Sluices jammed and it took three days to pump water to safe levels. Judging by OS maps, many people just outside Manchester were at high risk during this time[67] but warnings were issued to only 57 homes[68]. There have been 24 “near misses”, 12 on large raised reservoirs and 12 on dams not covered by the Act, and over 100 notices served[69] in order to achieve compliance with the Reservoirs Act 1975 since October 2004. The new more open approach in England and Wales is to be welcomed and liability insurers of reservoir undertakings should take the opportunity to apply their risk management skills to assist the authorities.

BOX 2
Case study: Boltby Dam[52]

Boltby reservoir was constructed in 1880 near Thirsk. It has a 20m high earth embankment. At the time of the River Rye floods in Yorkshire on 19th June 2005, the embankment and spillway suffered extensive damage from overflow discharge. Engineers do not call it a failure, but the village of Boltby was flooded with fast moving water to a depth of about a metre. The reservoir had not been used for water supplies for many years, but it was not emptied. Work was carried out to lower the retained water level in 2007, and the reservoir is no longer big enough to be subject to the Reservoirs Act 1975.

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Despite dam break disasters in Britain in 1852, 1864 and twice in 1925[70], planners seem to be under the impression that dams will not fail in the future, there will just be more "incidents", and have been quite happy to allow houses to be built in the direct path of a potential dam break. EA says that 69 per cent of dams pose a potential risk to life[71].

One 300 year old dam has 40,000 people living in the danger zone, and for at least 20 years cracks have been spreading in the earth embankments due to mining subsidence and burrowing animals. Its piezo-electric movement detectors have been disconnected because they showed movement of the embankment and so were assumed to be faulty. In another case there are plans to build a new school and hospital directly below a 150 year old concrete dam where there are cracks spreading in the concrete and the hillside surrounding the reservoir is covered in peat which is vulnerable to landslip. There were major peat landslips nearby in 2003 due to heavy rainfall after a drought and the property damage was so extensive that pictures were shown on BBC TV News. (The author has been assisting the relevant Emergency Planning Officers.)

Reservoirs holding more than 25,000 cubic metres of water above ground level have to be registered and inspected every ten years under the Reservoirs Act 1975 . It does not apply to below ground reservoirs, tidal barrages, the Thames Barrier, canals, or reservoirs in Mines and Quarries (such as the slurry dam at Stoney Middleton in the Peak District, which collapsed on 22 January 2007), which are the responsibility of the Health and Safety Executive.

EA is responsible for the enforcement of the Reservoirs Act 1975 for the 2,010 large raised reservoirs in England and Wales, owned by 710 businesses and individuals. EA is also the biggest operator of reservoirs in England itself, with 169 reservoirs. There are 680 reservoirs in Scotland. Safety enforcement in Scotland is carried out by the 32 local authorities. They do not need to have specialist dam engineers. Scottish Water, the owner of the most reservoirs in the UK, is currently selling off disused reservoirs for nominal sums to private landowners who may not be able to afford inspections let alone maintenance. There are 70 reservoirs in N. Ireland and there is currently a safety review under way. New regulations[72] came into effect on 1st February 2007. They do not deal with dam safety, but require all reservoirs to be licensed.

Reservoir risks are still obscure. In 2005, a new database of dam "incidents" was created by the EA, accessible to the public under the Freedom of Information Acts and a new voluntary post incident reporting system was set up on a UK wide basis[73]. At the time of writing the people responsible for statutory supervision of dams in Scotland or Ireland were not all aware of the new post-incident reporting system. Emergency planners do not yet have the sort of emergency warning and evacuation procedures used in other countries such as France[74] although "Flood Plans" are promised for England and Wales in 2009.

The security services used to insist that the maps showing the areas which would be flooded in a dam break are kept secret due to fears of terrorist attack. This was relaxed in 2007, and work is in progress to release existing maps in England and Wales[75]. Following lobbying by the author in the Scottish Parliament, emergency sevices in Scotland have been able to access such maps for some time, and Emergency Planning Officers have found this very valuable. There are no official plans to release maps in N. Ireland. In the meantime, the computer software needed to generate such maps is publicly available and relatively user friendly[76]. While Ordnance Survey maps can give a good indication, it should be borne in mind that the velocity of water escaping from a dam failure can carry it over a great distance causing widespread damage. To satisfy the Solvency II Directive, insurance companies with liability exposures for reservoir operators should acquire the computer software needed to generate their own maps to comply with the FSA's requirements on risk assessment.

Coastal erosion and landslide

Coastal erosion is a big problem, especially on the northeast coast of England, where sea levels have risen by 200mm since 1900. Sea levels generally are now projected by the IPCC to rise by between 100 and over 800mm this century due to glacier meltwater and thermal expansion. An OECD report[77] suggests the rise could be as much as a metre. While direct damage from coastal erosion in itself is not normally insured, it can increase the coastal flooding hazard.

In April 2005 the National Trust reported that 60 per cent of the 702 miles of coastline it owns in England, Wales, and Northern Ireland could be affected by erosion within the next 100 years, extending over 200 metres inland in places[78].

Over the next 175 years, 110,000 homes in England and Wales are at risk of being destroyed by coastal erosion, and over a million properties will be at high risk of coastal flooding. At present there is no mechanism for the public to find out if they live in a zone with a high coastal erosion hazard, although EA has now been given the responsibility to manage this risk. The current policy is known as "managed realignment". It is no longer cost effective to defend many coastal areas and defences are being pulled down. No compensation is payable to those living behind these defences and coastal erosion is generally uninsurable.

Landslide is also a growing problem. One of the UK's largest urban landslide complexes is at The Undercliff at Ventnor in the

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Isle of Wight. Over 6,000 people live there on a picturesque coastline. According to a study by the consulting engineers Halcrow[79], coastal slope instability and slow ground movements have resulted in repeated damage to roads, pavements and services, and the loss of over 50 homes, several hotels and other businesses. The annual costs of landslide damage and management are estimated to exceed £2 million. In the future, an increase in the occurrence of ground movement and landslide damage can be expected as a result of potential adverse effects of climate change and rising sea levels. In this case, insurers collectively undertook to maintain cover for clients even despite the risk of inevitable loss.

BOX 3
Coastal erosion case study: Lynemouth

Many power stations are located by the sea and are at risk of coastal erosion. This could severely damage the nation's power supplies A private coal fired power station opened in 1972 and owned by Alcan at Lynemouth (pronounced "Line mouth"), Northumberland, is in particular danger of being washed away by the sea. Until 2005, waste from nearby Ellington Colliery was continually tipped along the coast as a defence measure. The pit was temporarily closed in 1994, and the shoreline retreated rapidly until mining resumed. The mine was permanently closed in 2005. Alcan, a major employer in the area, has offered to pay 75 per cent of the cost of a new sea defence, but say they need it to be installed urgently.

Flood management

Structural methods

Japan leads the world in the use of structural methods of flood management. Like the Netherlands, the Japanese use a 10,000-year minimum standard of service for coastal defences and 200-year to 2,000-year protection for river systems. By contrast, the recent £100m Jubilee River scheme in London gives a 60-year return period protection. Until 2001, Japan spent 30 times more each year than England on flood defences as a percentage of GDP.

Surprisingly, the Japanese have concluded that structural flood management does not work. In January 2001, Japanese adaptation strategy changed from confining rivers within dykes and dams to managing floods within the river basin as a whole. This technique is known as "sustainable flood management" in which non structural solutions such as wetlands are combined with improved land use planning to avoid building in floodplains. The previous "no floods" policy for inhabited areas was very expensive and impractical in the light of climate change. This thinking would have been no surprise to the "father of floodplain management", a USA geographer called Gilbert White. He argued in 1945 that an over-reliance on structural works had increased damages caused by flooding rather than decreasing them. He argued famously that "Floods are an act of God, but flood losses are largely an act of man". Public confidence in structural works simply increased the amount of building in floodplains.

Structural flood defences can give a false sense of security as demonstrated in the New Orleans floods of 2005. An unofficial comment from a US engineer was, "There are two types of levees. Those that have failed and those that will fail." A more official comment came in 2007[80]; "in many cases (levees) create a significant and potentially catastrophic residual risk that may increase as conditions in the region change".

UK flood management policy still deals with the effects of flooding rather than the causes. Thus the UK government answer has been seen as "structural" solutions such as separating communities from their rivers using concrete walls, drains and reservoirs. Government does not seem to recognise the problems such a strategy can bring.

1. Flood defences are themselves damaged by floods. The Japanese government calculated that after serious riverine flooding in 1998 and 1999 half of the costs of the floods consisted of repairing damage to the flood defences themselves[81].
2. Structural flood defences need constant maintenance, taking much needed public spending away from schools and hospitals and other essential services.
3. If a river is not allowed to overflow, it is more likely to deposit sediment in the bed of the river[82]. This raises the height of the river, meaning that the walls have to be raised too.

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4. Defences can simply displace the problem upstream or downstream. This is a particular problem in continental Europe where one country's flood management solution is another country's increased problem.
5. When a flood defence fails, the results can be more catastrophic than if the defence had not been built because failure can be sudden and more people may be in the danger zone. People may be less likely to respond to evacuation orders when there are flood defences[83].
6. Flood walls can act as a barrier to stop the water draining away. After the 1953 coastal flood for example, many defences had to be demolished to let the water escape.
7. Flood walls will have to be repeatedly raised as climate change impacts are felt.

There is still a place for structural solutions to defend existing urban areas, or essential infrastructure. Flood defences can be integrated in the design of river crossings which can also be used for generating tidal energy. A tidal barrage across the River Severn for example could provide 5 per cent of Britain's energy needs. If this proceeds, insurers will need to take the opportunity to ensure that the design does not worsen the flood risk in the Severn corridor.

BOX 4
Multipurpose flood defences: The Forth Crossing

The Scottish Executive has recently decided to build a new river crossing on the Forth estuary. At present they are only considering a bridge or a tunnel costing around £3.5bn. Just upstream of the current Forth Bridges lies Grangemouth oil refinery. This is a major hazard site, supplying 40 per cent of the UK's fuel oil. If it were disabled by a storm surge, the economic consequences would be disastrous not to mention the effect on the 6,000 nearby homes below the 5m contour. Plans are being prepared for a new 18km long coastal flood defence but this will be difficult to build owing to the underground oil and gas pipelines and river tributaries at the site.

On the opposite bank is Longannet, a 2300 megawatt coal-fired station. Ash is produced there at the rate of up to 4,350 tonnes per day. Much of it is piped as slurry, and deposited in artificial lagoons to reclaim land from the Firth of Forth.

Plans are proposed for a ship to ship transfer of Russian oil in the mouth of the estuary. There are considerable environmental concerns over a possible spillage.

If there were to be a new river crossing in the form of a 9km causeway designed to withstand a 200-year storm surge, this could provide a flood defence for Bo'ness, Grangemouth and Longannet as well as a transport corridor for heavy rail, motorway and wildlife[84]. A short bridge would be needed in the middle over flood gates similar to the Thames Barrier to allow ships to reach Grangemouth and protect against storm surge or oil pollution. The causeway could provide other services like renewable energy, and storage of hazardous chemicals. This would help to defray the costs of the causeway.

For insurers, tidal barrages across the Severn, Thames, Clyde and Forth could protect many thousands of low lying coastal properties from flooding, besides their core purposes.

Sustainable flood management

There is a growing awareness in many countries e.g. Japan, that flood can best be managed in a sustainable way by working with Nature instead of fighting it, protecting and restoring natural systems. It has been suggested that engineering solutions alone would cost £52 billion by 2080 just to manage the additional risks from climate change. This compares with £22 billion when using engineering in concert with a range of non-engineering measures[85].

Often floods are caused by or made more severe by human actions. For example, farmers installed field drains and built flood banks alongside the River Eden in Cumbria to stop rain from flooding their fields. When the January 2005 storm came, the waters quickly descended on the town of Carlisle, contributing to the flooding of 4,500 homes and businesses and costing the insurance industry £350m. Changes in agricultural practices can reduce surface water run-off, for example by the creation of wet meadows and woodland and the blocking of land drains.

A four year demonstration project[86] organised by WWF and funded by HSBC claimed to have shown that sustainable flood management is ten times more cost effective than traditional concrete and steel solutions. There are also other experimental projects in Scotland such as the EU-funded SAFER project, the Tarland project and the Glasgow Strategic Drainage Plan, also EU funded. Such "soft engineering" practices are very cheap, quick, cost effective and well proven in other countries. Insurers have quite rightly refused to contribute to the costs of more concrete defences, but they should perhaps be prepared to help to fund more demonstration projects in different types of conditions with different types of natural flood management techniques, to test their cost effectiveness.

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Insurance is a key element of the integrated package of measures known as the "sustainable flood management" approach, sometimes called "natural flood management". Unlike structural measures a catchment wide approach is needed, irrespective of political boundaries. There are eight elements to sustainable flood management[87]:

- Sustainable drainage methods, called "SUDS" (see Box 1);
- Warning schemes;
- Insurance, using the price mechanism to discourage living in hazardous areas;
- Managing development in flood hazard areas through planning controls;
- Water management[88] (e.g. river restoration, maintaining watercourses, removal of culverts);
- Education and awareness raising so that people know what to do in the event of a flood warning, for example preparing an emergency kit (see Box 5);
- Agricultural practices, to encourage farmers to store water during heavy rainfall;
- Resistance, resilience and recovery.

Providing advice like that in Box 5 to policyholders is not just a helpful gesture, it can help to reduce the cost of insurance claims.

BOX 5
Flood advice for householders

Be aware of the effects of long wet periods and the chance that sudden rain can cause flash flooding even if you are not in a floodplain.

Make up a flood kit, with a torch, battery radio, warm clothing, wellingtons, rubber gloves, medications, insurance policy and contact numbers, and keep them in a box in a safe place.

Make copies of any sentimental photographs or essential documents and store them elsewhere in a safe area.

In severe weather conditions such as flooding, the council and the emergency services can be affected or overwhelmed. Don't just wait for help, you can block doors and ground-level air vents and ground floor toilets with sandbags made quickly from plastic bags and earth.

In the event of flood waters entering your home, move people and pets immediately upstairs or to higher property and await rescue. Consider your neighbour – they may be struggling alone and could use your help.

Find out how to turn off your gas and electricity in case you have to leave your home. Failure of gas, electricity and phones during floods and gales is common, so find out how to do it now.

Don't attempt to drive through floodwater – as well as the risk of breaking down, your vehicle may well obstruct the road for emergency services.

Don't walk outside unnecessarily in floods, or allow children to play in the flood waters. Floods can open up manholes, road works and hide culverts, all of which can pose a danger. Also, the water is usually polluted with sewage.

Evacuation from an area is only done where absolutely necessary. It usually means that utility services failures are going to be long and that the temperatures are low enough to cause concern for the health of the young, infirm and the elderly. If you are asked to move from your home, co-operate. Take only essentials, including all medication required by your family members. Switch off gas and electricity – even if the supply has failed – and lock up the house.

In the event of evacuation, the council may set up a rest centre close by to accommodate you, which will be warm and dry and where refreshments and support will be provided. You may have to stay until it is possible to return safely to your home. Your family's special needs or concerns will be noted at the rest centre, so that you can be assisted properly.

Flood water is dirty. On your return home, clean and disinfect everything that may have come into contact with flood water. Clean your taps with disinfectant and let the water run for several minutes. Use rubber gloves as much as possible when handling items and always wash your hands well before eating or drinking.

Resilient structures

In 2005, Norwich Union teamed up with local government to show what can be done to minimise the effect of flooding on a house. The property in Lowestoft had been flooded repeatedly at short notice, causing stress as well as financial hardship to the residents. The project spent around £30,000 on measures to make the property more flood resilient, by preventing water getting in and by reducing the damage that occurs if water does get in. Perishable materials were replaced with water-resistant ones like ceramic tiles. A pump was installed, electrical items were positioned higher, and one-way valves on drainage pipes prevent sewage "backing up" during a flood.

In October 2006, the house was tested by a real flash flood. The project resident simply mopped the floor and carried on as normal. Even a few of the measures will add enormous resilience. A full refit costs between £30,000 and 40,000. Without

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resilient measures in place it could cost up to £60,000 to repair the damage caused by a flood. And many of the measures, such as erecting flood boards, can be done by homeowners themselves when needed. The long term benefits are a more valuable asset for the property-owner, better terms and availability for flood insurance, and less damage and disruption, not to mention less mental stress.

The leader in this area is the Netherlands – even to houses that might have collapsible walls at ground floor level (to cope with strong currents along streets), and houses that can float in floods.

Temporary defences

There is a growing demand for temporary forms of flood defence, which can be very effective in reducing the damage from short term frequent shallow floods such as arise from inadequate drainage systems or small watercourses. There are many different products, but at present there is only one comprehensive and independent guide to the range of products available[89]. Some of them have British Standards approval, but absence of the BSI Kite mark does not mean these products are not effective. A number of insurers are providing incentives for people to fit these products, and some Scottish local authorities and Scottish Water are providing temporary defences to houses in flood hazard areas until more permanent solutions are found.

Government grant aid

Despite the proven superiority of natural flood management and temporary flood defences, public bodies are not empowered to give grant aid other than for structural defences for urban areas. The result is a bureaucratic system with high costs and delays due to the need for feasibility studies, cost benefit calculations and environmental impact assessments. It takes a minimum of ten years for a new structural flood management scheme to be implemented. EA estimates the cost of providing flood protection in England to be between £14,000 and £53,000 per house[90]. The average cost of flood damage is £28,000 per house according to the NFICD, so on a purely economic basis the cost/benefit is not favourable. Also, using only structural methods for flood management will need between £22 and £75billion for engineering work.

Meantime the highly promising experimental work on natural flood management carried out in North Yorkshire by EA has been discontinued due to lack of funding. The Parrett scheme in Somerset, however, has been funded by wildlife interests[91]. While there has been much progress in Scotland, it has so far all been funded by NGOs, the private financial sector or the EU, but not the Government. When the EU Flood Directive is transposed, however, the situation may change and it is already under review in Scotland where there are pressures to change policy[92].

Civil contingencies

The Civil Contingencies Act 2004 will be of particular relevance to flood risks. It gives great powers to the authorities, but also imposes six major duties (see Box 6). These can be summarised as:

- **R** Risk register for the community
- **A** Action to reduce impacts
- **I** Inform public and provide warnings
- **S** Service Continuity Planning
- **E** Extend duties of EPOs to create a resilience culture in the community
- **Co-operation** with stakeholders

BOX 6
Civil Contingencies Act 2004. The new duties on Local Authorities:

- A greater emphasis on risk assessment production of a community risk register which is to be maintained, reviewed and published.
- Planning to take action for the purpose of preventing emergencies and reducing, controlling or mitigating their effects.
- Informing and warning the public.
- Planning for business continuity.
- Promoting business continuity management locally – to generate a resilience culture at local level by extending the civil protection duty beyond emergency planning to address risks to businesses in the local business and the voluntary sector.
- Statutorily requiring co-operation and information sharing between agencies.
- In addition to the above, the Government has indicated that a new performance management framework is being developed for civil protection activity.

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Dissemination of warnings

Local authorities have a duty under the Civil Contingencies Act to inform and warn the public. There is a need for more research into the effectiveness of flood warnings and perhaps more importantly, the methods of disseminating them. For insurers, timely dissemination can not only reduce the losses for motor vehicles and movable property but also reduce intangible losses and business interruption costs. The biggest problem with flood warnings is the question of dissemination and assistance with evacuation. In most areas the police no longer provide dissemination of flood warnings and the public are dependent on automatic telephone messaging, the media, and looking up the internet when they suspect a flood may be due. Many members of the public refuse to sign up for telephone messaging services because they perceive that this might adversely affect their insurance or the resale value of their property. Insurers could play a much more pro-active role by using their call centres to telephone customers to pass on flood warnings and offer assistance with evacuation and moving property. They could do more for vulnerable people (see below).

Evacuation

Focus group surveys show that the most common reason for not obeying instructions to evacuate a property is fear that the vacated home will be looted. Electricity failure is common, so intruder alarms stop working when the batteries run down. Many would rather stay in a cold, dark, flooded house than leave it to the mercy of criminals. Two elderly ladies died in the January 2005 Carlisle floods from the cold after they refused to evacuate their home for fear of looters. Other reasons are that people believe flood walls will protect them, or they are unwilling to leave pets.

Database of vulnerable people

Local authorities have a duty under the Civil Contingencies Act to require co-operation and information sharing between agencies. This would be an opportunity for them to establish a database of vulnerable people as described below. Alternatively they could ensure that warnings are passed to the relevant agencies and that those agencies have contingency plans to help vulnerable people.

Emergency Services

A major flood may involve the Fire and Rescue Services, Police, Ambulance, HM Coastguard, Local Councils, and voluntary services such as the Royal National Lifeboat Institution and The Samaritans. In 2004, a 1000-year flood event was simulated in "Exercise Triton" to test the nation's ability to work together and deal with extensive flooding. The Chief Fire Officers Association[93] concluded:

"the UK simply does not currently have the capability to respond to a major flood event."

Worse still the emergency services are often dependent on power supplies which are based in the flood area. Events in Carlisle 2005 and more widely in 2007 showed the folly of this.

Insurers should be concerned. Although the emergency services are focused on human safety, a poor response clearly will retard the recovery process and worsen damage and interruption.

Human vulnerability

In floods, the more vulnerable groups such as the poor, the old, children, the disabled, and women suffer the greatest impacts[94], and these can be long-lasting[95]. Intangible "human" impacts, e.g. the loss of cherished family memorabilia by the elderly, can be much more costly to society in the longer term than tangible damage[96]. This can result in the public and politicians underestimating the true impact of flooding in terms of not only the damage caused, but the long term mental distress[97] and breakdown in social cohesion.

Economic barriers to safe housing, ethnic community and household power structures, combined with exposure to personal violence can produce unsustainable social environments which are vulnerable to disasters[98]. On the other hand, wealthier families can avoid the risks of flooding. A survey[99] published in 2007, asked parents to name the ideal features of a good place to bring up a family. High on their list was "low risk of flooding". Properties in areas outside the indicative flood map areas are therefore likely to see their relative values improve. (Of course, properties in areas of inadequate drainage will also be at risk, but these are not mapped.)

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In England alone, 18.2 per cent of the population have a limiting illness or disability, and 7.6 per cent are 75 or over. The problem is getting worse because people are living longer and more often alone. The proportion of people aged over 65 is projected to increase from 16 per cent in 2004 to 23 per cent by 2031. In 2004 3.5 million such people lived alone. Government are now looking at how to quantify the human costs of flooding[100] and possibly grade areas on a "people-vulnerability score" reflecting the following:

- **Elderly (Over 75 years of age)** They are often infirm. In particular, arthritis is sensitive to the damp, cold environmental conditions that would follow a flood event.
- **Lone parents** Lone parents have less income and must cope single-handedly with both children and the flood impacts, with all the stress that can bring.
- **Pre-existing health problems** Research has shown that post-flood morbidity (and mortality) is significantly higher when the flood survivors suffer from pre-existing health problems.
- **Financial deprivation** Poor people may not have home contents insurance and so have more difficulty in replacing household items damaged by a flood event.

Private individuals will find it increasingly difficult to obtain insurance in flood-prone areas and without insurance they will not get mortgages. In response, property developers and planners may consider using these areas for other developments, e.g. social housing, old people's housing, schools and children's preschool nurseries. Insurance strategies may in effect be creating concentrations of vulnerable people in hazardous areas.

Within the next few years many insurers are likely to have withdrawn from the highest flood risk areas at least for new business cases. Insurers are unlikely to cancel existing business, but increasing premiums and excesses will make flood events more costly for the survivors and make resale less easy. The result could be localised property blight.

Pay with rent schemes

Insurers have worked hard to build up special "pay with rent" schemes to provide affordable contents insurance payable by instalments for social tenants, often with special deals for pensioners. In one scheme, for example, a pensioner can get full contents insurance for as little as £1 per week. However, the market has become fragmented by government action to force the disposal of social housing from local authorities to myriad housing associations, many of which are not interested in administering such schemes[101]. This is damaging the take up rate amongst social housing tenants especially in England where only around 38 per cent of social housing tenants are insured for contents. In Scotland, government has spent £500,000 in promoting such schemes but the take-up is still only 60 per cent[102]. A low take up rate not only means that social tenants are more vulnerable, it threatens the viability of such schemes which may increasingly suffer from adverse selection, as those living in flood hazard areas will be more likely to insure.

One solution would be to extend Housing Benefit to cover the premium for contents insurance "pay with rent" scheme. This would help to protect the most vulnerable people and help the schemes to remain viable by increasing take up rates. It could be seen as a gesture in response to insurers' protests about insurance premium tax. It would be no harder than the current arrangements whereby Housing Benefit is increased to pay for pet food for pet owners. True, there is an emergency loan scheme to help flood survivors on low incomes to replace their property (the discretionary Social Fund). It is bureaucratic, little-known, with a low take-up and a high default rate. Flood survivors do not want to take on debt.

Insurance companies could take a much more pro-active role in helping flood survivors:

- They could ask customers in Scotland if they would need special evacuation assistance in the event of a flood, and if they do, seek their permission to be added to the EPO vulnerability database for their area. (Such databases do not seem to exist in other parts of the UK.)
- They could encourage staff not involved in claims to volunteer to help with evacuation of vulnerable people and their most treasured possessions.
- They could arrange for loss adjusters and claims staff to attend training courses on helping people who are suffering mental trauma. The Samaritans provide excellent ones.

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The role of government

Floodplain development

The construction of an ever increasing number of homes, especially in the SE of England, has proven to be a lucrative source of income for property developers. In 12 months just four property developers made a combined gross profit of £1,688m[103]. By comparison, annual flood defence spending in England for 2006-7 was just £428m.

However development of flood-prone areas on economic grounds is uneconomical:

- Conventional methods of estimating tangible flood costs do not reflect the true financial costs of a flood as measured by NFICD. This is the largest flood damages database[104] in the world, and is widely used by the insurance industry.
- The intangible costs of the human physical and mental health damage are very significant.
- The general economic costs caused by disruption, loss of business and increased cost of working are high. Insurance figures[105] show that the average cost of BI claims from small businesses after a flood averaged nearly £28,000.

More crucially, flood disasters are politically damaging, and that, combined with dire predictions of future weather, and pressure from insurers, has caused a U-turn in government attitudes.

The emergence of a sustainable flood management policy?

In 2006 a Parliamentary Committee[106] observed that:

- "90 per cent of the 120,000 planned houses in the Thames Gateway development are expected to be in high flood hazard zones" and that
- "following revised guidance from the ABI in January 2006, many individual householders may be unable to secure insurance against flood risk." This, says Paragraph 49,
- "makes the task of flood risk management more complicated." It goes on to say
- "the Government needs to take these issues seriously to protect householders."

The official response[107] made no mention of insurance, or flood, or even climate change.

But then the 2007 floods occurred, "the biggest civil emergency in British history." (No doubt the Black Death would be conceded to be a greater problem, but the victims are no longer with us.)

The Pitt Review[108], along with studies by EA and others, was convened and reported in June 2008, being strongly critical of the current system of flood management, and making 92 recommendations. (The insurance industry was generally seen to have performed well, apart from some weaknesses in maintaining communications with flood survivors.) The Government has yet to respond, but it appears to be taking the suggestions seriously.

Pitt calls for placing the at-risk communities at the centre, giving clear leadership, and collaboration. On matters of particular interest to insurers, it recommended that:

- EA should be given responsibility over all flood risk issues, and this has started to happen
- Hazard information should be improved, including emergency warnings
- The planning system should enforce sustainable flood management measures
- Local authorities should take ownership of local implementation of flood management
- Drainage management be resolved as a priority issue
- Central government should plan 25 years ahead, and support local risk management
- Insurers should improve their customer information, and market flood cover to the poor
- Emergency services procedures should be improved, including the transport networks
- The emergency services infrastructure be greatly strengthened
- Dams and reservoirs risk information be published
- Faster methods of repairing flood damage are needed

This was supported in a formal joint statement by ABI and Government in June 2008 (see overleaf).

Footnotes: See page 43

Building regulations

The Government has concluded that regulations can and should be used to ensure flood resistance and resilience within new buildings[109]. This already happens in Scotland but in England and Wales the current regulations[110] only have limited provision relating to flooding. For example, they require anti-flooding valves to be used for drainage and wastewater disposal in areas where there is surcharging of drains and sewers. They also require rainwater drainage from buildings to employ an adequate disposal system in preference to a watercourse or sewer. However, water service providers do not adopt these alternatives in England and Wales so builders use sewers[111]. The best source of advice on flood resilient reinstatement is the study produced in 2005 by the Building Research Establishment in Scotland after extensive consultation with the ABI and insurance experts[112], but it is not widely used by insurers.

If Building Regulations were made more resilient and then applied retrospectively following a flood or storm damage, in the same way as fire regulations can be applied retrospectively after a fire, this would create a level playing field which would force insurers to apply resilient reinstatement techniques[113]. The Building (Scotland) Act 2003 already has provision for this to be implemented by a future regulation in connection with flood or storm damage.

There seems to be an anomaly in the application of the Disability Discrimination Act to houses in flood hazard areas. Measures such as ground floor toilets and lowering floor levels to avoid doorsteps for disabled people make such properties much more vulnerable to flooding, and it would surely be preferable if disabled people were housed elsewhere.

Government insurance

In most developed countries, government takes a hand in providing insurance or reinsurance for natural hazards[114]. This can act as a constraint on the development of private insurance, especially for flood. On the other hand the economic costs of flooding can make government much more aware of the problem. Estate agents and brokers have suggested that the UK Government should act as insurer of last resort[115] but the government is unlikely to agree. Insurers also prefer a market solution, as long as they can price risks correctly, and obtain reinsurance. One measure the government could take would be to assist vulnerable members of society with their insurance premiums, just as they assist with other essentials such as rent.

Insurance response

Spontaneous moves

Already flood excesses up to £20,000 or higher are becoming common and premiums are increasing in flood risk areas. After the floods of 2000, 45 per cent of respondents to a survey of residents and businesses in Lewes, reported substantial changes in their insurance premium and a further 18 per cent, mainly residents, reported that flood insurance had been refused[116]. In a survey of the insurance industry published in Insurance Times in November 2006, 70 per cent of insurers said they intended taking a much firmer line in the future. Insurance availability has reached a tipping point for a number of reasons:

1. Even after 2006, planning policy in England[117] allowed floodplain development despite insurance industry objections.
2. Climate change predictions especially for flood are causing concern in insurers' boardrooms.

BOX 7
National Flood Insurance Claims Database (NFICD)

This contains details of more than 6,000 flood insurance claims from the top 25 insurers in Britain. Every major flood from 1993 to 2002 is included, with each claim analysed by up to 28 variables. Most of the claims are domestic property, but there is now a reasonable number of commercial claims too. The database is held at Dundee University and while the raw data is strictly confidential, as sample sizes become sufficient, analyses of aggregates are published to all those insurers who agreed for their data to be used. The "Dundee Tables" as they have come to be called are essential tools for catastrophe modellers, premium setting and claims validation.

Footnotes: See page 43

3. Insurers are better able to quantify their exposures in flood hazard areas due to developments in mapping and GIS technology, and analyses from the NFICD on flood damage costs (see Box 7).Competitive pressures are keeping premiums down, making it difficult to continue to subsidise flood claims from the premiums collected in safe areas without losing business from the safe areas. In the last 25 years the average house price has increased from £23,644 to £194,362. In some areas, rebuilding costs have increased even faster, but the average insurance premium for buildings and contents is still less than £350.
4. Underinsurance is rife. A loss adjuster survey of a sample of 1,500 properties found over 90 per cent of buildings under-insured, equating to a national shortfall of £2billion[118].
6. When ABI asked for more spending on flood defences in 2006[119], the Government actually reduced flood defence expenditure by £15m[120].
7. The industry is developing better catastrophe models for flood and storm (see Chapter 4). These pinpoint sources of concern and potential aggregations of loss (see Figure 2), which have to be supported by sufficient capital, reinsured, or reduced.

The 2008 ABI/Government Agreement

In response to the 2007 floods, in June 2008 ABI and the Government issued a formal joint statement on strategy[121], and ABI also updated its Statement of Principles on Flood Insurance in England. At the time of writing there is no ABI statement for the rest of the UK, although it is understood that different statements are planned for Scotland and Wales.

It signalled a major change in policy. The "guarantee" of flood insurance will cease completely from 1st July 2013, and from 1st January 2009, it will cease for all new housing.

The reasons are that subsidised flood insurance has distorted the market, leading to risky development, hindered the evolution of specialist flood insurance for the more difficult cases and limited incentives for the uptake of cost-effective resilience measures for individual properties.

The Government has agreed to pursue the major recommendations in Pitt:

- improve our understanding of flood risk;
- put in place a long-term strategy to reduce flood risk and fund it;
- ensure the planning system prevents inappropriate development in flood risk areas, and that any essential new development there is flood resistant and/or resilient;
- raise public awareness of flood risk and how to cope with it;
- promote access to insurance for low-income households.

Insurers for their part have agreed to collaborate with Government to achieve these aims.

It is sometimes suggested that the insurance industry should fund flood defence work. This is inappropriate, since in fairness they would have to levy a surcharge on their customers in flood-prone areas only. That would in turn deter the public from purchasing flood insurance, since they would be providing a subsidy to all the uninsured parties protected by the defences.

Flood exclusions

A key development for insurers may turn out to be the legal case of Tate Gallery v Duffy in 2007.

Until now, insurers have been unwilling to issue policies subject to the exclusion of flood damage because they knew this could result in costly legal arguments. Between 1976 and 2007, case law in England seemed contradictory. First it defined "flood" as water "not naturally there"[122] but later it was held that at the same time it had to be "caused by a natural event"[123]. However, in Tate Gallery v Duffy, 2007, it was held that if the insured peril is "flood" what matters is the accumulation of water itself and not how it got there[124]. This anticipates the definition due to appear in the new EU Flood Directive, which is: "'flood' means the temporary covering by water of land not normally covered by water".

A clearer legal definition of flood opens the way for insurers to exclude flood cover, which could be a valuable tool for underwriting high-hazard properties, especially new-build. It may be hard to tell if new properties are in a flood risk area. There are delays between the sale of a new home, allocation of a new postcode, and the appearance of that postcode in insurers' quotation systems.

Footnotes: See page 43

This would mean that anyone wishing to have flood cover would have to provide additional information about the risk, such as a copy of the EA flood risk assessment, and pay an additional premium. In high risk areas such cover could become very expensive, but that could encourage a niche market to underwrite such risks at the correct technical rate. In turn this could encourage policyholders to consider flood resistance and resilience measures[125].

In the USA , flood cover on domestic property is government insured, while storm cover is covered in a different policy. This causes problems after very destructive, wet storms such as Hurricane Katrina. The property may be totally destroyed, or it may be hard to apportion damage to a specific cause.

Future underwriting strategy for flood

FSA, the government-appointed regulator of financial services companies is insisting on closer management of exposure accumulations in the run up to the EU Solvency II Directive[126]. In the short term, well-informed insurers may adopt different strategies in different parts of the UK, because of the different legislative approaches to flood risk which still exist, outlined above.

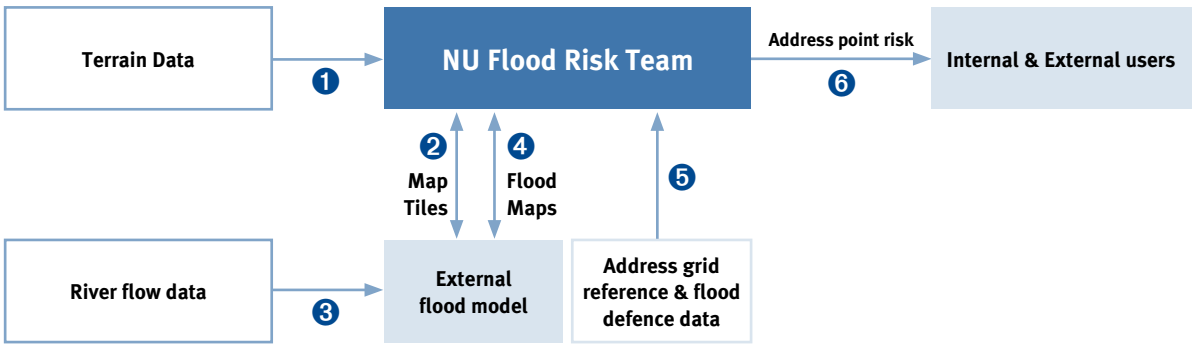
Interviews with insurers indicate that they are prepared to accept the increased risks of pluvial flooding because such events are unforeseeable and can happen anywhere[127]. However, when it comes to fluvial or coastal flooding, the hazard areas can be mapped and insurers can have a very positive role in using risk pricing to indicate via the market that planners and government should reduce exposure to such flood hazards[128]. Individual companies are making great use of geographical information systems to underwrite individual properties. Norwich Union undertook its own aerial survey to create more accurate topographical maps and identified 650,000 homes within official flood risk areas which were actually low-risk, so insurable. The company now sells the raw data to other insurers and agencies (see Box 8)

In the longer term, with the cessation of "guaranteed" flood insurance, and the steady rise in flood risk from climate change, insurers will increasingly segment the market according to flood risk as well as socio-economic factors.

BOX 8
Flood mapping

Norwich Union (NU) has set a new standard in flood insurance by carrying out its own pinpoint flood mapping exercise. The company was motivated by the increasing losses, and the realisation that this risk was being subsidised by less exposed policyholders. However, the available flood maps were known to be rather inaccurate. Figure CS1 shows the process of producing property level flood risk from the original data through to the completion of the risk mapping of addresses for a whole river catchment.

Figure CS1: Steps in generating the flood risk assessment



The flood model is based on a terrain grid with points covering the UK at intervals 5 metres apart. The elevation data is accurate to 1 metre for the UK, with a higher accuracy of 0.5 metres in the South-east, and in five conurbations to 0.15 metres using laser technology.

Errors in the elevation data can significantly influence the results. Edits are based on several data sources: government agency data and flood maps, flow data and radar images, and even Internet images of actual flood events. NU commissioned external technical experts to provide river flow data and map the extent of various floods for various severities of flood from 1 in 10 years, to the 1 in 1000 years event.

Footnotes: See page 43

Other classes of insurance

As river and coastal floods increase, the location of the policyholder's home may become a material underwriting factor for such classes as payment protection, legal expenses, personal accident, and even motor, as well as property.

Conclusions

The ABI Agreement on Flood Risk with Government is a major success for the insurance industry in England. However, insurers cannot relax for three reasons.

Firstly, already up to £230bn worth of property is exposed to flood damage in England and Wales. Reinsurance can only cover a minor part of this exposure, and could cease at short notice, particularly at time of renewal, or due to reinsurers' insolvency. Experience has shown that there are a number of scenarios in which losses could rise far above "normal" events. What if flood defences collapse in the face of an extremely high storm surge, combined with very high inland precipitation? What if this happens at the same time as the energy supply system is under stress, or emergency services are not able to respond for an unconnected reason? What if a dam collapses?

Secondly, there is a danger that constraints on funding will lead to "ghettos" of deprived and vulnerable people and poor quality housing. Withdrawing insurance may safeguard insurers' immediate solvency, but it will simply lead to greater problems; if social cohesion breaks down, then society will be a more dangerous, less insurable place.

Finally, insurers should be alert to the possibility that as the realisation grows that flood insurance is no longer cheaply available, there could be moves to compel them to provide cover at uneconomic terms as happens in the USA, and even to blame them for the worsening financial plight of the affected populations.

Recommendations on flood risks

In general, Pitt and the ABI/Government Agreement of July 2008 provide an excellent basis for managing flood risk. What is important is to implement the strategies, and refine them where experience indicates.

1. a. New homes are designed to last for 60 years. Inter-generational mortgages can last longer. Planning strategies should look at least that far ahead, taking climate change into account, especially the impacts for flooding from sea level rise and more severe rainfall events.

   b. Insurers should work together to persuade local authorities in England and Wales to establish Flood Liaison and Advice Groups as in Scotland and provide insurance delegates. This "ground up" approach will integrate development with the relocation of critical infrastructure and vulnerable people, and avoid criticism about "negative insurers".

2. Insurers should phase in premium increases and other underwriting features in flood hazard areas to reach the appropriate technical premium rate by 2013 at latest, so that the true costs of flooding are reflected in house values when the ABI Statement on Flood Insurance ceases. In doing this, insurers should ensure that they are using the best available scientific information on past and future flood hazard.
3. The market should consider whether there is a case for a general exclusion of flood claims for new build properties. Owners would then have to actively "buy back" the flood cover, giving insurers the chance to assess the risk and the appropriate terms. Protocols for apportioning claims costs between flood and storm need to be available.
4. Insurers should press for early changes in Building Regulations in England and Wales to make houses more resilient to flood damage as in Scotland and seek dispensation from the Disability Discrimination Act for houses built in flood hazard areas if the provisions of the Act make them more vulnerable to flood, provided these are not sold to elderly or disabled people.

Footnotes: See page 43

5. a. Property insurers should press for disclosure of dam and reservoir flood risk maps.
   b. Liability insurers of reservoirs in England and Wales should insist that the owners fit all earth embankments with adequate monitoring equipment to give early warning of failure.
   c. Both Property and Liability insurers should assess their dam break risks with best available technology so they can assess the maximum probable loss of a dam failure and discuss contingency and warning plans with the relevant Emergency Planning Officers.
6. a. There should be a programme of educating brokers, estate agents, local planners and council elected officers as to the importance of taking flood risks into account.
   b. Insurers should arrange for their front line staff and loss adjusters to receive training from The Samaritans to help them deal with flood survivors.
7. a. Insurers should consider pooling arrangements for contents insurance "pay with rent" schemes for social housing and housing for the retired and the disabled in flood hazard areas.
   b. Government should be lobbied to extend Housing Benefit to cover insurance premiums for such schemes.
8. a. Insurers should consider using their telephone call centres pro-actively to spread flood warning messages to policyholders, offering to assist with evacuation or advice.
   b. Collectively, insurers could employ private security staff to reduce looting after floods.
9. Insurers should promote resilient reinstatement and press Government for compulsory resilient reinstatement after a flood as provided under the Building (Scotland) Act 2003.
10. Insurers could do more to encourage sustainable or temporary solutions, by collectively or individually funding natural flood management demonstration projects.
11. Insurers should recognise the availability and use of an appropriate demountable defence, when quoting terms and applying deductibles. They could also facilitate favourable credit terms for policyholders who wish to buy demountable systems.
12. Professional indemnity insurers of architects and planners should raise with them the implications of climate change for designing the built environment[129].
13. Insurers should collaborate with Government to determine whether any insurance coverage is possible for the risk of coastal erosion. While the loss is inevitable, the timing of the loss may be uncertain. This is analogous to life insurance; death is inevitable, but insurance is possible. Potentially therefore, some form of multi-year risk pool might be applicable.

7.4 Storm

Introduction

This subject was well discussed in the 2001 CII study on climate change. Since then, there have not been any major developments concerning UK storm. This section therefore merely picks a few highlights, and the reader is recommended to consult the last report for more extensive analysis.

The last severe and widespread winter storms in the United Kingdom occurred in 1990. UK had near misses in 1999 and again in 2005. One suspects therefore that insurers and repairers may struggle when another series of storms appears.

Footnotes: See page 43

The outlook

Climate change will produce the risk of more frequent and severe storms in winter together with drier, hotter weather coupled with the risk of tornadoes and more thunderstorms in summer. There is a suggestion of a possible shift southwards of storm tracks in the British Isles, which may result in stronger winter winds across Southern England (see Chapter 3 for more detail). There is still considerable uncertainty on this issue.

However, recent research does cast some doubt on the ABI's projections that winter storm costs in Europe might be just 5% higher by 2080 due to climate change[130]. Other studies suggest 25%[131] or 35%[132]. In all cases there is no adjustment for the likelihood of more vulnerable fitments on buildings, or for the likely accompanying heavier rainfall, both of which factors would magnify the losses.

Policy conditions

Insurers set their technical definition of a storm following research into damage caused during high winds in the period 1962-1976, which indicated that minor damage to buildings began at a gust speed of 40 knots, but that widespread damage occurred when gust speeds reached 65 knots[133]. Given that the principle of insurance is to provide protection against loss or damage arising from unexpected and exceptional conditions, it is severe conditions which insurers should be indemnifying policyholders against, not damage which is due to a lighter wind and poor maintenance of the property concerned, as is often the case[134]. Research into past storms has shown that buildings in Southern England are less resilient to the action of the wind than those in Northern England and Scotland[135], where higher building standards have evolved to reflect the greater frequency of strong winds. In principle, a threshold gust speed would vary across the UK, reflecting the local wind regime (higher at the coast, on hills and in the northwest) but that is impractical.

It is likely that wind-resistance design standards generally will become stronger, to reflect the increasing storminess under climate change. This means that old housing stock will be more vulnerable. Insurers need to recognise this in their underwriting terms, and also address the issue after damage has occurred. When a house is upgraded, either during routine maintenance or during storm repairs, terms should be relaxed. Since insurance is a contract of indemnity, the policyholder should pay for upgrading to current building standards. However, it is the insurer's interest to encourage upgrading. Potentially, this could be done by varying the policy excess to reflect the quality of roof design.

For new build, it is essential that the building industry ensures that current windstorm requirements in the relevant Building Codes and planning standards are both appropriate and rigorously implemented for projected weather and climate change challenges. Euro Codes need to accommodate the conditions experienced in the UK now and in the future, not simply an average of conditions prevailing across Europe.

A significant proportion of the housing stock in the UK was built before 1944 and it would be natural to assume that these are the most susceptible to roof damage, especially if inadequately maintained. However, a major research project by the University of Aberdeen[136] analysed windstorm claims from the three biggest insurers and were surprised to find that the properties most susceptible to storm damage were houses built after 1971 in England using prefabricated roof trusses. These engineered trusses are much lighter than traditional roof designs and were very prone to toppling like dominos, resulting in the collapse of the gable wall. The research found that maintenance was not a factor at all. It also found that houses in Scotland were much more resilient due not only to higher building standards, but to the practice of using sarking boards on the roof which provided extra strength and ensured that every slate or tile had to firmly fastened, not just "hooked on" to a batten. There is some concern that a few building developments in Scotland are being constructed by English builders who do not use sarking boards, and these will be vulnerable to storms. Interestingly, this is such a concern in the Shetland Islands that only local builders are allowed to work there. As a result, the islands' buildings suffer very little storm damage, despite facing the most severe windstorms in Europe. Appropriate standards must be promoted for maintenance and repair given the age of these properties. Tiles and slates comprise the vast majority of roof coverings and are the most vulnerable to wind damage. Ideally the entire roof should be stripped and relaid, but that is too costly. Tiles or slates around the periphery of the roof could be fixed better by increasing the number of nails or screws and using tail clips. Other methods that could be explored are roof netting systems, spay-on foam coatings and redesigned roof vents which would ventilate the batten space between the underlay and the underside of the roof tiles leading to improved pressure equalisation[137].

Footnotes: See page 43

Convective storms (thunderstorms, hail and tornadoes)

A severe tornado affected the southern part of Birmingham on 28th July 2005 resulting in 20 people being taken to hospital and damage costing insurers in excess of £25million[138]. Recent scientific research confirms what had been expected: electrical storm activity increases as the average temperature increases[139]. This means that global warming will produce more of these incidents.

British coastal waters are at their warmest in September when the land is already cooling. This is why "convective" storms are common on the south coast in the autumn. These added to the flood problems in Sussex and Kent in October and November 2000. Summer 2006 was the warmest extended summer in England since instrument records began in 1659 and November 2006 recorded a record number of thunderstorms on the south coast of England. Damaging tornadoes were recorded in London in December 2006.

With the increased use of electrically powered apparatus in homes and businesses the risk of lightning strikes causing personal injury, death or damage to property has been significantly increased and this trend is expected to continue. Simple precautions like circuit breakers are available, but not widely used.

Hail damage to roofs and vehicles is a significant case of insurance claims in some countries (e.g. Sydney, 1999; Munich 1984), but it is unlikely to reach those levels in the UK.

Damage from fallen trees

Trees could be greatly stressed by variations in precipitation under climate change. They could face an increase in summer temperatures, coupled with a reduction in rainfall, but also waterlogging in autumn and winter[140]. This will result in a greater susceptibility to windthrow, and discarding of major boughs, with resultant damage to property and harm to people. 15 million trees fell in the storm of October 1987[141], though most of these were in plantations or woods.

Controversially, the British Standards Institute has proposed guidelines for tree safety inspection[142], which might impose a higher standard of care for homeowners, and reduce the number of tree fall incidents. This may be welcome news for insurers, but it is meeting resistance from environmentalists and safety authorities like the HSE.

The insurers of a tree owner will only pay for the damage caused by a falling tree if it can be shown that the tree was exhibiting signs of decay or instability prior to a storm occurring. The cost of the removal of the tree would be met by the insurer if the tree should fall onto a building or a brick wall, under the Removal of Debris extension, but not if it has hit a fence as the storm peril excludes loss or damage to fences. This has caused problems in the past and it might be prudent for the insurance market to consider paying for the removal of trees if they have fallen on any property, whether insured or not. However, under the new proposals, if the tree inspection were overdue, or the inspection advice were ignored, that might change things.

Summer storm damage

Even summer weather is expected to be windier[143]. (The summer of 2008 certainly was consistent with that.) Taken in conjunction with the trend towards strong localised storms in summer and autumn, and lifestyle changes, this has implications for storm damage.

Global warming means UK lifestyles are moving towards outdoors leisure. This entails an increase in garden furniture, domestic leisure equipment like trampolines, and attachments to houses like conservatories and awnings. In windy conditions, these can either become airborne missiles or vulnerable targets. Insurers have found that even well-designed structures are often damaged in this way.

Footnotes: See page 43

Recommendations

Insurers should propose the introduction of stronger wind-resistance standards for buildings, calculated to be able to deal with the likely higher windspeeds from climate change during the lifetime of the property. This could mean building in a margin of increased windspeed of 20% on current levels. This adjustment should be reviewed periodically as new scientific evidence becomes available.

Insurers should encourage owners and occupiers (perhaps by the use of renewal questionnaires, or warranties in policies) to undertake regular inspection and proper maintenance of roofs.

Underwriters should make greater attempts to recognise the quality of wind-resistance in property proposed for insurance, and adapt their terms accordingly.

When reinstating property after storm damage, insurers should promote the upgrading of the property to higher standards. This could be done in various ways; e.g. by advance notice that renewal terms will reflect the standard of the reinstated roof, etc; by facilitating finance for upgrading work that is not covered by the insurance contract; and by providing a commitment to terms that is longer than the normal 12 months.

Insurers should adopt clauses to exclude power surge damage to domestic electrical equipment unless it has been protected by a circuit breaker or equivalent device.

Insurers should set an industry wide definition of storm in the UK which states that claims will only be met if a threshold gust speed of 60 knots (69mph) is reached or exceeded. This would make communication with policyholders simpler.

Insurers should periodically remind policyholders of the problems that unsecured external furniture and equipment can cause during high winds.

Insurers should review market practice in dealing with tree damage, in the light of likely climatic impacts on trees, and the proposed British Standard on tree inspection.

7.5 Subsidence

Subsidence cover is particularly associated with domestic property in the UK and France. In other countries, and on commercial risks, cover is uncommon. Since the previous CII study on Climate Change not much has changed[144], so this section simply updates the issues.

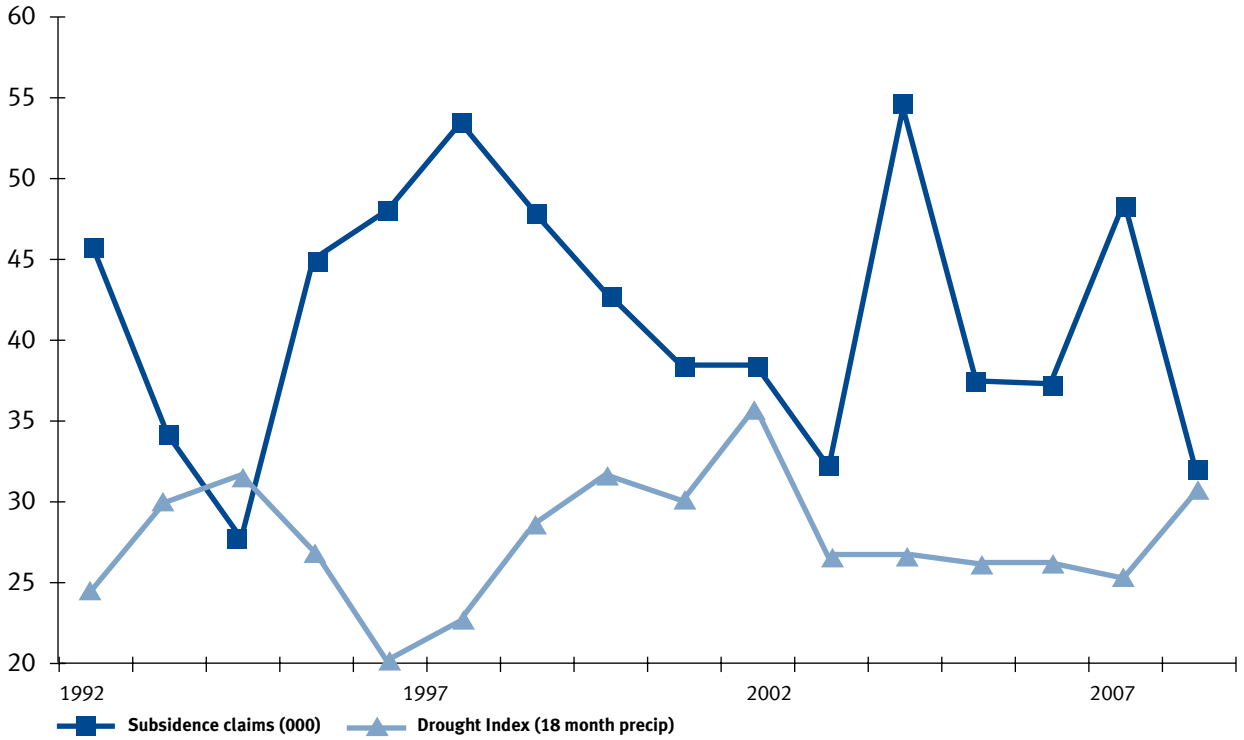
In the UK subsidence is primarily associated with areas of shrinkable clay soils. These soils, found predominately in London and the South East of England, swell when saturated with water or shrink after long periods of dry weather. Such shrinkage causes the building to sink and this creates cracking which follows a typical stepped pattern.

Typical historic weather patterns in the UK were of damp summers and autumns, with slightly drier winters and springs[145]. These patterns meant that dry, hot conditions were infrequent, so subsidence on clay soil was not common. In the twentieth century, UK rainfall patterns started to alter, with wetter winters and drier summers. Subsidence became more common due to drier, hotter summers. Usually these were balanced by wet winters resulting in the cracks closing. This process is known as natural recovery and before the advent of insurance cover any residual cracks were simply patched up.

In the 1960s, a rapid growth in home ownership coincided with a decline in summer rainfall. Lending institutions, who were the dominant intermediaries for domestic property insurance, persuaded insurers to add subsidence cover to the insurance contract in 1971. Insurers now face a regular influx of thousands of subsidence claims. This is exacerbated by prolonged drought, which we define as a period of 18 months up to September of any year, a period which includes a summer, a winter when ground-water would normally be recharged, and another summer. Figure 3 shows that when the quantity of precipitation over that period is low, then subsidence claims are high, because the intervening winter has not recharged the ground-water. Conversely, when the period is wet, subsidence intimations fall steeply.

Footnotes: See page 43

Figure 3: Subsidence claims and drought in UK, 1992-2007



Source: number of claims from ABI; cumulative precipitation in mm in England and Wales over 18 months to September, scaled by factor 1/50 from Hadley centre website

Initially, the solution for subsidence was to undertake expensive underpinning, but now the approach is more considered – monitor the problem, and identify the underlying causes, which can be quite complex. Often trees contribute to the problem, and careful management of nearby trees can be a much cheaper and effective answer.

The other contributory factor that was identified was the depth of buildings' foundations. Over several decades, the regulations relating to foundation depth changed, and the use of basements within buildings became less common. Table 3 shows clearly how the age of building was a determining factor in the likelihood of a subsidence claim. Houses erected from the 1920s to the 1960s have a higher rate of subsiding than do earlier or later buildings. However, due to their age and different construction, the oldest houses (i.e. pre-1920) tend to cost more to repair.

Table 3: Age of building and likelihood of subsidence

Date of building	% of subsidence claims in 1976	% of housing stock in 1976
Pre 1920	32	32
1920s-40s	37	30
1950s-60s	26	18
1970s	6	20

Source: ABI

Footnotes: See page 43

The future outlook for subsidence

As reported in Chapter 3, climate scientists expect a greater likelihood of short-term summer droughts over southern and central England. Long-term droughts are projected to become shorter and less severe due to increases in winter precipitation. Essentially this is good news concerning subsidence, since the main factor, clay shrinkage during prolonged drought, will be less likely. What it does mean, however, is that whenever there is a dry winter, the ensuing drought could be much worse. Insurers can therefore expect fewer clay subsidence claims on average, but possibly greater peak years.

This optimism has to be qualified. The fact that summers will be drier will cause tree roots to spread wider in search of water, possibly damaging nearby houses and underground services. Tree selection and management will therefore be more important.

Subsidence can also be caused by constructional problems that result in too much or too little water. Variations in the moisture content of the subsoil can bring about the collapse of drains and water supply pipes, which can result in subsidence as well as localised flooding. Other causes of subsidence relate to the inappropriate use of Sustainable Drainage Systems (SUDS), which can result in de-watering of water courses, and the increasing tendency to hard-pave areas around houses for off-street parking and recreational purposes, thus reducing the amount of moisture reaching the foundations of properties and increasing the risk of subsidence while ironically, the rain-water run-off can result in an increased risk of flooding. Such works even on a small scale can cause unacceptable risks, and insurers should press for tighter planning controls in this area, and possibly even retrospective enforcement at the time of a property changing hands.

It is likely that building regulations will be strengthened to require foundations on clay soils to be increased and whilst this should assist in the reduction of climate-change related subsidence claims there will remain large amounts of existing housing stock with shallow and inadequate foundations where risk improvements are not feasible.

Unfortunately particular areas can suffer property blight where there are “clusters” of buildings all suffering from subsidence. Occasionally these areas may be on the sites of old mine workings or where the clay soil is particularly subject to volumetric changes in response to climatic factors. Such properties will be difficult to sell as prospective purchasers will be alerted to the situation by pre-purchase surveys. One extreme case found a large modern private estate in Surrey that was built on the site of an old rubbish tip. Eventually the developers were obliged to buy the properties back prior to demolishing them!

Insurers are able to identify such properties by virtue of their post-code based rating system.

New customers may be refused cover or be expected to bear greater excesses or increased premiums. Each case must be looked at individually.

Subsidence in France

Foundation Engineering, France’s web-site contains some interesting information explaining why the situation there is worse than in the UK:

- The incidence of swelling and shrinking clays in France is far more widespread in France and covers a much larger area of built up land.
- Building standards and their enforcement have only recently come up to UK levels.
- Buildings of 20 years old and more may not be built to a high standard.
- There are many dilapidated buildings in rural areas where new build is not permitted.

Cover is virtually automatic, and 100% reinsurance is provided by the Government. The scale of losses was such that CCR, the government reinsurer was temporarily insolvent. Measures are being taken to restrict indemnity and improve risk management, to prevent recurrent losses in the same areas.

Footnotes: See page 43

Recommendations

Insurers need to underwrite on the actual structure of buildings, and the surrounding risk features, not just its age or post-code. Particular attention should be given to tree selection and management, in advising policyholders of the risks, and requiring warranties.

Through ABI, insurers should press for tighter planning controls on small scale alterations that can affect drainage, and even retrospective enforcement at the time of a property changing hands.

7.6 Extremes of temperature

Freeze

The coldest year in the UK since 1740 was as recently as the winter of 1962/3, when snow lay in some parts of the country from December to March and the average January temperature was minus 2.3^{0}C.The freeze of December 1995/January 1996 cost the insurance industry £350m, mainly in Scotland and N. England[146].

Thanks to the Gulf Stream, coastal areas are often relatively mild as Table 4 indicates.

Table 4: Number of days below freezing all day (period 1971 – 1990)

	Average per winter	Most in a winter
Lerwick (Shetland Is)	2.1	7
Birmingham	4.8	17

Climate change projections indicate that a minimum temperature of – 50C that currently occurs on 15 per cent of days in winter will happen on just 4 per cent of days in winter by the 2080s. Already, between 1961 and 2003 the length of the frost-free season has extended in Scotland by 38.8 days. Freeze leading to burst pipes is therefore much less likely than in the past.

It has been suggested that the Gulf Stream may decrease in strength by about 20 per cent over the next 100 years due to climate change (see Chapter 3). Even taking this into account, the Hadley Centre regional climate change model predicts that by the 2080s, winters in Shetland may be on average 1.8 degrees Centigrade warmer[147].

Heat waves

Temperatures in roof spaces, where water tanks and pipes are generally located, will commonly reach levels of 40^{0}C or more in future summers. Such temperatures can cause plastic pipes to distort or compression joints to blow apart resulting in escape of water, and extensive damage to structures and contents. Consideration should be given to insulating the interior of the roof covering, rather than the floor of the roof space and installing roof vents to give greater ventilation within the roof.

Other plastic components used in house building will also be susceptible to movement and damage as temperatures rise, while lath and plaster ceilings dry out and risk collapse in such conditions especially if located near the top of a house. Policyholders have submitted claims under the accidental damage peril of buildings policies for such damage.

Temperature extremes recommendations

- For the foreseeable future, insurers should maintain their warranties and other conditions relating to anti-freeze precautions for property left vacant for any length of time.
- Burst pipes caused by freezing is an avoidable risk. Research in USA[148] shows a simple low cost (£5) modification to plumbing systems could prevent burst pipe damage altogether, and this modification should be considered standard when dealing with freeze claims.
- ABI should review the vulnerability of modern buildings to high temperatures.
- Insurers should ensure that policy wordings exclude damage due to internal drying out of buildings.

Footnotes: See page 43

7.7 Claims handling

Principal sources of loss

Whilst natural catastrophes associated with climate change can include avalanches, heatwaves, freeze, drought and landslides, the majority of losses will result from windstorm and flood. These therefore form the focus of this study. While this chapter concentrates on UK domestic property, useful lessons can be learned from experience in other countries in dealing with the aftermath of extreme weather events. As we witnessed in the UK with the 2007 floods, the scale of events is increasing and it is only a matter of time before another series of storms hits here.

As shown in Chapter 2, the statistics collected by Munich Re (and Swiss Re) show major increases in catastrophic weather events in the 1980s and 1990s, continuing into the current decade. In particular, 2005 saw Hurricane Katrina which raised numerous issues with BI, damage to peripherals such as computer terminals and back-up facilities. Not least it highlighted major problems caused by the destruction of local infrastructure and a severe shortage of local claims handling and loss adjuster capacity.

Classic problems for insurers caused by natural catastrophes

- All classes of insurance are likely to be affected although this section focuses on domestic property. This means that skilled resources and management time could be in short supply.
- After a major loss has occurred the local infrastructure is likely to be severely compromised. This in turn is going to make it difficult to reach risks.
- A major natural disaster may destroy policies or at least make it difficult for policyholders to find them thus making claim notification more difficult.
- External organisations such as loss adjusters, construction companies and specialist repairers may be unable to cope with the volume of work, and materials may be in short supply.
- If claims are not notified timeously it makes it very difficult to estimate overall losses which in turn can impact on notifications to reinsurers. This was a particular problem after “Lothar” and “Martin” in 1999, when intermediaries with delegated authority could not cope.
- In these circumstances it makes sense for insurers to “guesstimate” provisional loss figures, based on catastrophe model simulations of the event’s effect on the insurer’s portfolio of risks.
- Another difficulty that confronts insurers is the need to deal with claims fairly, promptly and equitably against a background of heightened press publicity, and the sheer organisational and logistic challenges posed by the receipt of thousands of claim notifications within a very short space of time. In practice this could mean a process of “triage”, i.e. identifying the hard core of cases that are very costly or suspicious and handling them in special teams, while the bulk of cases are fast-tracked, but with some being spot-checked in more depth.
- Geocoded information can be valuable in the detection of fraud through linkage of databases with maps in the wider field of claims management. For example, in the August 2002 floods in Germany geocoded data proved useful in considering reported losses outside the discretely identified loss zones. However, this has to be applied with care. After the 1993 Perth flood in UK, many valid claims for golfing equipment, and for loss of frozen food, were received from policyholders outside the flooded area. These were due to storage of items at a flooded golf club house, and to failure of the public electricity supply[149].
- Disputes over issues like event definitions will always arise. Where these are widespread, a central team should be tasked with resolving them promptly in the current crisis, working with major intermediaries and loss adjusters, and if necessary other insurers or ABI. A note should be made to take appropriate measures to avoid their recurrence in future events, e.g. by redesigning products.

Footnotes: See page 43

Preparation

Insurers need to concentrate on pre-loss measures to be adopted so that they are prepared to cope with emergencies when they arise. They need to have strategies in place to satisfy peak customer demand and robust and transparent systems to handle the claims once they actually arise. A balance must be struck between, at one extreme, excessive expenditure to counter a remote possibility, and at the other, a policy of "business-as-usual" the consequences of which can be a systems collapse, with high on-costs from ad hoc measures, and dire customer service.

The plans should be subject to an in-depth analysis after a major weather-related event to see what was done well and what are the areas capable of improvement.

Given the inherent uncertainty of the weather, it is vitally important that as far as possible the advanced planning is set up so that the claims management only need to "press the button" to set the processes in train. This detailed plan needs to be "bought" into by the various agencies and staff, so that everyone knows what is expected of them when an emergency arises. Box 9 contains the likely components of such a plan although the precise details need to be worked out in the light of individual local resources and infrastructure.

BOX 9
Core elements of a claims disaster plan

- Emergency procedures, including alternative premises and computer facilities and a list of key staff contact details, because the insurer's own operations may be disrupted.
- A robust back-up communications plan. Mobile phones may not be viable in a crisis, due to disruption of the network, or excessive demand.
- Occasional dummy runs to assess the viability of the plan.
- Clear support from senior management before distribution to the staff. The clearest demonstration is visible commitment of personal time and corporate resources BEFORE THE CRISIS – for example, attendance at briefings, actually carrying out dummy runs.
- Strong relationships with outside organisations like damage restoration firms, equipment suppliers, and loss adjusters as their help will be key in view of the extreme pressures likely to be imposed on staff following a major insured event, and competing demands from others during the crisis.
- The use of trans-territorial and even trans-national staff and resources. Some insurers have created a pool of part-time or retired staff available for rapid deployment.
- A training programme for staff.
- Satisfactory remuneration arrangements for crisis working, including potentially funding additional family expenditure while the staff member is at work.
- Quick access to additional equipment for the extra workers.
- The use of early-warning systems for extreme weather.
- Flexibility in the normal claims handling procedures so that most cases can be fast-tracked.
- Arrangements for delegating emergency disbursement of funds to such as loss adjusters and intermediaries, while accounting for them.
- Arrangements to define the event and identify associated losses for reinsurance purposes.
- A public relations strategy.
- A communications strategy for customers and intermediaries.
- Provision to make an early estimate of the financial implications for the company.

While Box 9 is aimed at insurers, loss adjusters of course will have their own emergency plans, which will very likely be called upon more frequently than insurers' ones.

Handling the claims that arise

This is the core of the insurer's promise to customers. Insurance is an intangible product and the customer only knows the value of the product he has purchased at the point of a claim.

Once a major claims event has occurred, senior management authority should be rapidly obtained to initiate the claims disaster plan. A steering group should be formed to agree the initial measures necessary.

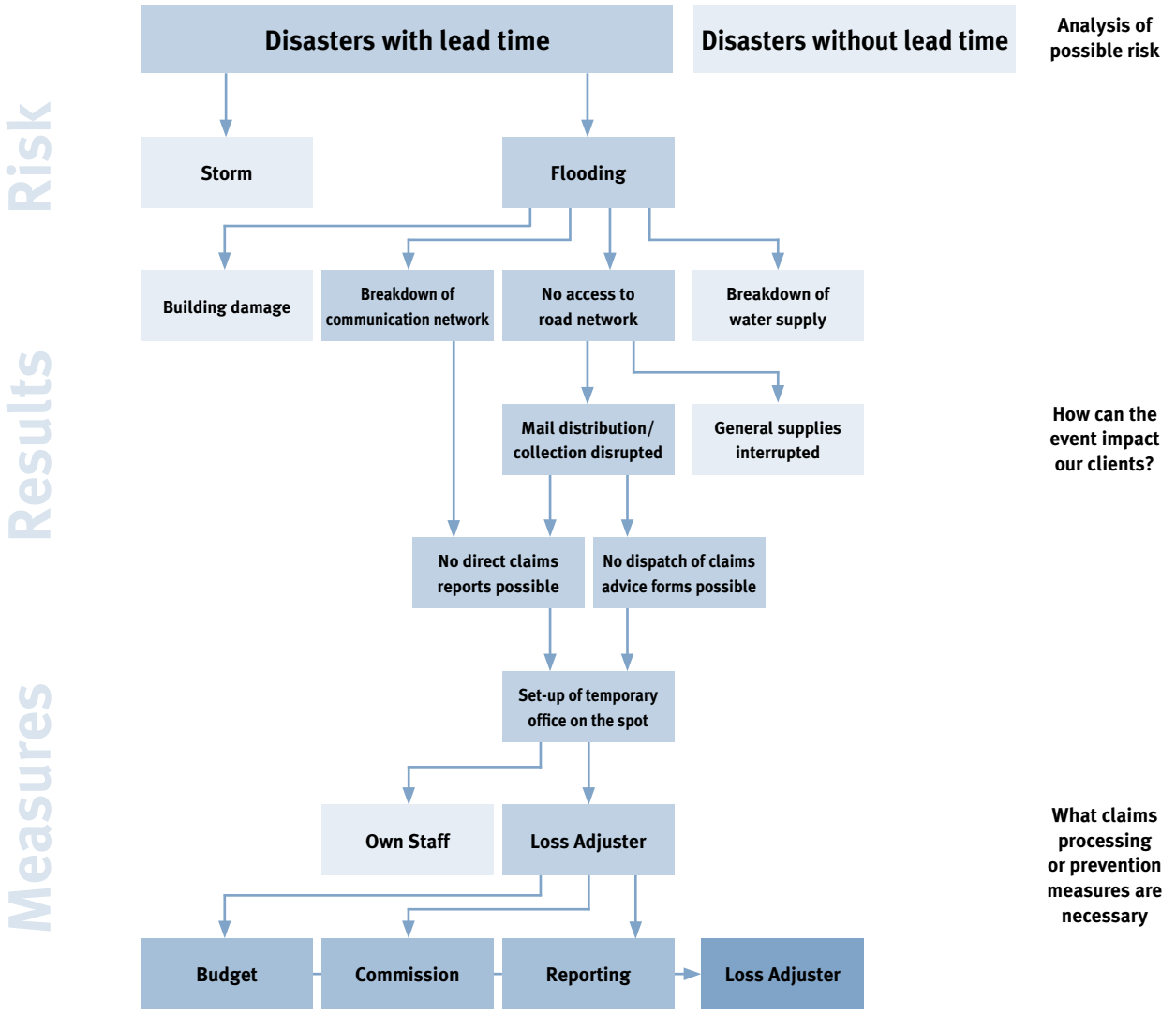
Footnotes: See page 43

As has been suggested earlier, much media interest is likely to be attracted and there should be a dedicated press officer, if necessary externally appointed, to deal with such enquiries. As much information as possible should be conveyed, provided client confidentiality is not compromised. Aspects relating to the overall cost or of a financially sensitive nature should be referred to the usual channels for comment. It is possible that commentators will produce wildly excessive estimates of the costs to insurers, and staff must not be drawn into discussion of such kite-flying.

A dedicated major loss team(s) should be formed, as it is important to maintain close focus on the claims notified, and to share information rapidly as the situation develops. This also allows the other parts of the insurer's business to function as normally as possible. Apart from the potential customer impact, the other crucial issue is to what extent the insurer's own resources have been affected. If necessary, the appropriate fallbacks must be activated, e.g. home-working, portakabin arrangements, alternative premises and computers, etc.

The flow chart (Figure 4) that follows indicates the likely repercussions on an insurer's business processes. A better response should be possible for disasters with lead time, i.e those that can be predicted some time ahead such as storms and tidal surges. Accurate forecasting can lead to better preparation and the taking of immediate action such as the evacuation of staff and the removal of sensitive equipment. Events without lead time such as tornadoes and flash floods will preclude this type of activity and reliance will need to be placed on activating the emergency plan after the event has occurred.

Figure 4: Problems in claim-handling following a catastrophe



Source: Munich Re

Footnotes: See page 43

Effective staffing of the claims handling unit is critical. It may be necessary to cancel staff holidays or use company pensioners to cope with the huge additional workflow anticipated. It may also be possible to make use of contract agency staff at hourly rates. This can be particularly useful for the more routine processing operations to be carried out under the supervision of a permanent member of staff at the appropriate level of seniority. These temporary staff can also include competent relatives and perhaps potential university students in gap years. Where the insured event is relatively localised it may be possible to arrange for claims staff from other of the company's centres to be transferred and provided with overnight accommodation.

It is essential that ALL claims handlers are made aware of the relevant policy terms and conditions so that time is not wasted investigating claims that clearly fall outside the scope of the policy cover. (This is not as easy as it sounds – often insurers have numerous special wordings for affinity groups and specific intermediaries).

It is of the utmost importance that the insurers' I.T. systems are able to cope with the additional work-flows anticipated. It goes without saying that in the UK, the claim files are on an electronic system, but it may be unavoidable to handle some initial work manually and upload it later. Record-keeping is vital and such cases should be kept to a minimum.

At the earliest stage it will be necessary to contact loss adjusters. An indication of the workload will be needed, as well as activating such measures on the claims disaster plan as dedicated claims-handling authorities on pre-determined limits. Pre-designed forms will facilitate instructions to loss adjusters. Ideally a brief client history should be available. It is essential that they work to clear briefs and that there are no avoidable misunderstandings. The following is a short check-list of the main points that should be covered.

- Clear authority levels to be set.
- Ensure close familiarity with insurers' policies and relevant deductibles.
- Liaise with appropriate bodies on damage limitation.
- Agree suitable basis of fee remuneration, there may be a pre-determined structure which may need varying whether it is fixed-fee or an hourly or daily rate for more complex cases.
- Record sufficient information that will enable insurers to satisfy reinsurers' audits, and provide a basis for future analysis of the costs.

The workload needs to be efficiently managed whether by insurers or adjusters so that there is an appropriate balance applied between claims suitable for desk-top handling and those where visits are essential. Loss adjusters and insurers are now able to set up temporary offices with computer connections close to major disasters to handle claims and keep in close contact with policyholders[150]. The Chartered Institute of Loss Adjusters is able to lend a hand in the co-ordination of responses and to liaise with Local Authorities and other bodies on behalf of adjusting practices. In addition, many insurers and loss adjusters have panels of building contractors and other specialists available to them that can be called upon to dry out, make safe and restore properties and their contents and these specialists can have a site office presence alongside technical representatives from the adjuster making themselves available for help, guidance and liaison.

However, widespread damage could result in services becoming stretched and access being restricted and insurance companies and adjusters could investigate the possibilities of using other forms of remote technology, such as web cam/ video imagery to transmit images of the scene to a claims official located some distance away who could communicate with the policyholder or others located at the scene of the claim using mobile phone technology to ascertain details of the loss and to examine any particular points of damage so that speedy decisions can be reached[151].

Policyholders need to be made aware of what is likely to happen and to be given advice as to what they can do by way of emergency and damage-limitation methods. Potentially this can be done on the internet or by text messaging.

Experience has shown that most incidents are windstorm and flood claims. Close liaison should be established with those best able to deal with these particular emergencies. For example, flood claims will demand the use of cleaning and restoration concerns and windstorm claims will entail the use of insurers' panels of approved builders both to carry out emergency repairs and also permanent restoration works. Damage to historic or scheduled structures may well entail the instruction of specialists. Furthermore any work entailing the stripping out and removal of asbestos is likely to require the use of licensed specialist contractors.

An important aspect which can run the risk of being overlooked is that damage claimed by the insured as resulting in a total loss may in fact be repairable. To investigate this possibility it will be necessary to ensure that loss adjusters instruct and liaise with damage restoration companies. This will be particularly important where property of a specialist nature is

Footnotes: See page 43

involved. Contrary to received opinion, much can be done to restore computer hardware and software and even historical documents (in one case a valuable collection of maps in a flooded museum) can be substantially restored.

Unfortunately there will be instances of fraud, seen by some policyholders as a victim-less crime. Economics will dictate that a proportionate approach should be applied to investigating suspected fraud. Loss adjusters should already be aware of insurers' approach in such cases and should seek to mirror this. Modern technology enables discrepancies in estimates and invoices to be investigated and cognitive interviewing techniques can be applied. In no circumstances must the public be led to believe that there is a "threshold" below which no investigation will be carried out.

Alternative accommodation

Alternative accommodation can present significant problems in the event of catastrophe damage occurring. Not only would accommodation be required for the insured and family, but also for tradesmen and insurers' claims representatives drafted in to deal with the resulting claims, and potentially even the insurers' own backroom staff and their family members.

Liaison with the local authority, tourist board or hotel association might identify cost-effective solutions. Hotels are expensive and can only be considered as a short-term option for a period of 2/3 weeks. Caravans and mobile homes can be used if a policyholder wishes to remain on, or close to, his land in order to oversee repairs or if there are pets or other animals to look after. Provided that a suitable site could be found, a mobile home park could be created by a pool of insurers and adjusters, while the possibility of paying for long holidays in the UK or elsewhere may be a solution where retired policyholders are concerned.

Cases

One of the authors personally dealt with a number of losses resulting from extreme weather-related events. The following may be of interest:

a. The "hurricane" of 1987 was the first major loss event of this nature in modern times in England. As it was largely concentrated in the South-East of England, expensive properties and sophisticated electronic businesses were involved. Its relative concentration enabled claims staff to be drafted in from elsewhere in the country, though weekend working was essential to cope with the mass of claims. A major problem at this time was overcharging by builders and maintenance work claimed as windstorm damage. Dedicated teams were set up and guidelines such as factsheets setting out the "fair" prices to be charged for certain basic building operations were posted in the office and appreciable variations from these charges were subject to challenge.

b. On one occasion it was necessary to liaise with the press to ensure that insurers' views were given adequate press coverage in the face of criticisms of undue delay. It needed to be demonstrated that "quick fixes" particularly with flood damage are counter-productive. Properties must be allowed to dry out and time taken to ensure the best solutions for customers. This problem is still with us, as seen by misguided Ministerial comments relating to the "tail" of flood claims from 2007.

Subsidence claims

In the early days of subsidence claims handling in the 70s and 80s it was the invariable practice to underpin properties. There was a climate of opinion amongst policyholders that this was the only effective remedy and pressure was also exerted by mortgage lenders. A whole underpinning industry grew up and this greatly increased insurers' costs. Subsequent research suggests that many properties were unnecessarily underpinned and the common practice now is for a period of monitoring (typically 6 months) to be carried out. In many cases all that is required is repair of the cracks by various proprietary methods. By any standards these methods must show cost savings. Initially there was a degree of customer resistance but in general monitoring is accepted. In most cases there is substantially less disruption than with traditional underpinning. Insurers should continue cover after crack repair and will have to reopen cases where it has not proved effective.

Some insurers are now actively looking at the use of new satellite technology called Permanent Scatterer Synthetic Aperture Radar Interferometry (PS inSAR) which can identify ground or building movements of less than 4 mm per year in the x, y or z axis. These data go back more than 12 years and can readily identify subsidence or heave as well as giving advance warning of the likely collapse of buildings, dams, reservoir embankments, etc.

Footnotes: See page 43

BOX 10
Case study: Lessons from Hurricane Katrina

Background

The USA is accustomed to hurricanes, but Hurricane Katrina was on a new scale, and provides lessons for insurers everywhere. The economic effects were enormous, but here we focus on the personal lines claims-handling difficulties seen during a "super-catastrophe".

New Orleans is the fifth largest port in USA, and had 500,000 residents in 2005. There are many storage facilities, and also tourist attractions. Large areas are below sea-level, protected by "levees" or embankments. In late August 2005, Hurricane Katrina struck. The levees collapsed in several places. Up to 80% of the city was flooded, with 55% of the properties over 1.2 metres deep. Possibly 2,000 residents died: no-one really knows. Due to pollution from leaking sewage, chemical and oil facilities, the entire city and surrounding areas were compulsorily evacuated. It was early December before access to the city was completely restored.

Claims-handling problems

This event is an example of a 'phase transition' in the claims environment, where the scale causes further types of loss[152]. Failure of public utilities like water pumping, power, and communications means that damage is not quickly brought under control. Voluntary efforts by neighbours become impossible. Debris from disintegrating buildings damages nearby buildings.

Although insurers deployed thousands of adjusters in advance of Katrina, they were denied access by the emergency. This allowed damage to deteriorate, making the eventual repairs more complex. The delays increased living costs for consumers, which are often insured. Other loss-aggravating factors were public disorder (theft, looting and arson) and pollution.

Shortage of resources led to "demand surge" where repair costs soared by as much as 40% on average, and backlogs of work built up due to unavailability of insurance and repair staff. The cost of accommodation also rocketed. Insurance work in other areas was impacted, due to the departure of construction workers for lucrative "Katrina contracts".

The quality of life for residents and recovery teams suffered, with substandard services, economic hardship, poor living conditions, and social stress. The recovery process was complicated because repairs to hurricane damage in the previous season were still incomplete, and subsequent storms (Rita and Wilma) added to the damage[153]. With high levels of damage and pollution, whole neighbourhoods may be demolished, rather than repair less damaged properties.

Some policyholders took advantage of the situation to exaggerate or even falsify claims. Insurers are under pressure to pay for a broader range of losses than are covered. Policyholder groups may threaten litigation. From a commercial point of view, some insurers may conclude that generous claims settlements are good for business.

Implications

- Collectively, ensure that the insurance industry has a say in the recovery strategy adopted by the authorities
- Reserve essential resources (accommodation, contractors, materials) quickly as a precautionary measure
- Budget for additional costs

Civil Contingencies

The UK Cabinet Office commissioned a study of the event to assist with UK disaster planning[154]. The evacuation was massive: 1.2 million people, many obese or unwell, often with several cars per family, boats on trailers, and pets. The study noted the need to assist essential private sector workers to evacuate their own families, so that they could continue to maintain vital services like transport, food, and energy during an evacuation. No mention was made of the recovery process, or the need for insurance claims workers.

Implications

- In a crisis, insurers should focus on contractual obligations, not intervene in public safety
- Insurers should ensure that civil contingency plans give proper attention to the recovery process, including the importance of insurance personnel

Banks

Interesting insights came from the banking sector reviews of the incident[155]. Many institutions had not prepared for a disaster of the intensity, duration and geographical extent, including the absence of power, mail, premises, staff access and all types of communication. Back-up sites often under-performed, or were inaccessible. The failure of communications and general uncertainty caused a local cash-only economy. To cope with the crisis, banks relaxed many of their standard procedures. The collapse of the postal system provoked a move by customers to use internet services.

Implications

- Think the unthinkable in contingency planning
- Payment facilities may be very inadequate
- Major intermediaries may be unable to cope, and be distracted by their own problems
- Back-up sites need to be well removed

Footnotes: See page 43

Recommendations

It is vital to have a well-tested contingency plan for claims disasters, on the lines of the example provided oppposite. Reliance on a single back-up site is unwise.

Availability of trained claims personnel within and outside the organisation is crucial. The plan should provide for ways to increase resources rapidly and support them for a prolonged period.

A pro-active approach is essential for every incident, until the full extent has been determined. This must begin with the warning system before the event has happened. To maintain service levels, it may be necessary to take extraordinary steps very quickly, such as cancelling leave, alerting reserve staff, or awarding pre-emptive contracts to suppliers.

Costs can be controlled by good internal communication, streamlining work procedures, close liaison with loss adjusters and using appropriate specialists for specific types of damage. Consideration should be given to acquiring supplies of core items such as pumps, driers and tarpaulin. In some cases, it may be advantageous to collaborate with other insurers on common issues like alternative accommodation.

Intermediaries, including banks, may be unable to exercise their duties effectively, and the insurer should offer to assist.

Regular communication with clients for the whole duration of the recovery process is important.

While good service is essential in a crisis, the insurer should look out for pointers that indicate if organised “scams” are being attempted.

Collectively, insurers need to ensure that the authorities include them in contingency planning for civil emergencies, through all stages of the event, especially risk reduction and recovery.

A “post-mortem” must be held to identify lessons for future events.

7.8 Reinsurance

The bulk of exposure under most reinsured property portfolios is Personal Lines, so we consider reinsurance within this Chapter. Issues relating to catastrophe models were discussed in Chapter 4; it is assumed that insurers and reinsurers will use these increasingly to monitor exposures and make decisions about retentions and pricing.

Current market situation

The key risks in the UK are winter storm and coastal flood. Freeze, inland flood and subsidence are significant but secondary.

Relative to other natural catastrophes, UK events do not pose a major capacity problem for reinsurers currently (see Table 5). The worst storm year in UK, 1990, cost under £5 billion at today’s prices ($10 bn) and current estimates for flood exposure are from £2.5 billion ($5 bn) for an East Anglia flood, to £6 billion ($12.5 bn) for an event in the Thames estuary[156], assuming the Thames Barrier worked effectively. The fact that ABI has effectively ended the guarantee of cheap flood insurance in UK will also comfort reinsurers that the risk is not deteriorating.

Table 5: Catastrophe PML’s around the world

	Hazard and PML ($ bn)				
California E/Q	US Hurricane	Midwest E/Q	Europe storm	Tokyo E/Q	Japan storm
74	119	45	31	51	15

Source: Lloyd’s Realistic Disaster Scenarios, 2008

Effect of climate change

Storm

As noted in the discussion of storm risk in Section 7.4, the ABI estimate of the effect of climate change on UK storm risk is probably too low, but the increase over time will be gradual. More importantly, insurers need to be aware that the UK economy may have some difficulty coping with a series of major storms because of unfamiliarity and staff reductions since the last event in 1990.

Footnotes: See page 43

Flood

The 2006 ABI study of coastal flood effectively indicates an increase in risk of 1.5 per cent per year due to climate change alone, since the PML is estimated to be about 3 times greater in real terms by 2080, with no change in defences or exposure. This may be an underestimate, since climate change could also affect the frequency of events, and the strength of winds. A previous ABI report recommended that insurers use a range of 2-4 per cent per year as a risk deterioration factor[157], and this still seems valid.

It should also be borne in mind that different models give a wide range of estimates for flood risk, which suggests a cautious approach to PML's.

Subsidence

Section 5 noted that probably future subsidence costs will be lower on average, but with higher peak years if a dry winter combines with hot dry summers before and afterwards. It is uncommon to purchase reinsurance for subsidence risk, but this tendency makes the risk more attractive to transfer.

Multiple events

Chapter 3 noted that climate change will probably mean an increase in the number of events, as well as their intensity. This has important implications. For example, in 2007, the two UK floods were separated by more than the 168 hours specified in reinsurance covers and were therefore treated as two separate events for reinsurance purposes. While some insurers faced claims of as much as £200m for each event, each was within their retentions and reinsurance recoveries were not possible.

Recommendations

Storm

Insurers would be well advised to assume that climate change will have two effects on their PML's: a gradual increase of perhaps 2 per cent per year; and a "supercat" effect of perhaps 30% to allow for demand surge and other exacerbating factors on costs.

Flood

Insurers should assume that climate change will have two effects on their PML's: a steady rise of 2 to 4 per cent per year; and a possible "phase transition" effect as was seen in Hurricane Katrina. That might effectively mean raising the top estimate by 50 per cent or more, to judge by the pre- and post-Katrina rates that reinsurers charged.

Subsidence

This risk is becoming more peaky, and reinsurance may be appropriate. If so, the decision needs to be as early as possible, since the reinsurance rate will surely rise as the drought intensifies.

Aggregate cover

This is becoming essential as the number of events increases with climate change, while shareholders dislike fluctuations in profitability.

Footnotes: See page 43

7.9 Key recommendations

The key recommendations are driven by three important developments since the previous CII report on Climate Change:

- The 2007 floods in England, and the resultant shift in government priorities
- Hurricane Katrina, and the realisation of what a disaster can mean in a developed country
- Advances in climate science

All climatic hazards

Insurers should ensure that they are aware of the best available research on future climatic hazards. If necessary, they should fund such research themselves individually or collectively.

Flood

The Pitt Review and the ABI/Government joint statement on flood risk management are welcome.

Collectively, insurers need to

- press for rapid implementation of the 92 recommendations in Pitt;
- consider closer liaison with planning authorities, as happens in Scotland.

Individually insurers should promote the development of sustainable solutions to flood risk, such as water management schemes, SUDS, resilient domestic construction and demountable defences, e.g. through funding trials, and facilitating installation for customers at risk.

In the light of the end of "flood-for-all" cover in 2013, insurers need to speedily refine their underwriting of flood risk to avoid anti-selection. A major aspect will be to urgently review reservoir and dam burst risk.

Storm

Insurers should underwrite on the quality of roof, not just a crude view of the materials used.

Collectively, insurers should press for better wind resistance standards, and also a market approach to roof maintenance.

Subsidence

Insurers should intensify their efforts to underwrite on the individual risk details, since the risk is not just a "postcode" factor, but depends on aspects like vegetation and drainage.

Collectively, insurers should press for retrospective reinstatement of sustainable drainage when property changes ownership. That would also alleviate flood risk.

Claims

UK has not experienced a major storm or coastal flood for years. Insurers need to review their procedures to ensure that they can cope with the sort of problems revealed by Hurricane Katrina. They need to prepare a claims disaster plan in advance and test their plan periodically. Key elements involve forecasting, emergency staffing and communications and back-up facilities for inhouse systems failure. Insurers need to be proactive to cope with scarcities of experts and materials, monitor delegated authorities, provide funds, arrange accommodation for various categories of people, check for fraud and above all satisfy customers.

Collectively, insurers need to ensure that the authorities consult them in drafting and implementing civil contingency plans, particularly in the risk management and recovery stages.

Reinsurance

Insurers should calculate their flood PML's with an allowance for a steady "climate change" increase of 2 to 4 per cent per year, apart from other factors.

In addition they should load their storm and flood PML's by a significant "super-catastrophe factor" of around 30 per cent for storm, and 50 per cent for flood.

Insurers should consider reinsuring their subsidence risk as it will become more peaky.

Treaties for flood and storm should incorporate an aggregate clause, to cope with the expected increase in the frequency of events.

Footnotes: See page 43

Vulnerable segments of society

Insurers should promote simplified products for landlords to distribute through ”pay-with-rent” schemes.

Collectively, insurers should press Government to recognise the fact that the vulnerable need to budget for insurance in their limited expenditure.

Annex: The insurance template

The prime consideration in any proposed development must be possible risks to the health and safety of the public. Where rivers are “flashy”, floodwaters can rise very quickly, and in hilly areas, the velocity of the floodwater can wash vehicles and buildings away, and cause fatalities. Sometimes, however, there may be compelling commercial, practical, and political reasons for locating certain types of development in a hazardous area. Professor Crichton has therefore proposed three different categories of development. The precise definitions are obviously up to each planning authority, but the following “Insurance Template” has been adopted by the insurance industry as guidance for planning authorities. Almost all planning authorities in Scotland now base their strategies on some or all of this template, and the “Risk Framework” in the recent Scottish Planning Policy SPP7 is consistent with the template.

Category One - Strategic sites

Facilities which must continue to function in times of flooding, e.g. emergency services, hospitals, electricity supplies, telephone exchanges, mobile telephone and broadcasting transmitters, and emergency control centres. Not permitted in flood hazard areas unless very high standards of local defences can be guaranteed.

Category Two - Residential

Facilities where the public sector is prepared to provide a high standard of flood defences where necessary. The minimum level of protection which would enable insurers to offer cover at normal terms for residential properties is at least a 200 year return period up to the year 2050, after taking climate change into account.

Category Three - Commercial and industrial

Developments where the owners would be responsible for providing their own defences, or where the flood hazard is considered to be less important than other considerations, such as the need to be close to a river. Some developments in this category may need special treatment, for example:

Public attractions, especially for children and old people (such as health centres and leisure centres).

Where large numbers of the public are likely to gather, and where evacuation routes are limited.

Refuse tips or areas where hazardous materials are to be stored or processed.

Wastewater and sewage treatment plant. (Sewage could escape onto adjoining land.)

Health and safety must always be the prime consideration. It should be remembered that flooding could often occur very quickly without warning, leaving little time for evacuation.

Residential standards required if insurance is to be offered at normal terms are as follows:

Type of housing	Standard of protection	
	Return period	Annual probability
Sheltered housing, and homes for the disabled and elderly	1,000 year	0.10 per cent
Children's homes, boarding schools, hotels, hostels	750 year	0.15 per cent
Basements used for accommodation	750 year	0.15 per cent
Bungalows without escape skylights	500 year	0.20 per cent
Ground floor flats	500 year	0.20 per cent
"Flashy" catchments (little or no flood warning available)	500 year	0.20 per cent
Bungalows with escape skylights	300 year	0.33 per cent
Caravans for seasonal occupancy only, provided adequate warning notices and evacuation systems are in place	50 year	2.00 per cent
All other residential property	200 year	0.50 per cent

In each case up to the year 2050, taking climate change into account.

Climate change

This adjustment should reflect the possibility that the 100 year return period flood now will, by 2050, become:

- 10 to 20 year for coastal flood (ignoring increasing wave heights)
- 60 to 65 year for fluvial flood

Footnotes: See page 43

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Biography

Professor David Crichton

MA, FCII, Chartered Insurance Practitioner

David is an economist with 30 years experience in the insurance industry. He has held senior underwriting and claims management positions in both property and casualty business, and has won a number of insurance industry awards. He is currently visiting professor at both of Europe's leading universities dealing with research into flooding and natural disasters. He is also an honorary research fellow at the only UNESCO centre for water law research in Europe.

David has advised governments and insurers in four continents on climate change, and has worked for the OECD, various branches of the United Nations, and NATO. He is a founder member of every Flood Liaison and Advice Group in the country and has advised more than 30 local authorities in the UK on flooding issues. He has spoken to hundreds of flood survivors, and has given oral evidence at several parliamentary and local government inquiries, often as the only person from the insurance industry.

He has spoken at every major insurance institute in the UK and Ireland, and gave the centenary lecture at the Norwich Insurance Institute.

He is the author of the Flood Fact File on the CII web site, which he updates regularly.

He has served on national academic steering committees for climate change research, reservoir safety, sustainable drainage, and building standards for flood repairs, and represented data users on the NERC Earth Observation Expert Group, the DTI Earth Observation Programme Board, and the ESSRC Steering Committee.

He has written seven books and many peer reviewed academic papers, including one published by the Royal Society.

Biography

David Clark

David spent his entire working life in what was eventually the Aviva Group, predominately working in the Claims area. He held a variety of posts in the branch organisation finishing his career as the Head Office Property Claims Superintendent in London.

David travelled extensively both at home and abroad on business and also developed a number of training/induction courses for junior claims staff.

He was also conducting evening classes for CII subjects at London Metropolitan University where he remains involved on a part-time basis.

After David left full-time employment he worked as a forensic marketing consultant with a leading firm of chartered accountants focusing on the insurance market.

Currently he works as an insurance and training consultant on a freelance basis.

Additionally he works with CII as an examiner and postal study tutor.

David holds a Bachelor of Arts degree from the Open University and is currently halfway through an Honours Law degree. He is FCII qualified and a Chartered Insurance Practitioner.

David's other interests include Modern European History, Music (All kinds) and watching cricket.

Biography

Dr Andrew Dlugolecki

Andrew spent his salaried career with General Accident (now part of Aviva Group), starting in 1973 as a statistical analyst. Early projects included the effect of weather on motor and property claims. There followed a variety of interesting jobs at senior level, including managing the UK branches, and then emerging countries. A merger in 2000 led to a change in corporate direction, and departure for him.

When scientists started to investigate the economic implications of climate change in 1988, they asked various industry associations to identify experts to work with them. The British Insurance Association nominated Andrew, and he continued this "sideline" even as he worked in other areas, and then as a second career after he left Aviva.

Andrew's work on climate change covers three major aspects. Firstly, advice to politicians: he has been the chief author on insurance and financial services in major studies of climate change commissioned by the UK government, the EU, and of course the Intergovernmental Panel on Climate Change.

Secondly, in education, he has chaired three major studies of climate change by the UK Chartered Insurance Institute (1994, 2001 and 2009). He prepared and mentored modules of an e-learning training package on climate change and finance for financial institution executives, under the auspices of UNEP Finance Initiative (UNEPFI). He often gives talks and writes articles.

Thirdly, he continues to be active with business clients. He has been an advisor to the Carbon Disclosure Project and the UNEP Finance Initiative since 2000.

Andrew's qualifications include degrees in pure and applied mathematics, and a doctorate in applied economics. Among his affiliations he is a Fellow of Chartered Insurance Institute, and a visiting Fellow at Norwich University's Climate Research Unit. When IPCC received the Nobel Peace Prize in 2007, Andrew was one of those cited who had "contributed substantially" to their work.

Malcolm Johnson ACII, FCILA, FIFAA

Malcolm has been employed in the insurance profession for over 40 years and is currently a Senior loss Adjuster with Stuart Neal Chartered Loss Adjusters.

He has been interested in weather, the environment and climate for many years and is a Fellow of the Royal Meteorological Society as well as a member of the Tornado and Storm Research Organisation and the Climatological Observers Link. Malcolm has been the weather presenter and forecaster for a local community radio station in Havant, Hampshire.