

# Flood Risk & Insurance in England and Wales:

Are there lessons to be learned from Scotland?

David Crichton



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## The Author

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He is a Visiting Professor at Middlesex University Flood Hazard Research Centre as well as Visiting Professor at the Benfield Hazard Research Centre. He is also a Research Fellow at the University of Dundee. He initiated the National Flood Insurance Claims Database held at the University of Dundee, and was a member of the national steering committee which produced the technical manuals on “Sustainable Urban Drainage Systems” (SUDS). He has advised all local authority flood appraisal groups (currently being renamed Flood Liaison and Advice Groups”) in Scotland on flood insurance and other issues since 1995.

He is the author of a recent book on the implications of climate change for the insurance industry, and was a co-author of the Chartered Insurance Institute Book on Climate Change published in 2001. He was also the co-author of a Scottish Executive Research Report on flood risk in Scotland (published in 2002), and contributed to a recent major report on the impacts of climate change in London for the GLA, published in 2003.

He is the author of the “Fact File” on flood insurance on the web site of the Chartered Insurance Institute, and the co-author of a major text book about making cities more resilient to climate change<sup>1</sup>.

In recent years, he has been invited to address academics, government and insurance representatives in Australia, Canada, Singapore, and the USA on climate change and flood risks.

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He also thanks the Environment Agency and the Scottish Environment Protection Agency for their detailed comments, but would emphasise that any views expressed in this report do not necessarily reflect the policies of these agencies. He would also like to thank the Hadley Centre at the Met Office, and the UK Climate Impacts Programme for permission to reproduce some of their diagrams, Stirling Council for permission to

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<sup>1</sup> Roaf, S. Crichton, D., and Nicol, F. (2005) “Adapting Buildings and Cities for Climate Change” Elsevier Press, London.

reproduce the front cover of their flooding report, and those who contributed photographs.

Finally he would like to thank his wife Haf, for her patience and for her assistance with Welsh sources.

## **Application**

This report only applies to Britain, that is, England, Scotland and Wales. It does not necessarily apply to Northern Ireland or the rest of the British Isles. Of course flooding is not confined to Britain. Between 1998 and 2002, Europe suffered over 100 major damaging floods, including the catastrophic floods along the Danube and Elbe rivers in 2002. Since 1998, floods have caused some 700 fatalities, the displacement of about half a million people and at least € 25 billion in insured economic losses<sup>2</sup>.

The assets at risk of flooding can be enormous. For example, more than 10 million people live in the areas at risk of extreme floods along the Rhine, and the potential damage from floods amounts to € 165 billion. Coastal areas are also at risk of flooding. The total value of economic assets located within 500 metres of the European coastline, including beaches, agricultural land and industrial facilities, is currently estimated at € 500 to 1,000 billion<sup>3</sup>.

## **Glossary**

A glossary has been provided at the end of the report.

## **Foreword to Second Edition**

A number of developments have taken place since the first edition of this report was published in January 2003. For example, the Foresight reports on flooding have been published, the Marcic court case took an unexpected turn, and the Norwich Union have completed their new flood maps, agreeing to supply some of the data used to create the maps to government agencies. In July 2004, the EU issued a flood “communication” which could become very significant<sup>4</sup>. In Scotland, the planning

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<sup>2</sup> European Environment Agency, Environmental issue report no. 35, 2003, quoted in EU Communication COM(2004)472.

<sup>3</sup> EUrosion: <http://www.euroasion.org>

<sup>4</sup> “Flood risk management Flood prevention, protection and mitigation.” Brussels, 12.07.2004 COM(2004)472 final. COMMUNICATION FROM THE COMMISSION TO THE COUNCIL, THE EUROPEAN PARLIAMENT, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS. Can be downloaded from: [http://europa.eu.int/comm/environment/water/pdf/com\\_2004\\_472\\_en.pdf](http://europa.eu.int/comm/environment/water/pdf/com_2004_472_en.pdf)

guideline NPPG 7 was replaced<sup>5</sup> in January 2004, by a new guideline “SPP 7”. In line with the author’s suggestion, the name “Flood Appraisal Groups” was replaced in 2004 by “Flood Liaison and Advice Groups” which more closely describes their current function (and produces a more acceptable acronym). At the time of writing, “FAG”s are being renamed “FLAG”s, and only the new name is used in this report. SPP7 places even more emphasis on the importance of not building in the floodplain, and contains a risk profile which is consistent with the author’s insurance template.

Four new sections have been added, covering flash floods (including Boscastle), landslides (including the Shetland landslide in 2003), rising groundwater, and a general section on participation issues.

In April 2004, a series of reports were issued under the Foresight initiative of the Cabinet Office, showing the extent of the flooding problem under various climate change scenarios. (The author was involved with the preparation of some of these reports.) The research calculated that just to manage the additional flood risks caused by climate change would require an investment of £52,000m if engineering measures were used, or £22,000m if using engineering in concert with a range of non structural measures such as tight planning controls.

On 26<sup>th</sup> December, 2004, an earthquake resulted in a tsunami which hit the coasts of countries in SE Asia. Over 160,000 people died in this tragic event. As climate change increases sea levels and glacier melt deposits more water in the oceans, shifting the stresses on the sea bed and driving more water into undersea fissures, one wonders if such events may become more likely and damaging in the future. A sobering thought, especially as the unstable Storegga area of the continental shelf in the North Sea is overdue for another slide in geological timescales (possibly hastened by current oil exploration drilling over the site). The last two Storegga slides were around 12,000 and 7,000 years ago, the latest laid down a layer of sand about 300mm thick along the east coast of Scotland up to two km inland. The layers can be clearly seen at Maryton, near Montrose.

An eruption of the La Palma volcano in the Canary Islands is also geologically imminent and could lead to a giant tsunami up to 100 metres high which would inundate the south and west coast of Britain and the east coast of the USA. As yet there are no specific monitoring or warning systems in place for such events.

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<sup>5</sup> Scottish Planning Guidelines for Flood (SPP 7). Scottish Executive, 2004. Available at: <http://www.scotland.gov.uk/library5/planning/spp7-01.asp>

## **Disclaimer**

The contents of this report are for information purposes only. The author does not claim to represent any of the organisations mentioned in the report, but is simply recording an independent view, based on extensive research and private discussions with a wide range of those people most closely involved in the issues. Neither the author, nor the Benfield Hazard Research Centre offers any guarantee for the accuracy and comprehensiveness of the contents. The report is not intended as professional advice, and no liability is accepted for any actions taken on the basis of the information contained in it.



## Executive Summary

Flood insurance in Britain is going to become harder to obtain in the future. An agreement by insurers to provide household flood insurance at a reasonable cost anywhere in Britain expired at the end of 2002, and already many insurers are not offering cover for new business. The stated reasons for this agreement being discontinued are the lack of adequate planning controls and a lack of adequate spending on flood defences. These reasons have caused some surprise in Scotland, where since Devolution in 1999, planning controls have been tightened up by most local planning authorities to limit any building in the floodplain, and spending on flood defences has risen dramatically.

The insurance industry as a whole has mainly been concentrating on lobbying central Government to spend more money on flood defences in England and Wales, a tactic that has only been partially successful so far. Perhaps this is because flood defence spending has to compete with many other, arguably more deserving, calls on the public purse.

Since 1995, the author has been concentrating on non-structural measures, such as planning controls and sustainable drainage. He hopes to show that this non-structural approach has been particularly successful in Scotland. Many experts around the world now see non-structural measures as being a more sustainable, efficient way ahead, tackling the problem rather than relieving the symptoms. For example, years of regular face to face meetings at a local level have given the author the opportunity to influence planning strategies for all the main population centres in Scotland. Current planning strategies for most of these communities now presume against allowing any new housing development where the flood risk exceeds the 200-year return period. In addition, differences in legislation in Scotland have resulted in preparations being made for a test case for insurers to recover up to £70m in claims payments from a local authority in Scotland. If successful, it could have important implications for the flood insurance risk north of the Border.

The author's confidential discussions with the senior underwriting managers of many of the leading insurance companies indicate that there is a very low awareness in the British insurance industry of what has been achieved in Scotland and he hopes that this report will help to remedy that situation. While the solutions are working well in Scotland, it may already be too late for the South East of England, where some radical measures may be required in the future. Some of these measures are listed in the future outlook section at the end of this report.

**Some Flood Facts for England and Wales**

5 million people in England and Wales are at risk from flooding every year, principally during the flood season (September to April) – but flooding can happen at any time, as it did in August (2002) in areas of the North East and North West of England.

2 million homes and 185,000 businesses are at risk of flooding in England and Wales

Property, land and assets to the value of £214 billion.

10,000 properties were flooded in the severe floods of Autumn 2000 - but flood defences successfully protected 280,000 properties.

Scientists predict that climate change may lead to an increase in extreme and unpredictable weather – including floods.

Since 1999, some 20 people have died as a direct result of flooding. Thousands have suffered shock, trauma and devastating damage to their homes and possessions.

Research by the insurance industry has shown that half a metre of floodwater in a modern semi-detached house will result in an average cost of £15,000- £30,000 to repair the building and £9,000 to replace damaged belongings.

Source: Environment Agency Press Release, 23rd September, 2002.

## Introduction

Figure 1: Uckfield October 2000, Courtesy Alan Thompson, Symonds Group Limited



Around the world, no other natural hazard has claimed more human lives in past decades, ruined more fertile land, or destroyed more houses than flooding<sup>6</sup>. As countries become wealthier, as more people want to live by coasts or rivers, and as we become a more complex and interdependent society, flooding is an increasing menace to our way of life. Climate change will simply accelerate an already fast increasing risk.

The flash floods and landslip problems in Britain in the summer of 2004, were as a result of torrential summer rainfall, indeed in parts of Scotland the total summer rainfall was the highest on record.

Climate change will continue to have serious impacts, and more information is becoming available all the time. For example "Climate Change 2004", Technical Report Number 2 from the Benfield Hazard Research Centre. There is also an important European Environment Agency Report<sup>7</sup> published in August 2004, which sets out a wide range of climate change impacts.

In most of the world, private insurance companies will not offer flood insurance for householders. Britain used to be the same. Then in 1961, to stave off Tony Benn's threat to nationalise insurance when the Labour Party next came to power, the British

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<sup>6</sup> Munich Re, 1997. "Flooding and Insurance" Munich Re, Munich

<sup>7</sup> European Environment Agency, 2004. "Impacts of Europe's changing climate" EEA (European Environment Agency) OPOCE (Office for Official Publications of the European Communities). ISBN: 92-9167-692-6. Available from [http://reports.eea.eu.int/climate\\_report\\_2\\_2004/en](http://reports.eea.eu.int/climate_report_2_2004/en)

insurance industry voluntarily agreed amongst themselves to guarantee to provide cheap flood insurance for all households and small shops, regardless of where they were situated. This guarantee is unique in the world, indeed in many countries such as Canada and Australia (apart from NW territories), flood insurance for households is simply not available at all, while in others, such as USA, and most of Europe, it is only available to a limited extent<sup>8</sup>.

Latterly, the British flood insurance guarantee has been instrumental in enabling people to obtain mortgages on the increasing number of new houses being built in high-hazard areas such as floodplains or coastal plains. To a large extent the rapid growth in the number of houses being built in high hazard areas could be considered the fault of the voluntary insurance guarantee. If the market had been free to apply prudent underwriting standards, many of these houses would not have been sold because purchasers would not have been able to afford the insurance premium and therefore would not have obtained mortgages. In any event, after forty years of the market distortion caused by the guarantee, insurers find themselves faced with the situation of a large and growing number of houses at risk from flood, as planners and developers have taken the continuing availability of cheap flood insurance for granted.

It could be argued that until the last decade, the insurance guarantee did not really do much harm, because flood mapping was so crude. Indeed until the 1990s, flood mapping had made little progress since the first geology based flood hazard maps were produced by James Croll in 1875<sup>9</sup>, but in recent years flood hazard mapping has become increasingly sophisticated. Much of this is thanks to more powerful computers and new remote sensing techniques<sup>10</sup>.

The point has now been reached where many insurers have very accurate flood maps down to individual address level (often more detailed than the maps held by the government or its agencies). They are therefore now able to “cherrypick” from the areas that are relatively safe from floods.

The continuation of the flood insurance guarantee was dependent on an informal partnership between the insurance industry and local and national government<sup>11</sup>. Insurers would continue to provide relatively cheap flood insurance as long as government kept some control over developments in flood hazard areas and built adequate defences. In England this partnership has been breaking down as more and

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<sup>8</sup> Crichton, D. (2002) “UK and Global Insurance Responses to Flood Hazard.” *Water International* Vol 27, 1. Pp 119- 131. Illinois, USA.

<sup>9</sup> Croll, J. (1875) “*Climate and Time in their geological relations*” Daldy, Ibister, London, 1875.

<sup>10</sup> Logica, 1997 “Earth Observation for Insurance” Report for the Centre for Earth Observation Programme of the EC, May 1997

<sup>11</sup> “Flooding: A Partnership Approach to Protecting People”, ABI (November 2001).

more new houses are built in flood hazard areas, often against the advice of the Environment Agency.

If insurers pull out from such areas, would the government nationalise insurance as Tony Benn threatened in 1961? Insurers believe this is unlikely: UK Government has always refused to provide compensation to flood victims. Nick Raynsford, when Minister for Planning, emphasised this point in his evidence to the Select Committee Inquiry into the autumn 2000 floods. When asked if the government would accept flood risks that private insurers would not be prepared to take he said:

“That would not be a wise or sensible position for any government to take.”<sup>12</sup>

Yet governments in the USA, Canada, Australia, and most of Europe do provide compensation to flood victims<sup>13</sup>. Does this mean that UK Government think that almost every government in the developed world is not “wise or sensible”? How does this square with the view that the first duty of government is to protect its citizens?

Still the UK is right up there with countries such as Argentina and Israel, (neither of which are known for flooding problems).

As a report from Middlesex University pointed out<sup>14</sup>, the UK government needs the insurance industry to continue to provide affordable flood cover, as otherwise it would be under pressure to introduce compensation at the taxpayers’ expense.

In 2002, the first insurer to openly refuse cover in flood hazard areas in Britain was “esure”, the telephone and Internet banking insurer. The stated aim of esure was “to ensure that premiums remained competitive for the ‘dry majority’ by excluding flood-risk areas with inadequate defences”<sup>15</sup>.

On 9th July, however, esure announced that it is to begin offering home insurance in some areas of Scotland it had previously declined to cover due to flood risk. Why has it singled out Scotland for such preferential treatment? The answer is that esure has been doing its homework and has found that since Devolution in 1999, Scotland has been actively pursuing much more effective flood risk management policies than

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<sup>12</sup> The Environment Transport and Regional Affairs Select Committee Report on the Autumn floods in 2000. Published on 20th December 2000. HMSO, London.

<sup>13</sup> Crichton, D., 2001 “Residential Flood Insurance – Lessons from Europe”. Proceedings of a Flooding Workshop, Australian National University, Canberra, Australia. 7-9th February 2001.

<sup>14</sup> Green, C., and Penning-Rowell, E., (2002) “Flood risk and insurance; strategic options for the insurance industry and government” Middlesex University Flood Hazard Research Centre, London.

<sup>15</sup> Esure press release, 12 June 2002.

England or Wales<sup>16</sup>. One of the aims of this report is to explain in more detail why this was a sensible decision for esure to take, and why other insurers should follow its example.

However, before looking at what has been achieved in Scotland, it would be appropriate to set out the nature and extent of some of the flood problems in England and Wales.

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<sup>16</sup> Esure press release, 9 July 2002.

## The Problems:

Figure 2: Ukfield October 2000, courtesy Alan Thompson, Symonds Group Limited



## The Planning Problem

“...when the too fatal Experience of Years has shewn the Sufferers the inevitable Consequence of their wilful and wayward Habit of placing their Residences and Stock Yards within the reach of the Floods... the Compassion excited by their misfortunes is mingled with Sentiments of Astonishment and Surprize that any People could be found so totally insensible to their true Interests, as the Settlers have in this instance proved themselves.”

General Orders issued by the Governor General of Australia, Lachlan Macquarie, in 1817 after serious flooding of the Nepean and Hawkesbury rivers<sup>17</sup>.

An increasing number of new houses have been built in flood hazard areas in England and Wales, often against the advice of the Environment Agency (EA). While the percentage of cases where the EA advice has been ignored reduced between 1996 and 2000, the actual number of cases more than doubled (see panel).

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<sup>17</sup> Quoted in Emergency Management Australia, 1998. *Floodplain Management in Australia. Best practice Principles and Guidelines.* Commonwealth of Australia, Canberra.

**Planning applications where the EA raised an objection on the grounds of flood risk**

	1996	2000
Number of cases	4,000	24,000
Percentage of cases where EA advice was ignored	38%	14%
Number of cases where EA advice was ignored	1,520	3,360

Sources:

1996 figures: Veronica Jones, Environment Agency. "Flood Risk and Land Use Planning in England and Wales", Proceedings of a seminar entitled "Flood Issues in Scotland", 15 December 1998, published by SEPA, 1999.

2000 figures: House of Commons, evidence from the Environment Agency to the Parliamentary Select Committee Inquiry into the flooding in England and Wales in autumn 2000.

According to National Land Use Change Statistics, 591,566 new houses were built in England between 1995 and 1999. Of those, more than ten percent (62,434) were built in the floodplain.

More recent figures are rather easier to obtain, thanks to High Level Targets introduced for the EA in 1999. These targets mean that the EA is now keeping better records of information about planning decisions. Among these targets is the important "Target 12", (see panel).



### Target 12

“Annually from June 2000, (the EA are required to) report to MAFF and DETR on

- Those local authority development plans upon which the Agency have commented, identifying plans which do, and do not, have flood risk statements or policies and
- The Agency’s response to planning applications, identifying cases where:
  - the Agency sustained objections on flood risk grounds: and
  - final decisions, either by the local planning authority or on appeal, were in line with, or contrary to, Agency advice.

Source: “High Level Targets for Flood and Coastal Defence and Elaboration of the Environment Agency’s Flood Defence Supervisory Duty” MAFF, November 1999.

Thanks to these new reporting rules, industry associations have been able to find out more details. Unfortunately these show that the position is still deteriorating:

- According to the Council of Mortgage Lenders, figures issued by the Office for National Statistics on 28 May 2002 show that 11% of all new dwellings built in England between 1997 and 2000 were in areas defined as at flood risk by the EA<sup>18</sup>.
- Currently 27% by value of new properties are now being built in floodplains against EA advice<sup>19</sup>. This seems to indicate that either the percentage of new properties in floodplains has increased dramatically since 2000, or the value has increased, or both.

So it is clear that the planning community in England and Wales are often quite happy to ignore the advice of the EA, and allow developments to proceed in flood hazard areas despite the risks, and despite the legal consequences of possible lawsuits by flood victims.

There seems to be no prospect of any improvement in the situation. Stephen Byer’s Green Paper on future planning policy<sup>20</sup> issued in 2002, proposed fewer planning controls, not more, and incredibly, it did not even mention flood as an issue. The planning system may need to be more responsive and less bureaucratic than present, but it certainly must also ensure that issues like flooding and contaminated land are dealt with adequately.

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<sup>18</sup> Press release issued by the Council of Mortgage Lenders on 6<sup>th</sup> June 2002.

<sup>19</sup> High Level Target 12 - Environment Agency report to DEFRA and DTLR July 2001. Cited in *“Flooding: A Partnership Approach to Protecting People”*, ABI (November 2001). Also Lord Renton of Mount Harry, House of Lords Debate, Hansard, 18 Dec 2001 : Column 215

<sup>20</sup> Department for Transport, Local Government and the Regions, (2002). Green Paper: *“Planning: delivering a fundamental change”*

On one level, it is hard to argue with planners who have to meet targets for new house building. Besides, if people want to live by rivers or near road and rail links (which tend to use floodplains as transport corridors), it is not up to the insurance industry to complain, so long as the community does not expect insurers to subsidise such properties. There is no social duty on the insurance industry to provide cheap flood cover after all, even though the media seem to take it for granted that there is. Local planning is part of our democratic tradition, and where there is a shortage of land and a high demand for housing, the use of floodplains for housing may well be justified on the grounds of economic efficiency, so long as public safety is not compromised.

What does seem unfair, however, is that

- frequently the purchasers of these properties are not aware of the flood hazard,
- when they do become aware of it, they expect the EA to fund flood defences to protect them, even if the EA has advised against the development in the first place.
- often flood plain land, being cheap, is used for social housing, where the residents may not be able to afford to buy insurance.

The general public should have a right to expect that experts, such as the planning authorities, will take all reasonable steps to protect the interests of the people who are affected by their decisions, namely those who buy new homes built with the consent of the local planners. Indeed this sort of duty is enshrined in the case of *Hedley Byrne & Co v Heller & Partners* [1964] A.C. 465.

## The Social Justice Problem

In the past, floodplain land has been cheap and has often been used for social housing. This has meant that often the people who were flooded were low-income families who did not have the resources or influence to agitate for improved protection. The floods in 2000 marked a shift in the pattern, with many influential and famous people affected for the first time. If this trend continues, it will be interesting to see if this has an effect on the government.

For example, several of the flood victims in the April 2000 floods in Edinburgh were Queen's Counsel and other eminent citizens. After an 18-month feasibility study, it was announced that a consortium of insurers and loss adjusters was going to sue Edinburgh City Council for up to £70m for damage resulting from these floods<sup>21</sup>. Is this a coincidence? (It is still not certain if this case will proceed.)

Insurance penetration has always been lower for low-income groups, and if insurance premiums rise in flood hazard areas, it could easily become lower still, yet these are the people who are most vulnerable to the impacts of flood. The housing benefit system

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<sup>21</sup> "Leith flooding sets off £50m court battle" Sunday Times, (Scottish Edition) 8<sup>th</sup> September 2002.

should be adapted to include additional benefits to help such people pay for household contents insurance, perhaps under a “pay with rent” scheme. This would reduce pressure on the government to compensate flood victims who cannot afford insurance by providing a safety net for the most vulnerable members of society. The costs to government would certainly be much lower than the revenue it receives from insurance premium tax.

However the problem is not just with those on housing benefit. Everyone should have a right to a decent home, but for the good of society as a whole, this must particularly apply to people like nurses, teachers, train drivers and others on whom society is so dependent. It is not sustainable or acceptable for such people to have to commute long distances to work, or to live in overcrowded or sub standard accommodation.

In July 2002, the government announced a change in strategy, to promote “growth sub regions” in Milton Keynes, the South Midlands, and the London/Cambridge corridor, and other areas further north are likely to be selected too. This is to be welcomed if it relieves the pressure on planners in the Southeast to allow more building in the floodplains or in coastal areas. The question is whether these are the right strategic growth points, and whether flood and subsidence hazards have been taken into account in this policy?

Reinsurance brokers such as Benfield Group Limited and others have sophisticated modelling expertise which could be called on to advise government on such issues. So far the author is not aware of any dialogue with the insurance industry to make sure that these new developments will be in areas which are insurable.

## **The Flood Hazard Problem**

Increasingly, the insurance guarantee has resulted in a subsidy from policyholders in low flood hazard areas to enable low premiums in high hazard areas. This has effectively boosted developers’ profit margins, by enabling purchasers to obtain mortgages for these houses despite the dangers. This has significantly increased the insurance industry’s exposure to flood hazard. Matters started to come to a head when the Association of British Insurers (ABI) published a research report<sup>22</sup> in October 2000 which predicted that an inland flood could cost insurers over £1 billion. The size of the figure caused many raised eyebrows, but the sceptics were silenced when, within four weeks, England and Wales suffered an inland flood that damaged 11,000 homes and businesses and cost insurers over £1.3 billion<sup>23</sup>. Other financial losses to the economy

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<sup>22</sup> Entec Ltd and JBA Ltd, with contributions from Crichton, D, and Salt, J, (October 2000) “*Inland Flooding Risks. General Insurance Research Report No 10*” Association of British Insurers, General Insurance Research Report 10, London.

<sup>23</sup> “Flooding: A Partnership Approach to Protecting People,” ABI (November 2001).

have been assessed as a further £400m with considerable social and health costs in addition<sup>24</sup>. However, the coastal flood risk is even more significant.

## **The Flooding disasters of 1928 and 1953. Are we ready for another?**

### **Storm surges**

These are caused by the action of wind on the surface of the sea, with barometric pressure a secondary factor. When pressure decreases by one millibar, sea level rises by one centimetre. Thus if barometric pressure drops to 960mb, sea level will rise by about half a metre compared with normal pressure of 1013 mb. The strong winds that create surges also generate large waves.

Source: Met Office.

75 years ago, on 6th and 7th January 1928, London suffered severe flooding, due to the combination of four factors: rapid snow melt, heavy rainfall, a spring tide and a storm surge (see panel above) in the Thames estuary. 14 people died, but worse was to come.

50 years ago, on the 31st of January and 1st February, 1953, there was a storm that devastated much of the East Coast of England. The storm, which peaked during the hours of darkness, and continued into the 1st February, killed 304 people in the four counties of Lincolnshire, Norfolk, Suffolk and Essex. A further 177 people were lost at sea.

The surge ended up in the Netherlands, where 1,835 people were drowned<sup>25</sup>.

These are figures only for those who died during the event. It does not include those who subsequently died prematurely due to the experience.

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<sup>24</sup> Penning-Rowse, E., Chatterton, J., Wilson, T., Potter, E., (2002) "Autumn 2000 Floods in England and Wales: Assessment of National Economic and Financial Losses." Middlesex University Flood Hazard Research Centre, London.

<sup>25</sup> Dr Dijkman, Delft Hydraulics, Personal communication, January 2003.

Table 1

The UK death toll from the 1953 storm

Kelman, I, 2002. CURBE Fact Sheet 3: UK Deaths from the 1953 Storm Surge (available from: <http://www.arct.cam.ac.uk/curbe/CURBEFactSheet3UK1953Deaths.doc>)

Deaths on land (conservative estimates)		Deaths at sea	
Lincolnshire	40	Loss of the "Princess Victoria" (Irish Sea ferry), (only 41 of the passengers and crew survived)	130
Norfolk	100		
Suffolk	44	Loss of fishermen from the "Michael Griffiths", "Guava" and other trawlers	45
Essex	120		
		Loss of lifeboat men	2
<b>Total</b>	<b>304</b>	<b>Total</b>	<b>177</b>

The 1953 storm was one of Britain's worst weather disasters in recent times. The surge generated was the worst on record for the North Sea, and raised the sea level by 2.97m in King's Lynn and 3.36m in the Netherlands<sup>26</sup>. It was caused by gale force winds and a severe depression, which during that fateful night deepened to as low as 968 millibars. The winds and low air pressure "sucked up" the level of the surface of the sea into a giant mound of water, which travelled south along the east coast, driven by gale force winds. By the time it reached King's Lynn, the sea level was 2.5 metres higher than normal high tide, and combined with ferocious winds, a 2 metre high wave suddenly rushed through the town centre. 15 died in King's Lynn itself, and another 65 people died that night on the coast between King's Lynn and Hunstanton. Overall in England, the sea defences were breached in 1,200 places and in some cases the sea reached 2 miles inland. There was widespread devastation, as nearly 1,000 square kilometres of land were flooded, and 32,000 people had to be evacuated from their homes. 24,000 houses, 200 major factories, and 200 miles of railway were flooded<sup>27</sup>. Property damage costs were more than £5 billion at current values<sup>28</sup>.

<sup>26</sup> Met Office [www.metoffice.com/education/historic/flood.html](http://www.metoffice.com/education/historic/flood.html)

<sup>27</sup> Gilbert, S. and Horner, R (1984) "The Thames Barrier" First published by Thomas Telford Ltd, London. Reprinted for the National River Authority (Thames Region) in 1992. ISBN 0 7277 0249 1.

<sup>28</sup> Willis Faber Re Limited (1999) "Thames Flood". Willis Faber & Dumas Limited, London.

Table 2

Summary of statistics for the 1953 storm

	Britain	The Netherlands <sup>i</sup>
480 deaths (land and sea)		1,835 deaths on land
1,200 breaches of sea defences		160 km of dykes severely damaged; 89 breaches
1,000 square kilometres of land flooded		1500 square kilometres of land flooded in addition to polders (reclaimed land)
32,000 people evacuated		
£5 billion damage (at current values)		livestock lost: 20,000 cows; 12,000 pigs; 1,750 horses
24,000 houses, 200 major factories, and 200 miles of railway were flooded.		47,300 buildings damaged, of which 10,000 beyond repair.

(i) Dr Dijkman, Delft Hydraulics, Personal communication, January 2003.

The storm affected the whole of the East Coast of Britain, from Lerwick in Shetland, where the hourly **average** windspeed was 75mph<sup>29</sup>, to Deal in Kent. A gust speed of 123 mph was recorded in Orkney<sup>30</sup>, but further south the wind was gale force 10 or 11. In the North of Scotland, thousands of acres of forest were blown down in Deeside. This was partly due to the preceding mild conditions which had started to melt the snow on the tops of the trees. A sudden freeze turned the melting snow into ice, and then further snow piled on top, making the trees top heavy. The same conditions also brought down many overhead power lines, not only in Scotland but all over England. In Canvey Island, 13,000 people were evacuated and 58 people died when the sea walls collapsed. The BP oil refinery on the Isle of Grain was flooded. Fortunately this did not result in a major fire, as so often happens during a serious flood.

Horrific though these figures are, the death toll could have been a lot worse if it were not for the heroic actions of the large number of military personnel, including US and Canadians, still stationed in the area after the war. The availability of wartime military landing craft and amphibious vehicles was also a major factor in rescue work. An American airman, Corporal Reis Leming, saved 27 people from the freezing water, even though he was a non-swimmer. He was the first non-British recipient of the George Medal.

<sup>29</sup> Stirling, R., 1997 *"The Weather of Britain"* Giles de la Mare, London. P 240

<sup>30</sup> Met Office [www.metoffice.com/education/historic/flood.html](http://www.metoffice.com/education/historic/flood.html)

Largely as a result of this storm, the Thames is now one of the best defended estuaries in the world, with the Thames Barrier, 36 additional tidal barriers and gates, as well as 200 miles of flood walls which were upgraded in the 1980s. Canvey Island is well defended and the population there has risen to 37,000. However, many other sea defences in England built, or rebuilt since the 1953 storm are reaching the end of their design life. Research commissioned by the Association of British Insurers in 1997 showed that lack of adequate maintenance meant that 1,232 defence structures could be at risk of failure in the type of storm we can expect on average every 50 years.<sup>31</sup> The findings are from a detailed report on work carried out for the ABI by consulting engineers and the Met Office based on the 1990 Sea Defence Survey. (This report was not published by the ABI, but a copy was given to the Environment Agency).

That, of course, does not mean that the 1953 storm will happen every 50 years, but it will happen again sometime. Are we ready for it?

If the 1953 storm was repeated now, it could result in insured losses of over £20 billion<sup>32</sup>. While the insurance and reinsurance industry does have the capacity to pay such claims, there would be pressure on insurers to subsequently increase premiums for customers in flood hazard areas even further, especially with the recent expiry of the insurance industry's guarantee on availability of flood insurance. The figure is based on two major assumptions:

- That there is no "fire following flood" hazard<sup>33</sup>. Such a hazard is quite high owing to the bulk storage of oil and propane on the coast, especially in the Thames and Humber estuaries. A 1978 report on Canvey Island for the Health and Safety Executive<sup>34</sup> stated: "...the roofs of the in-ground (gas) storage tanks might collapse if the river were to overtop the sea wall because of an exceptional storm and high tide, causing a substantial release of vapour as the tanks were flooded." It would be interesting to know if this is still the case, and comments from readers are invited. Even if it is no longer the case in Canvey, it could apply elsewhere.

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31 Crichton, D., and Mounsey, C. (1997) "How the Insurance Industry is using its flood research." Proceedings of the 32nd MAFF Annual Conference of Flood and Coastal Engineers, Keele, England.

32 Based on a flood model designed by the author for the ABI in 1997. This was the first flood model to operate at full unit postcode level for all the postcodes at risk of coastal flood in England and Wales. It excludes central London on the assumption that the Thames Barrier will provide protection. Because of the number of factors included, such as Census data and marketing database data, it took 24 hours on a large mainframe computer to run it.

33 For general information on natural hazards triggering technological disasters. See NATECHS at <http://nedies.jrc.it>

34 Locke, J.H., Dunster, H.J., and Pittom, L.A. (1978) "Canvey: summary of an investigation of potential hazards from operations in the Canvey Island/Thurrock area." Health and Safety Executive. HMSO, London.

- That London will not be flooded and that existing flood defences will protect London adequately. However this protection will be eroded by relative sea level rise due to climate change and the fact that London is sinking.

A repeat of the 1953 flood could result in the loss of many more lives in England than 50 years ago. This is because of the increased numbers of people living and working in the danger zone and the absence of a large standing army stationed in the area to assist with emergency defence and rescue work. Such a flood could have a disastrous effect on the economy even if London is not directly affected.

Hopefully, however, the improved flood warning systems which have been installed since 1953 should enable people to escape the danger in time<sup>35</sup>, but that will still mean misery for many and a great deal of property damage.

A major concern is the effect on infrastructure, for example power supplies. During the snow storm which took place on the 50<sup>th</sup> anniversary of the 1953 flood, tens of thousands of people were without electricity for more than 24 hours, especially in Lincolnshire, which is one of the counties worst hit by the 1953 floods. People are much more dependent on electricity for heating and cooking now than in 1953, and the fragility of power supplies in a relatively mild snow storm must give cause for concern.

Another major concern is fire following flood, especially given the number of oil refineries, chemical works and bulk storage facilities at the mouth of the Thames (and indeed the Humber). Richard Doyle has written a frightening book<sup>36</sup> on a possible fire following flood catastrophe scenario for London. While fictional, the book has been very well researched, and is well worth reading by all insurers with large exposures near the Thames.

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<sup>35</sup> Khatibi, R., National Flood Warning Centre, and Haywood, J. Environment Agency, (2002) *"The role of flood forecasting and warning in sustainability of flood defence."* Municipal Engineer, 151, pp 313-320

<sup>36</sup> Doyle, R. (2002) *"Flood"* Century, The Random House Group, London. Also in paperback by Arrow Books, 2003. See also [www.floodlondon.com](http://www.floodlondon.com)



### **Power supplies**

A report commissioned by the Department of Trade and Industry from the independent energy consultants British Power International warned in early May 2002 that several companies might not be able to deal with widespread storms.

It pointed out that some companies were using the same pool of contractors to provide mobile generators, engineers for overhead lines, and the technology to handle surges in calls, and that they would have to compete for these services in a widespread emergency.

According to the trade union, Amicus, "Following a price cap by the regulator four years ago, companies have made major cuts to staff and tree maintenance."

Source: Guardian, 15 November 2002

### **Future outlook**

The 1953 storm surge flood could have been much worse if, like the 1928 event, it had coincided with a spring tide, combined with rapid snowmelt, and heavy rainfall. The 1953 storm surge raised the sea level in Britain by less than three metres. In December 1999 there was a North Sea storm surge that raised the sea level by more than five metres, causing severe damage in Denmark. The hazard is increasing due to climate change: according to the latest predictions by the UK Climate Impacts Programme, storm surge height could increase by up to 1.4m along the south-east coast by the 2080s.

The losses from such events would stretch the capacity and solvency of many insurers unless they do something to limit their exposure by shedding business in the most hazardous areas. Indeed they may ultimately be forced to do so by the regulatory authority.

### **The Regulatory Authority Problem**

An additional factor which insurance company directors cannot afford to ignore is the activities of the government regulator for insurance in Britain, the Financial Services Authority (FSA). This took over the regulation of insurance on 1st December 2001, announcing its rules for a risk-based strategy for assessing the solvency of insurers<sup>37</sup>. In May 2002, the FSA published a discussion paper "The New Regulatory Reporting Environment" setting out further proposals, a key element of which is that insurers will have to provide more information on their operational risks and their reinsurance arrangements.

How this will work is not yet clear, but in theory at least, one of the effects could be that an insurer that takes on too much business in areas at risk of flood, and does not have adequate reinsurance, could find the FSA deciding to audit it. If the audit concludes

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<sup>37</sup> For details, see [www.fsa.gov.uk](http://www.fsa.gov.uk)

that the insurer is not managing its exposures correctly the implications could be very serious.

Concentrations of exposure can arise for a number of reasons: perhaps the insurer had an active branch in an area where other insurers did not have branch offices, or perhaps the insurer had a block scheme with a local building society, or a head office located in a provincial centre. For most insurers, however, the main concentration of exposures will be in London.

## The London Problem

The Thames Estuary has one of the best tidal defence systems in the world. There is not just the Thames Barrier, but also over 200 miles of sea walls and embankments, which were upgraded and raised by 2.5 metres in the 1980s.

The effects of climate change will erode this protection gradually, and many of the sea walls and embankments will come to the end of their design life at approximately the same time. However, even if the Barrier were to be overtopped, this would only happen for a short period – for example during a high tide combined with a severe storm surge, so it will still give a high level of protection for many years.

London was one of the first “Mega cities” and has a population that will soon exceed 8 million. Attempts to limit urban sprawl with greenbelt regulations mean that there is a high concentration of people and wealth in a relatively small area. This means that it is very exposed to hazards, and its ageing infrastructure makes it vulnerable.

Overall in London the value of property in the floodplain is around £80 billion<sup>38</sup>. The Thames Barrier alone protects property worth around £30 billion. If the Barrier were to be put out of commission by accident, terrorism or sabotage, London could be at risk of flooding, although there are many precautions taken to prevent this happening.

The Barrier will protect London against the 1,000 year flood until 2030, but it will have to be raised more often. Between its opening in 1982 and August 2001, it was raised 63 times. Most of these events have been in recent years: in the winter of 2000/2001 alone, it was raised 24 times, mainly in response to unprecedented freshwater flows. As at January 2003, the Barrier had been used a total of 82 times following its use in a record 14 consecutive tides to help to alleviate fluvial flooding in the Thames catchment, when flows in the Thames reached their third-highest value, a more-severe event than in Autumn 2000. 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<sup>39</sup>. It seems to be generally accepted that further protection will be needed at some point in the next

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38 Parker, D., and Penning-Rowsell, E. (2002), “Disaster Transformation and Management issues in London” Proceedings of the 2002 London’s Environment and Future (LEAF) conference at University College London.

39 “The Thames Barrier Flood Defence for London.” Environment Agency, 2001.

30 to 50 years. The Environment Agency has therefore extended its planning horizon by 70 years to the year 2100, and has started a project called "Planning for Flood Risk Management in the Thames Estuary" to develop a strategy for the tidal Thames from Teddington to Sheerness/Shoeburyness. Preliminary estimates of the cost of providing a 1,000 year standard in flood defences up to the year 2100 produce a figure of £4bn which will need to be spent in the next 40 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<sup>40</sup>. Along the tidal stretch of the Thames, 800,000 people live within a ten minute walk of the river.

London's infrastructure is near full capacity, yet the growing demand for houses means that many more houses are to be built. According to the Thames Gateway web site, for example<sup>41</sup>, the Planning Framework estimates that in due course Thames Gateway might provide over 110,000 new dwellings, with 70,000 anticipated by the year 2006. Of these, it was revealed at a recent conference in London, some 86,000 could be built in the Thames floodplain by 2015.

Local authorities have been asked to "...give priority to the redevelopment of vacant and under-used urban sites before the release of greenfield land, and to foster sustainable relationships between homes, workplaces and community facilities"

Nevertheless, most of the new housing will lie in certain major sites, including the Royal Docks, Barking Reach, Thamesmead, Chafford Hundred and Chatham Maritime, together with, in due course, Greenwich Peninsula, Kent Thames-side, and Havering Riverside.

One aspect which may really concern insurers is that in the Thames Gateway area it is planned to have a high concentration of dwellings: around 120 dwellings per hectare compared to a normal level of around 30 dwellings per hectare even in Southeast England. Therefore, while the Thames flood hazard may be low because it has the best standard of protection in Britain, the exposure is set to increase enormously, threatening insurers' ability to carry such a high concentration of risk.

The value of property protected by the Thames flood defences is therefore set to continue to rise rapidly, and while the Barrier itself gives a high standard of protection, a weak link in the 200 miles of associated defences could cause localised problems.

While London may be well protected from coastal and river flood, there is still a problem with pluvial flooding from severe rainfall events. On 7th August, 2002, an inch

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40 McGlade, J., (2002). "Thames navigation and its role in the development of London." Proceedings of the 2002 London's Environment and Future (LEAF) conference at University College London

41 <http://www.thames-gateway.org.uk>

of rain fell in central London in 30 minutes during the evening “rush hour”, resulting in the closure of five mainline railway stations, and considerable disruption. London’s drainage infrastructure is too old and overloaded to cope with such events. More than 50% of drainage and sewage overflow problems in England take place in London as will be seen in the next section.

Of course the problem of inadequate sewage and drainage systems is not confined to London.

## **The Sewage and Drainage Problem**

The Victorian attitude to drainage was to get rid of unwanted water as quickly as possible, hidden away in underground pipes and culverts. For many years this continued to be the strategy, with a single pipe, called a “combined sewer” used to carry both foul water and surface water drainage. Most of our drainage is still through combined sewers. The problem with this system of course is that when there is a heavy rainstorm the combined sewer pipes cannot take the volume of water and they overflow, leading to sewage contaminated flooding and backup through toilets and baths into houses.

Sewage contaminated flooding is particularly unpleasant and costly, with potentially serious health risks. Sewage backup claims are commonly insured, even in countries like Australia and Canada where private flood insurance is unavailable. This is because insurers are prepared to accept that such claims can happen anywhere, not just in floodplains.

As more land is covered with buildings, and as climate change increases the threat of severe rainfall events, sewage backup and drainage surcharge floods are becoming increasingly common in Britain. If someone suffers from such events on a regular basis, insurers will be bound to consider that such claims are becoming inevitable and uninsurable. Alternatively they may seek recovery from the responsible water company or authority.

In England there was a recent successful lawsuit against Thames Water (Peter Marcic v Thames Water Utilities). The court determined that Thames Water had potentially violated human rights as a result of allowing a sewer to flood Mr Marcic’s garden many times over a period of nine years. Thames Water has estimated that it would cost £1bn to rectify all such problems<sup>42</sup>. The case went to an Appeal to the House of Lords in October 2003. The Lords reversed the decision of the Court of Appeal, so the water company was held to be not liable. Otherwise, there could have a string of similar cases from the insurance industry<sup>43</sup>. A consequence of this decision seems to be that

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42 Institution of Civil Engineers Presidential Commission (2001) “Living with Rivers”. ICE, London.

43 Howarth, W., (2002) “The changing character of flood defence law.” *Municipal Engineer*, 151, pp 275-282

water companies and Scottish Water are no longer turning out to clean up sewage flooding in gardens (as they had started to do after the Court of Appeal decision). This has serious implications for the risk of disease, especially for families with children and pets.

### **Marcic v Thames**

Peter Marcic owns a house in Stanmore. When there is heavy rainfall his garden is flooded with sewage back up, although the house itself is not flooded.

The Director General of Water Services has imposed a price cap on Thames Water which takes into account construction work to reduce the number of houses subject to internal sewage flooding, but he has not made any allowance for properties subject to external flooding.

Mr Marcic brought legal proceedings against Thames Water for

Breach of statutory duty

Negligence

Nuisance

Breach of the European Convention of Human Rights

The judge dismissed all of these except for claims based on the European Convention. The case then went to the Court of Appeal which upheld the original judgement but also found for Mr Marcic on the basis of private nuisance.

It had been the position that a sewerage undertaker could only be held liable in nuisance when it was guilty of misfeasance, where its actions had contributed to the nuisance. It could not be held guilty of non-feasance, where it had not taken any action. The Court of Appeal held that even though Thames Water were not guilty of misfeasance, they were still guilty of nuisance because they had failed to take all reasonable steps to prevent the flooding. The case subsequently went to the House of Lords where the decision was reversed.

Source: Venters, R., (2002) "Marcic v Thames Water: a change in the law" Water UK, 19 June 2002, Number 151, p7.

The EA report on the autumn 2000 floods<sup>44</sup> indicated that 14% of the properties flooded were flooded by drainage surcharge or sewage overflows. Insurance claims data suggests that the figure could be much higher. For example, it is estimated that 30 to 50% of flood insurance claims after the autumn 2000 floods related to properties outside any floodplain. In the Boxing Day storm in Scotland in 1999, only 40 out of 240 claims were within the indicative floodplain map area. In the April 2000 floods in Edinburgh, it was alleged that less than 600 out of nearly 2,400 claims were in the

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44 Environment Agency, (2001), "Lessons Learned, Autumn 2000 Floods" Environment Agency, Bristol.

indicative floodplain map area<sup>45</sup>, and while that figure is probably incorrect, there was no doubt a significant number of such cases.

Robust data is hard to obtain, because many events are unreported to the water companies, but the Construction Industry Research and Information Association (CIRIA) estimated in 1998 that 32,500 properties have a one in ten or one in 20 chance of sewage flooding each year<sup>46</sup>. At an estimated cost of £50,000 per house<sup>47</sup>, it would cost £1,625m to cure the problem just in this relatively small number of properties.

The problem is not just lack of money; there is also a lack of skilled water engineers. Nick Reeves, executive director of the Chartered Institute of Water and Environmental Managers was recently quoted in the Guardian<sup>48</sup> as saying: "At a time when we are having to manage the effects of climate change and flooding, it is critical that we have the innovative engineers and environmental managers in place to deal with these important issues. We have a good track record in this country, but now we have a skills shortage."

The Office of Water Services (Ofwat) Annual Report for 2001-2002 states: "Flooding caused by blocked or overloaded sewers is one of the worst failures of companies' activities that customers experience." They published a consultation paper on the subject in March 2002<sup>49</sup>, to which the customer representative bodies, known as "Water Voice" groups, have now responded. The response from "Water Voice Thames" (WVT) is particularly interesting<sup>50</sup>. Thames Water has over half the properties at risk of sewer flooding in England and Wales, and WVT say they are convinced that "a continuation of the established approach to correcting the deficiencies in the system will not succeed." They call for the avoidance of sewer flooding to be given the highest priority over the next five years.

In March 2001, The Ofwat National Customer Council (ONCC) called for the planning process to take into account sewer flood risk.

The ONCC which formulates the views of water customers in England and Wales expressed its support for the Government's proposals for reducing flood risk through

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45 ABI flood seminar, July 2002

46 May, R., Martin, P., and Price, N. (1998) "Low cost options for prevention of flooding from sewers." CIRIA Report C506

47 Institution of Civil Engineers Presidential Commission (2001) "Living with Rivers". ICE, London.

48 Guardian, 15th January 2003.

49 Ofwat Report 18/02, (2002) "Flooding from sewers, a way forward: consultation."

50 Available on [http://www.ofwat.gov.uk/consultationpapers/thames\\_sewer\\_flooding.pdf](http://www.ofwat.gov.uk/consultationpapers/thames_sewer_flooding.pdf)

the planning process. However they have called for water and sewerage companies to become statutory consultees in the planning process and for planning permission for new developments not to be granted unless the design and capacity of the existing local sewer system has been checked and approved.

A relatively new development is the current practice of constructing new pipelines along the coast beside coastal cities to divert sewage outfalls which previously went into the sea towards new water treatment works. While this is excellent for reducing marine and beach pollution, there are signs that such diversions are resulting in a more frequent incidence of sewage backup into the cities during major rainfall events. In one case, a pipe only 1.5m in diameter is now capturing the outfalls of 37 combined sewage and surface water pipes, serving a population equivalent of 270,000. Three months after opening the pipe became blocked, resulting in localised flooding.

One of the main causes of sewer flooding is the excessive load on sewers from surface water draining into inadequate combined sewer systems. A solution that is strongly supported by the EA and the Scottish Environment Protection Agency (SEPA) is "Sustainable Urban Drainage Systems", or "SUDS". This initiative is also called "Sustainable Drainage Systems" to reflect the fact that it is not limited to urban applications. (Following this, the abbreviation was changed to SuDS in England and Wales, but has now changed back to SUDS). SUDS is a method of source control to reduce the overloading of sewers and improve the quality of rainfall run off. At the same time, it improves the environment and the amenity of new housing and commercial developments, increasing property values. It is therefore being strongly supported by developers.

In the last five years, SUDS have become an increasingly common solution to the problems of drainage in new developments. It is important that the insurance industry should learn about SUDS and lend its support to SUDS schemes, because of their potential for reducing flooding and pollution problems. The panel contains a brief summary of SUDS, how it works, and the benefits for society and the environment. The author would strongly recommend that all planners, developers, and property insurance underwriters obtain or borrow a copy of a video produced in 2002, called "Designs that hold water". This short video should be available from any regional office of the EA or SEPA, and it gives an excellent introduction to the benefits of SUDS<sup>51</sup>. It also illustrates how it works, using some of the best examples of SUDS systems in the country. For those who wish to have more details of SUDS, there are a number of technical manuals and guidance notes available<sup>52</sup>. There is also an excellent

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<sup>51</sup> Shot in the Dark Centre for Environmental Communications (2002) "*Designs that hold water: Sustainable Urban Drainage Systems Explained*" Video production (25 minutes) sponsored by SEPA, The Environment Agency, and the Institution of Civil Engineers.

<sup>52</sup> See the following CIRIA Guidance Notes: CIRIA Report C506

"Low cost options for prevention of flooding from sewers." London, 1998. ISBN 0-86017-506-5

introductory booklet produced in March 1999 by EA and SEPA entitled “Sustainable Urban Drainage – An Introduction”.

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CIRIA Report C521

“Sustainable urban drainage systems. Design manual for Scotland and Northern Ireland”, London 2000.

CIRIA Report C522

“Sustainable urban drainage systems. Design manual for England and Wales”, London 2000. ISBN 0 86017 522 7

CIRIA Report C523

“Sustainable urban drainage systems – best practice manual”, London, 2001.

CIRIA Report C539

“Rainwater and greywater recycling in buildings – best practice guidance”, London, 2001.

The Scottish Executive have also published an excellent planning advice note: PAN 61

Planning Advice Note 61 “*Planning and Sustainable Urban Drainage Systems*” Scottish Executive, Edinburgh, July 2001. ISBN 0 7559 2097 X.



### **Sustainable Drainage Systems (SUDS)**

In the last 100 years, more than 75% of our natural ponds have been lost due to development and artificial drainage. This is not good news for our wildlife, apart from the millions of brown rats, which inhabit our drains, culverts and sewers. Culverts are attractive but dangerous places for children to play, and costly to maintain. They are particularly dangerous if there is a flash flood. Culverts can be blocked by rubbish, leading to flooding in unexpected places.

A property development that uses conventional drainage can cause flooding problems downstream, possibly leading to the need for flood defences, or preventing further development from taking place due to the flood hazard.

SUDS is intended to imitate natural processes, by using a combination of features such as:

Permeable surfaces – to allow water to drain through the surface into filtration material underneath

Filter strips – for initial filtration of pollutants in surface water, for example oil from car park surfaces

Swales – long shallow channels to slow down the water and allow it to infiltrate into the ground with natural treatment from vegetation

Interception ponds – ponds with reed beds for further filtration if necessary, for example beside car parks and filling stations

Retention ponds – ponds to store surface water run off and give it a chance to drain away naturally into groundwater and watercourses. There may be safety issues with ponds and children, but ponds are safer than culverts, and are usually quite shallow.

Detention basins – shallow basins, which are normally dry and covered with vegetation, but which can fill up with water in the event of a severe rain- storm, to prevent flooding downstream.

20 to 50% of poor river quality is due to urban run off, and 50% of oil in the sea comes from urban drainage. SUDS can prevent diffuse pollution reaching watercourses, while at the same time creating attractive amenities for the community and providing habitat for wildlife. It therefore has a very positive impact on property values.

SUDS is about sustainable development, water quality, and environmental issues. It is not primarily a flood control system, or a substitute for a flood alleviation scheme for developments in flood hazard areas. Indeed SUDS will not work properly in areas prone to regular flooding. Nevertheless, it can prevent flooding upstream or downstream, provided it is well designed and maintained. SUDS is relatively new in the UK (although elements of SUDS have been used in Canada for over 100 years) and developers and planners still have much to learn about how to use the techniques properly.

**The Environment Agency view of SUDS is stated as follows:**

“Sustainable drainage is a process for achieving integrated surface water drainage design with the objectives of:-

1. reducing the flood risk from development within a river catchment;
2. minimising diffuse pollution arising from surface water runoff;
3. minimising environmental damage, e.g. bank erosion, and damage to habitats;
4. maintaining or restoring the natural flow regime of the receiving watercourse;
5. maintaining recharge to groundwater subject to minimising the risk of pollution to groundwater;
6. achieving environmental enhancements, including improvement to wildlife habitats, amenity and landscape quality;
7. minimising the amount of surface water runoff and infiltration entering foul and surface water sewerage systems.”

## **The Health Problem**

Sewage overflows can create an obvious health risk, but flooding in general carries a significant health and safety risk.

- Since 1999, 20 people have died as a direct result of flooding in England and Wales.
- Traditional combined sewers are bad news for all kinds of wildlife, except brown rats. There are millions of them in Britain, and when there is a flood they abandon the sewers and come to the surface. Leptospirosis or “Weil’s disease”, spread by rats’ urine, is rare in the developed world, but in 1981, there were 72 cases in Britain, with seven of them fatal.
- *Escherichia coli* (“E-coli”) is also a danger. In May 2000, the small town of Walkerton in Southern Ontario had a serious outbreak of E-coli. Their drinking water system became contaminated with these deadly bacteria, which had been washed into a well from farmland spread with manure. Seven people died, and more than 2,300 became ill. The community was devastated. There were widespread feelings of frustration, anger, and insecurity<sup>53</sup>.
- In 2002, there were several outbreaks of cryptosporidium in the water supply in Scotland caused directly by heavy rainfall washing sheep droppings from fields into watercourses used for water supplies. Normal water treatment processes do not kill these bacteria. If there are more frequent severe rainfall events, such outbreaks may become more common unless sheep and wildlife are kept away from water catchments, or drinking water treatment is improved.

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<sup>53</sup> “*Report of The Walkerton Inquiry.*” Ontario Ministry of the Attorney General. Available on [www.walkertoninquiry.com](http://www.walkertoninquiry.com)

- There are long term health risks from the mould that can grow on the walls of buildings that have been flooded, especially if the property is not thoroughly cleaned and dried out. In countries where flood insurance is not widely available to clean up the property, toxic mould can be left to grow, leading to widespread problems as the spores can cause serious respiratory problems. Sometimes the only solution is demolition. Some insurers think that toxic mould is a peculiarly USA problem, and certainly there are some major law suits being pursued in the USA. However there is no reason, with a warming climate, why toxic mould cannot become a big problem in Britain as well.
- There are also long term health risks from asbestos, which is quite common in older houses, for example in textured ceilings and flues. This needs specialist removal.
- Removal of floodwater incorrectly can spread bacteria around the house, especially if the water is contaminated with sewage.
- Injury or death can result from walking in even quite shallow floodwaters if they are fast flowing, for example people can be knocked off their feet, or fall into manholes where the covers have disappeared. Flood induced landslip can engulf houses and roads. Six inches of fast flowing water will knock you off your feet and two feet of water will float your car.
- In addition to physical health problems, there are also problems from the trauma of suffering flood damage<sup>54</sup>. The Samaritans have thousands of volunteers all over the country and their training in dealing with people who are in despair is second to none. They will usually have teams on site very quickly to be there for distressed flood victims but their immensely valuable contribution is rarely recognised. In Scotland, at the author's suggestion, SEPA's flood warning documentation includes a section on the value of talking to The Samaritans. Research has shown that flood can be so traumatic that flood victims can be put into a state of fear every time there is heavy rainfall<sup>55</sup>, and three months after the Boscastle event in August 2004, residents were still having nightmares.

## The Flood Mapping Problem

The original flood hazard maps from the EA and SEPA were called "indicative" floodplain maps (because they were not very accurate). These provided a general

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<sup>54</sup> Penning-Rowsell, E., Chatterton, J., Wilson, T., Potter, E., (2002) "Autumn 2000 Floods in England and Wales: Assessment of National Economic and Financial Losses." Middlesex University Flood Hazard Research Centre, London.

<sup>55</sup> Penning-Rowsell, E., Chatterton, J., Wilson, T., Potter, E., (2002) "Autumn 2000 Floods in England and Wales: Assessment of National Economic and Financial Losses." Middlesex University Flood Hazard Research Centre, London.

overview of areas that are within natural floodplains, and identified those properties which are potentially at risk from flooding from rivers or the sea. The maps were based upon historical flood records, survey records and computer models. Copies were provided to all local authorities in Britain.

In December 2000 the Environment Agency added indicative floodplain maps to its web site allowing anyone with access to the Internet to check out which areas of England and Wales are at potential risk of flooding from rivers or the sea. A feature called "What's in your backyard" means that users can enter the name of a town or a postcode to see what the flood risks are for their own properties. See <http://www.environment-agency.gov.uk>.

The Environment Agency service only applies to England and Wales, but there is a commercial web site that provides a free postcode search facility for the whole of Britain. It can be found at: [www.home-envirosearch.com](http://www.home-envirosearch.com).

These indicative flood maps only give a rough indication of areas at risk of flooding. For example, they do not include the effects of flood defences, and because of this they may show areas to be at risk when they are not, and vice versa. In other words they may give a false sense of alarm or a false sense of security. Smaller insurance companies used them for underwriting, but the bigger insurers had their own, more accurate flood maps. Almost all insurers will have maps showing coastal flood hazard areas that take into account coastal flood defences. These maps also show which defences are likely to fail during a 50-year storm, and which areas would be inundated as a result.

### Insurers and flood maps

Some insurers have invested substantially in more accurate flood mapping. Royal & Sun Alliance (RSA) have an intranet system called "Geographical Risk Analysis" (GRA) which enables underwriters to access flood risk information using full postcode. GRA links the underlying geology with overland geography including rivers, their height, river and sea defences, plus boreholes etc. This allows the user to accurately determine the property's exposure to flood risk. The system was highly commended in the Insurance Times "Risk management initiative of the year" for 2002.

RSA's intranet-based application grades properties on a traffic-light basis - green, amber or red, depending on their level of risk. They are currently adding a subsidence mapping tool, been based on the company's own geological engineering risk techniques, combined with digital terrain mapping and address verification information from Ordnance Survey and a Geographical Information System supplied by ESRI.

Norwich Union has commissioned an airborne survey of the country using synthetic aperture radar interferometry. This has been used to produce "Next Map" in conjunction with Intermap, a USA company. In return for their investment, the Norwich Union has a period of exclusive access to Next Map.

Next Map is a digital terrain model with a vertical resolution of 50 cm in the South of England and 1 m for the rest of Britain which compares well with the Ordnance Survey error margin of plus or minus 3 metres. Norwich Union (NU) subsequently has used the new digital elevation data to produce a flood map for the whole of Britain and they rolled this out to their branches in March 2004. At the time, Post Magazine said<sup>1</sup>: "NU claims it is the largest and most accurate map of its type for the UK and will provide a better understanding of the flood risk for individual properties.

"The technology means NU can set premiums on a specific address rather than using a postcode band."

An NU spokesperson said: "This model will mean we don't penalise people who live in a high-risk area but are at low risk of flooding."

Norwich Union had a further roll out to selected intermediaries in July 2004. In addition, Norwich Union has reportedly decided to offer free flood cover for gardens, a courageous move in the light of the outcome of the Marcic case.

Norwich Union has agreed that the digital elevation data which they funded can be supplied to the Environment Agency and the Scottish Environment Protection Agency, both of whom have commissioned consulting engineers to convert these data into a new generation of flood maps, which started to come on stream in October 2004.

The internet insurer, "esure" has bought in additional imagery layer information to make its flood maps more accurate. In addition, it has a number of sources of information about flooding in high hazard areas.

Meanwhile, the Environment Agency is working with Intermap's UK distributor Getmapping, to assess selected areas. Getmapping already has complete aerial photographic coverage of Britain (through the "Millennium Map" project), and has signed a deal to become a reseller of Next Map. The combination of high-resolution aerial photographs and digital terrain model could be a powerful tool, not just for flood insurance but for many other types of insurance problems as well.

Therefore if anyone is having difficulties obtaining flood insurance, it would pay them to shop around, trying a mixture of big and small insurers. The Environment Agency published “second generation” flood maps in October 2004, starting with river flood maps, based on the data commissioned by the Norwich Union, but extending this to include coastal flood and taking into account flood alleviation schemes. These maps may make insurance cheaper for some, but more expensive for others. The Scottish Environment Protection Agency is due to publish similar maps in September 2005.

It will still pay to “shop around” as some insurers will still have more accurate and detailed maps than the government and its agencies can afford.

The Environment Agency has called for up to £200m more to be spent each year on flood defences, and it is also in the process of preparing a map of flood risks across the country in 2050, taking account of climate change.

If their property appears in the indicative flood map, they may still get a quote from one of the dozen or so bigger insurers which have more accurate and detailed maps than the government and its agencies can afford.

It should be emphasised however that insurers would generally try to maintain cover for existing long term clients, and those who change insurers frequently are more likely to have problems.

One of the problems of publishing flood maps is that this could have an adverse effect on property values, and possible legal consequences. In England this has been solved by classifying them as a “Statutory Public Register” which confers immunity from litigation as well as exemption from the Data Protection Act. (This step is apparently not necessary in Scot’s Law.) The technology exists already to not only publish such maps on the internet, but to link them into existing gauging stations to give real time indications of the flood risk for flood warning dissemination purposes. Householders concerned about heavy rainfall and rising river levels could then check the danger directly themselves by keying their postcode into the internet and seeing the latest assessment “on line”.

### **Future Mapping**

The Environment Agency has commissioned work on an “extreme flood outline” to produce flood maps for the 1,000 year return period. In addition, flood hazard areas in England and Wales have been surveyed by the Environment Agency using an airborne laser instrument called “LiDAR”. This instrument has the potential to produce much more accurate digital elevation models, essential for more accurate flood mapping. While the system has only recently been used in Scotland for the Scottish Executive on an experimental pilot study basis, a commercial operator, “Info Terra”, has carried out independent LiDAR surveys in most urban centres in Britain, including Central Scotland.

(For more details see the panel and the glossary, or contact [info@infoterra-global.com](mailto:info@infoterra-global.com))

In March 2001, the Ordnance Survey launched a new three dimensional mapping product. Ordnance Survey say they

“...have developed the airborne laser technology in alliance with the Environment Agency and software specialist InfoTerra. The LIDAR (light detection and ranging) technology is used to provide detailed 3D digital maps and offers a remarkably accurate assessment of flood risk as well as being beneficial for the planning of new developments and road schemes.”

### **Is flood mapping the answer?**

Many insurers have spent large sums of money on improving their flood maps, but is this the whole story? Thanks to sewer overflows, and inadequate drainage infrastructure, it is clear that floods can occur almost anywhere. While mapping is adequate for commodity business like household insurance, insurers will need to be aware that avoiding such areas will not eliminate the flood risk.

For some years, the author has been encouraging Scottish local authorities to adopt a different approach when considering flood defence works. This is to use a zoning approach, to zone areas according to vulnerability, rather than hazard, and to concentrate on ensuring that locations such as hospitals, sheltered housing, social housing and evacuation routes are safe (more details appear later in this report). The EA are now looking into this concept with a view to improving the targeting of flood warnings, public education, and community involvement. An approach worth considering can be found in Sweden, where priorities vary depending on the “social tolerance” of flooding expressed in terms of impact. Thus inner city areas with a high level of people at risk and a high level of investment have the lowest tolerance.

### **The Small Business Problem**

Many communities are very dependent on small businesses. Often the village or small town’s sub post office or small shops are the heart of a community and local small factories provide much of the employment and prosperity.

Small businesses can be very vulnerable to flood damage, and unless the business is adequately insured, a flood can lead to bankruptcy.

A survey published in November 2002 by the Federation of Small Businesses<sup>56</sup> in the South East of England shows that most small businesses that survived the Autumn 2000 floods have had significant increases in premium. It also shows that 42% had losses in excess of £50,000 after taking business interruption costs into account. The majority (63%) felt that their insurance settlement was fair, but 21% suffered from the imposition of big excesses, or withdrawal of flood cover afterwards.

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<sup>56</sup> Barter, A., 2002 “Autumn 2000 Flood Survey” Federation of Small Businesses (South East). Polegate, England.

The most commonly used sources of advice during the floods were the insurance companies (24%), the Environment Agency (17%) and the local authority (13%). The highest levels of satisfaction with the advice given, related to advice from insurance companies. The highest dissatisfaction with advice given related to advice from the Environment Agency and local authorities.

According to the survey, very few businesses had installed flood protection measures after flooding. 37% moved the electrical sockets higher, but only 12% had installed moveable flood protection barriers in doorways, and only 4% had bought temporary covers for airbricks. This may well reflect the fact that many small businesses operate from rented premises, often under a five or ten year lease. A number of the respondents indicated that they would stay until the lease has expired, but would then be looking to relocate to a safer area.

This means that in many flood hazard areas there could be a delayed impact on communities and landlords over the next five to ten years, if a large number of businesses decide not to renew their leases and move to safer areas, or cease trading altogether.

The Federation of Small Businesses research only applied to companies that had survived a flood event. According to research by the insurance company AXA, 1.1 million or 68% of small businesses do not have recovery plans to ensure they could survive serious computer failure. AXA state that the majority of small businesses affected by flooding either never reopen or cease trading within 18 months, because in arranging insurance, they have underestimated the business interruption costs a flood can cause<sup>57</sup>. The ABI claim that a severe flood event can result in a general loss of trade as people avoid a disaster area and that some communities “may be blighted permanently”<sup>58</sup>.

The value of such small businesses in keeping a community alive should not be underestimated. Unfortunately, the prospects for them are not good, especially in the light of climate change projections.

## The Climate Change Problem

Climate change has many implications for the insurance industry<sup>59</sup>. There is a consensus in the results<sup>60</sup> from all the 19 major climate change models around the

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<sup>57</sup> Post Magazine, 30th January 2003

<sup>58</sup> Milne, J., Manager, Household and Property, ABI, (2002) “Better flood management: the insurance perspective” Municipal Engineer, 151 pp283-286.

<sup>59</sup> Crichton, D. 2001 “The Implications of Climate Change for the Insurance Industry.” (ISBN 1-903852-00-5), Building Research Establishment, Watford, England.



world that Britain will become much wetter, and this alone must increase the chances of flooding in Britain<sup>61</sup>:

In addition, however:

- sea level is rising (see figure 3)
- storm surge heights will increase (see figure 4)
- the frequency and severity of windstorm events will increase, according to the Hadley Centre model (although not all climate models agree with this).
- storm tracks are changing. Atmospheric high pressure over the continent of Europe usually blocks storms from tracking over the South of England or the North of France. As winters in central Europe become milder, the blocking highs are becoming weaker or shifting to the East<sup>62</sup>. When there are milder winters in central Europe, more storms track across the South of England and the North of France<sup>63</sup>. Because buildings there are designed and constructed to lower standards, damage can be severe. For example the storms of October 1987, January 1990, and December 1999.
- Changes in tidal ranges mean that the frequency and severity of extreme high water levels will increase (see figure 5).

As if all this was not enough, as will be shown later in this report, in the south east of England the land is sinking due to tectonic tilt caused by post glacial rebound in the north of Britain, which will accelerate relative sea level rise.

Rainfall in the autumn and winter is projected to increase significantly, with more frequent severe events. At the same time rainfall in the summer will reduce, but there will still be short duration extreme rainfall during thunderstorms, which will runoff faster when the ground is dry. There have been examples of this in the past, such as the

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<sup>60</sup> Palmer, T.N., and Rälsänen, J. (2002) 'Quantifying the risk of extreme seasonal precipitation events in a changing climate' *Nature*, Vol 415, pp.512-514.

<sup>61</sup> Hulme, M., Turnpenny, J., Jenkins, G., 2002. "Climate change scenarios for the United Kingdom. The UKCIP 02 Briefing Report." Tyndall Centre for Climate Change Research, University of East Anglia, Norwich, UK

<sup>62</sup> Parry, M.L. (Editor) "Assessment of Potential Effects and Adaptations for Climate Change in Europe: The Europe ACACIA Project." Jackson Environment Institute, University of East Anglia, Norwich, UK, 2000, 320pp.

<sup>63</sup> Dronia, H., 1991. "Zum vermehrten Auftreten extremer Tiefdruckgebiete über dem Nord-atlantik." *Die Witterung in Übersee*, 39(3), 27. Cited in Parry et al., 2000.

Lynmouth and Boscastle disasters, and flash floods and landslides are going to become a more frequent problem in the future. (For more details see “The “Flash Floods Problem” and “The Landslide Problem” later in this report.)

With such freak events becoming more frequent, there are numerous questions being raised as to whether this is evidence of climate change.

However, it is just as important to remember that a single weather event is not clear evidence of climate change, and that looking at the longer term picture is essential.

The US fossil fuel lobby has argued that impacts of climate change will be good for business because more people will pay more for insurance, so why should insurers care?

There are two main problems with this argument. The first is that the increases in losses are unlikely to be steady and predictable. If the climate is changing, the numbers of attritional losses are likely to grow, but there will also be an increasing number of “sideswipes” due to catastrophic losses. Because the extreme events that cause catastrophic losses are rare, it is much harder to quantify the risk in terms of probability, but all the General Circulation Models built by respected scientists around the world seem to suggest that the risk is growing. In a recent letter to “Nature”, Palmer and Rälsänen<sup>64</sup> reported how they have made a probabilistic analysis of 19 global climate model simulations - in effect, a “poll of polls” - and have concluded for example, that winter precipitation in the UK could increase five-fold in the next 100 years.

Climate change will have major impacts across Europe<sup>65</sup>, and although this report is confined to flood risks in Britain, it is worth pointing out that hail storms and windstorms will also be a problem. Underwriters should be concerned about the fact that climate change will result in winter storm tracks moving south<sup>66</sup>, as happened with the very damaging storms of 1987, 1990 and 1999. Fortunately so far England and France have escaped a storm of the severity of the Braer storm which hit Shetland in 1993. This storm nearly broke the European record for low pressure with atmospheric conditions similar to a category 5 hurricane. If such a storm were to hit highly

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<sup>64</sup> Palmer, T.N., and Rälsänen, J. (2002) ‘Quantifying the risk of extreme seasonal precipitation events in a changing climate’ *Nature*, Vol 415, pp.512-514.

<sup>65</sup> European Environment Agency, 2004. “Impacts of Europe's changing climate” EEA (European Environment Agency) OPOCE (Office for Official Publications of the European Communities). ISBN: 92-9167-692-6. Available from [http://reports.eea.eu.int/climate\\_report\\_2\\_2004/en](http://reports.eea.eu.int/climate_report_2_2004/en)

<sup>66</sup> Dronia, H., 1991. “Zum vermehrten Auftreten extremer Tiefdruckgebiete über dem Nord-atlantik.” *Die Witterung in Übersee*, 39(3), 27. Cited in Parry, M.L. (Editor), 2000 “Assessment of Potential Effects and Adaptations for Climate Change in Europe: The *Europe ACACIA Project*.” Jackson Environment Institute, University of East Anglia, Norwich, UK, 2000, 320pp.

populated areas of the mainland, there would be widespread devastation and loss of life. Already, the number of winter storms crossing the UK mainland has doubled in the last 50 years<sup>67</sup>.

Secondly, in a competitive world, market forces put a cap on how rapidly premiums can be increased without loss of market share. Even without climate change impacts, the rate of increases in losses is already beginning to be too rapid now for premium increases to keep pace, simply because people are wealthier, and more people are living in hazardous areas. Vulnerability is also increasing, as our society becomes more complex and inter-dependent.

There are implications not only for humans and their property, but also wildlife<sup>68</sup>. The UK has 15,000 km of coastline with 106 internationally important sites for wintering waterfowl, 10 per cent of which have been identified as under threat from climate change, with a further 10 per cent vulnerable. English Nature estimate that at least 13,000 hectares of English shoreline, much of it vital wildlife habitat, will disappear in the next 20 years. Mudflats could decline by around 10,000 hectares; in the winter three million wading birds rely on the UK's mudflats as breeding grounds. Saltmarshes will decline by 2,750 hectares by 2020, with two thirds of the loss in southeast England. Ten per cent of saline lagoons are expected to disappear, along with many rare species.

Climate change has important implications for flood defences. By 2075, according to research for the government, climate change impacts could treble the frequency of the current "design" flood. A flood defence designed to a standard of service for the 100 year return period event will only provide protection ranging from the 50 year event in Anglian region to the 33 year event in the North East of England<sup>69</sup>. The state of flood defences will therefore become increasingly important to insurers.

This does not fully take into account the effects of Antarctica, where temperatures are rising faster than the rest of the world. In January 2002, the "Larsen B" ice shelf broke away due to rising temperatures and this could speed up the movement and melting of land based glaciers in Antarctica and Greenland. (By coincidence, this happened while a film crew were shooting the opening sequence for the film "The Day after Tomorrow")

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<sup>67</sup> Hadley Centre, 2003. "Climate change observations and predictions: Recent research on climate change science from the Hadley Centre", UK Met Office, December 2003  
<http://www.metoffice.gov.uk/research/hadleycentre/pubs/brochures/2003/global.pdf>

<sup>68</sup> WWF, 1998. "Keeping the seas at bay" WWF, Surrey.

<sup>69</sup> Deakin, R., Burgess, K., Samuels, P., Sayers, P., and Chatterton, J., 2001 "A National Economic Appraisal of the Impacts of Flooding and Coastal Erosion considering the potential impacts of climate change." Proceedings of the MAFF Conference of Flood and Coastal Engineers, Keele, 2001

There is a chance that this alone could raise sea levels by over a metre by the end of the century.

Figure 3: Sea level rise. (This assumes that Antarctica will have a temporary negative effect due to storage of increased snowfall.) Reproduced with the kind permission of the Hadley Centre at the Met Office

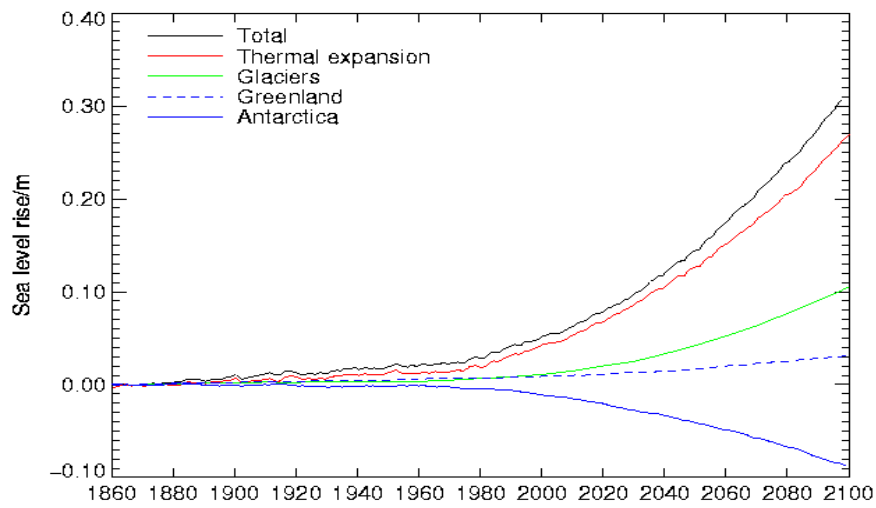


Figure 4: 50 year return period storm surge heights by 2080 under the A2 (medium high) emissions scenario. Shows the height in metres of the extreme sea level. Reproduced with the kind permission of the Hadley Centre at the Met Office

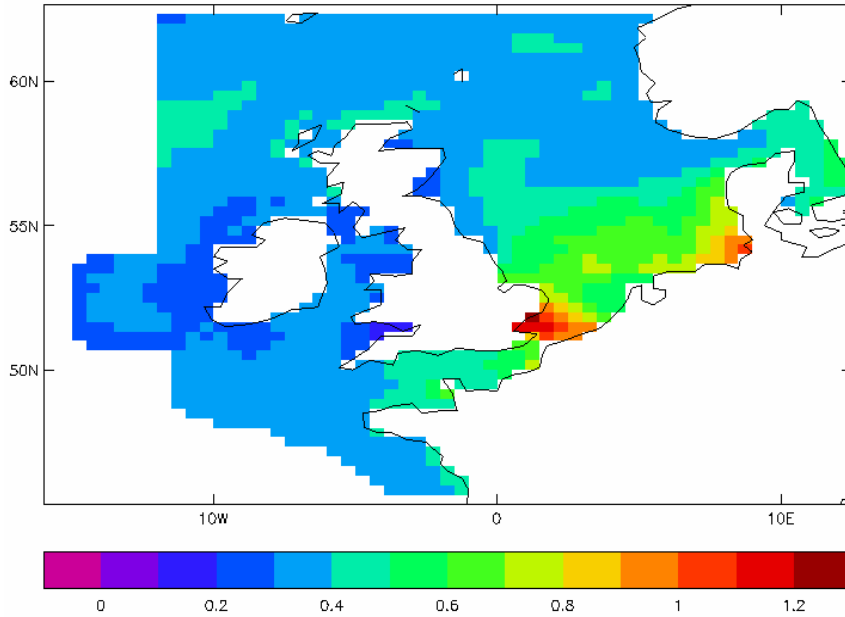
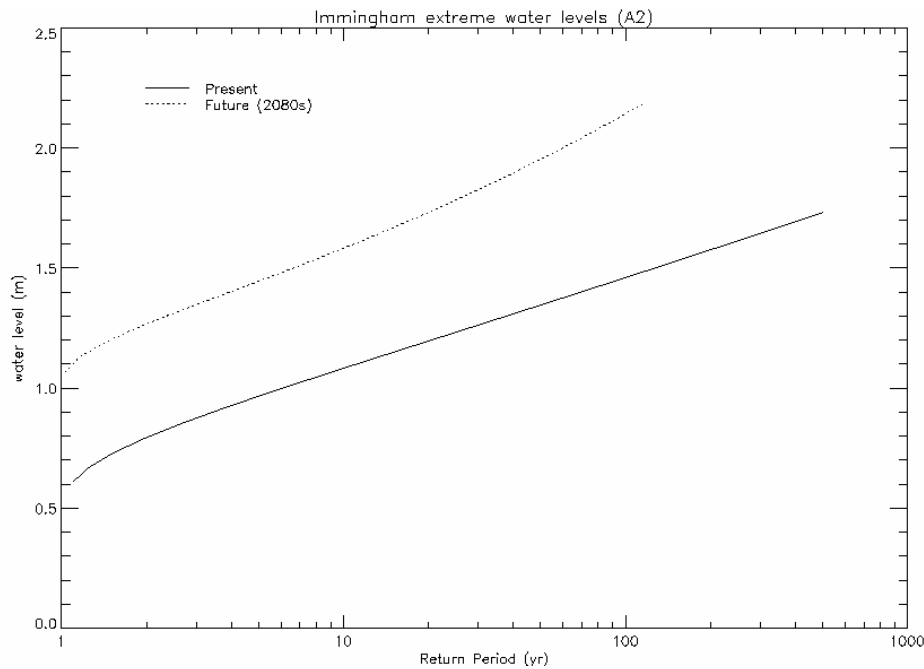


Figure 5: High water return periods at Immingham under the A2 emissions scenario. Levels which currently have a 100-year return period will have a 5.5 year return period by the 2080s. Reproduced with the kind permission of the Hadley Centre at the Met Office



## The Flood Defence Problem

There are some 35,000 km of coastal and flood defence embankments in England and Wales. Nevertheless, the pace of new building means that some areas may not be fully defended before properties are occupied. For example, the 2,500 houses at Sovereign Harbour, Eastbourne<sup>70</sup>. The EA claim that people living in such houses are seriously at risk from a coastal storm, and argued against the development.

Increases in new building in floodplains means that money for flood defences is spread thinner, and this may result in defences being built to a lower standard of service. However, building to less than a 200-year standard of service could be a false economy as the defence is more likely to be damaged, and repair costs could mean that the whole life cost of the defence could be greater. In addition of course, if the standard of service is less than 200 years plus climate change allowance, insurance costs for residents could be higher than normal.

Engineers have tended to be drawn towards structural solutions such as embankments and other “hard” defences and have argued for greater spending on such defences<sup>71</sup>. In Japan, they spend 30 times more than in England as a percentage of GNP. Although they do have a much more severe flood risk, it shows what can be afforded if the country has the will, but it also means covering riverbanks and coastlines in concrete and steel. There is also the issue of whether the general taxpayer should pay for defences, and in 2002, the government seriously considered some sort of “Flood Tax” for those in hazardous areas. (After lobbying by the author<sup>72</sup> and flood victims, the government abandoned its plans in September 2002.) A tax on flood victims would have been grossly unfair: taxing people who have already suffered, usually through no fault of their own. It would seem particularly unfair at a time when property developers are making record profits, especially as much of this profit comes from developing in flood hazard zones.

A research report published by the Department for Environment, Food and Rural Affairs (DEFRA) in July 2001<sup>73</sup> concluded that:

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<sup>70</sup> EA Press Release, April 2000. Also “Living in the Death Zone” BBC TV documentary transmitted November 2000 as part on the “Southern Eye” series. Producer Jenny Craddock.

<sup>71</sup> Institution of Civil Engineers Presidential Commission (2001) “Living with Rivers”. ICE, London.

<sup>72</sup> Crichton, D., 2002, “The ‘flood tax’ – is the Government out of its depth?” *Town & Country Planning*, 2002, vol 72, March, pp66-68. London

<sup>73</sup> National Appraisal of Assets at Risk from Flooding and Coastal Erosion, including the potential impact of climate change. DEFRA, July 2001

- “The capital works and maintenance investment needed to continue to provide and maintain present defence standards is in excess of £0.3 billion/year;
- “Current standards of defence reduce annual average damages to approximately £0.8 billion/year;
- “Continuing to invest at present levels of approximately £0.24 billion per year will result in increasing annual average damage possibly at the rate of some £10-15 million per year.
- “Accommodating climate change is likely to require a further increase in investment of between 10% and 20% over and above that required to meet indicative standards under present day conditions;
- “Without allowance for accommodating the predicted impacts of climate change within defence provision the economic impacts associated with flooding could increase significantly, with annual average damages increasing in fluvial areas by approximately 50% and in excess of 200% on the coast by the year 2050.
- “To allow for anticipated climate change over the next 50 years, an overall increase of between 35 and 85% in flood defence spending would be required.”

The report offered two alternatives: increase spending by up to 85% now, or concentrate spending on selected areas, in effect abandoning less populated areas to the risk of repeated floods. In such areas, flooding would become inevitable. Such “managed retreat” as it is called in other countries, is euphemistically termed “managed realignment” in Britain, and the government and its agencies have been quietly working on such schemes for some time.

(The most comprehensive list of “managed realignment” sites seems to be the one contained in a detailed study produced in 2001 by the Babbie Group for the Scottish Executive, Scottish Natural Heritage, and other groups in Scotland<sup>74</sup>.)

If the government cannot afford to defend people already living in areas it has designated for managed retreat, should it compensate them? It is interesting to note that the government’s recent consultation paper on compulsory purchase in England and Wales has no proposals to introduce compensation for homeowners in such circumstances<sup>75</sup>. (The question of compensation in cases of managed retreat is a

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<sup>74</sup> “Feasibility and implications of Managed Realignment of Skinflats”, Forth Estuary, Scotland. See [www.forthestuaryforum.co.uk](http://www.forthestuaryforum.co.uk)

<sup>75</sup> Department for Transport, Local Government and the Regions (2001) “*Compulsory Purchase and Compensation - the Government’s proposals for Change.*”

complex one. A useful outline of the position in England is contained in a recent report produced by the Royal Institution for Chartered Surveyors<sup>76</sup>.)

Should insurance companies continue to offer flood insurance for these properties, or should the government step in? As mentioned in the introduction, the government has already made its position clear on this point, there will be no government compensation for flood victims.

But the biggest issue remains the continued growth in the number of people living in flood hazard areas and the failure of government to adequately control this, or to make corresponding increases in flood defence spending. Is it right that in a civilised, developed country such as the UK, the government should simply accept that thousands of its citizens will be put at risk of being flooded regularly in the future? Why should the government expect the insurance industry to continue paying out for damage which is increasingly becoming inevitable due to the government's failure to protect its citizens adequately?

Thomas Jefferson, the author of the USA's Declaration of Independence, said "The care of human life and happiness, and not their destruction, is the first and only legitimate object of good government"<sup>77</sup>. Posterity might well judge current government policy in England and Wales to be more concerned about building houses in the South East of England, than in protecting their citizens.

It is true that funding has been made available in England for increased investment in capital works since the autumn 2000 floods. Elliot Morley reported that the annual budget of £150 million of capital works supported by DEFRA grant represents a 25% increase over the £110-120 million average in recent years<sup>78</sup>. This was perhaps a little misleading because it probably includes the "one off" payment from the Deputy Prime Minister of £50 million following the floods in 2000. Mr Morley did not mention that the DEFRA spending in 2002-3 is due to reduce again to £114m, the equivalent of around half the profits made by Barratts the house builders in 2001-2002.

While the increase in 2001-2002 is welcome, it has done little to reassure the insurance industry's concerns over maintenance of defences. The ABI had asked for an increase in investment of £435m by 2005/2006, that is an extra £145m per year on average, but the government is only offering an additional £150m over the next three years, and it is not clear how much of that will be new money. Even then, it will be several years before this increased spending will be reflected in better flood defences.

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<sup>76</sup> RICS Working Party, 2001. "Flooding: Issues of concern to chartered surveyors" RICS, London

<sup>77</sup> Thomas Jefferson's speech in 1809 to the citizens of Washington County, Maryland, USA.

<sup>78</sup> Elliot Morley, Westminster Hall Debate on Flood Defences, 10<sup>th</sup> July 2002.



In July 2002, the government gave details of its spending plans for flood defences as follows:

Table 3

Spending plans for flood defences in England and Wales (£m)

Source: "Renewing the partnership - how the insurance industry will work with others to improve protection against flood" Association of British Insurers, September 2002, London.

	2002-3	2003-4	2004-5	2005-6
DEFRA Grant	114	122	137	162
Local Authorities	280	292	332	382
New funding	-	-	-	20
Total	394	414	469	564

**Note: Defra announced in March 2003 that the figure for 2003-2004 would be increased from £119m to £136m.**

It should be noted that most of the projected increases are to come from local authorities, who may not be prepared to deliver. On 9th January 2001, John Grogan MP said in the House of Commons<sup>79</sup>:

"A Leeds city councillor, Liz Nash, who was on the (Yorkshire) flood defence committee until last May, was recently reported in the Yorkshire Evening Post as saying:

"Some local councils want to top skim this money to spend on other priorities. Councils have been strapped for cash for years and the temptation to use this money, which should be passed on for flood prevention, is very great."

Time will tell, but time is running out. Insurance problems may help to mobilise the local community to put pressure on their local authorities to do something to reduce the flood risk. In the short term this may well help to maintain local authority spending on flood defences.

### Case Study

#### Flood Insurance in Ruthin, Denbighshire, North Wales

Householders and businesses in Ruthin are already finding that they are suffering from big increases in premiums and excesses on their insurance. In September 2002, they demanded to know why their £1m flood defence scheme had been delayed, because their insurance premiums would remain high until it was completed. The Ruthin Flood Action Group has been formed to keep up the pressure on the local council. Meanwhile people who want to buy homes in the area cannot get insurance (and therefore a mortgage) unless the property is on high ground. Existing policies are being renewed but at much higher premiums.

The public and insurers can see what levels of protection exist – or don't exist - for particular postcodes<sup>80</sup>.

This project, the National Flood and Coastal Defence Database (NFCDD), is a requirement under the DEFRA High Level Targets for flood and coastal defence operating authorities.

The system is now utilised within the Agency and from March 2004 was made available to operating authorities. At the time of writing there is as yet no news of it becoming available to the public or insurers, and it is not yet taken into account in the Norwich Union maps. Even if it were, NFCDD only applies to England and Wales, although the Scottish Executive has made a commitment to produce a similar database for Scotland.

It is not just the amount of money allocated for flood management that is a problem. With eight separate Acts of Parliament dealing with flood and coastal defences and 254 separate bodies in addition to local authorities involved in flood defences and planning procedures across England alone<sup>81</sup>, there is a huge bureaucratic burden for the EA, and many decisions are based on local political interests<sup>82</sup>. An ABI official stated recently that "some flood defence bodies date back to medieval times – and it shows."<sup>83</sup>

DEFRA have promised to "streamline administrative arrangements"<sup>84</sup> and this is certainly required. A good start was made on 12th March, 2003, when the Government's conclusions on the Flood and Coastal Defence Funding Review were announced (see panel).

### **The Flood and Coastal Defence Funding Review**

Summary of conclusions published on 12th March 2003:

1. a single annual Government block grant to be paid to the Environment Agency by Defra for its capital and revenue work to provide greater certainty of funding than the present arrangements. (This is to end the apparently perverse incentive to encourage capital work, which attracts Defra grant, rather than maintenance work which does not.)
2. the Environment Agency will have responsibility for all rivers creating greatest flood risk. This means transferring responsibility for ordinary watercourses at high risk of flooding from local authorities and internal drainage boards (IDBs) to the Environment Agency.
3. creating a single tier of regional flood defence committees by winding up local flood defence committees where they exist. In some big regions, there may be a need to split the region and create additional committees to ensure local accountability. But it will still be a single tier system.
4. streamlining present approval processes for flood defence schemes, initially for the Environment Agency. Defra engineers will consider schemes at an earlier and more strategic level.
5. the approach will be subject to review after three years of operation.

<sup>83</sup> Milne, J., Manager, Household and Property, ABI, (2002) "Better flood management: the insurance perspective" Municipal Engineer, 151 pp283-286.

<sup>84</sup> Dancer, H. "Cash not answer". Insurance Times, 18th July, 2002.

### Summary of changes

Defra supports capital and other works undertaken by the operating authorities shown in the summary of changes below. Payments are subject to defences being assessed as meeting environmental, economic and technical criteria, and reaching an appropriate priority score (comprising three elements - economics, "people" issues and environmental protection and enhancement).

### Old System

Responsibilities for flood and coastal defence are:

- the Environment Agency has responsibility for controlling flooding from designated main rivers and the sea. The Agency is also responsible for flood warning arrangements and exercises a general supervision over all matters relating to flood defence.
- internal drainage boards (IDBs) exist in areas of special drainage need (such as in Somerset and in much of East Anglia). They are responsible for flooding from "ordinary watercourses" (ie the more minor streams and rivers) in their area.
- "ordinary watercourses" not within an IDB district were the responsibility of local authorities.
- coastal local authorities are responsible for coastal defences, including protection against coastal erosion and inundation from the sea. Shoreline Management Plans are in place which set out in each area the relative responsibilities of coastal local authorities and the Environment Agency.

### New System

Ordinary watercourses most prone to flooding will be redefined as main rivers with responsibility for them passing to the Environment Agency. The Environment Agency will have the authority to subcontract maintenance and other work back to the appropriate local authorities or IDBs where these bodies are willing to take this on and have a good track record. But the Environment Agency will retain the overall responsibility. The responsibilities of coastal local authorities will remain unchanged.

As the EA point out in a recent report<sup>85</sup> the current process delivers different standards of protection within the same community and in different parts of the country. For example the EA say that 84% of flood defences in the North West of England are "good" or "very good" while only 15% of defences in the North East reached that standard.

The EA have serious concerns about the whole system, and their report states that "over-dependence on economic appraisal leads to a sub-optimal solution, particularly by excluding social matters of high public interest. The pursuit of short-term economic efficiency also prevents consideration of long-term, more sustainable, solutions. This leads to long-term inefficiency in the use of funds from taxpayers and others that, in turn, can create a cycle of reducing standards of protection against a back cloth of increasing flood risk from climate change. This works against the public interest and public expectations."

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<sup>85</sup> Environment Agency "Review of the Appraisal Framework", October 2001

The reference to “long term more sustainable solutions” is an important one. Many countries, including Japan, are turning to so called “non-structural” solutions to the flooding issue<sup>86</sup>, as an increasing proportion of their spending on flood defence is taken up with maintaining existing structures. In England and Wales, there is also concern about maintenance issues and the increased loading that will be placed on defences due to climate change. In December 2001, DEFRA and the EA funded a nine month project to review the issues, and this was carried out by HR Wallingford in conjunction with Posford Haskoning<sup>87</sup>. The report is closely linked to the IMPACT project which is looking at dam break issues.

One alternative to hard defences such as embankments is a whole range of different types of temporary defences, ranging from sandbags and flood boards, to barriers made from pallets, plastic skirts, or huge pneumatic tubes<sup>88</sup>. These all have a role to play, and can allow additional response flexibility, but from an insurance point of view the question must be whether such defences would actually be deployed in time, and would they be effective?

Some other countries have turned to non structural solutions including measures such as allowing rivers to flood naturally by creating flood storage areas, and wetlands. Many people welcome the “natural look”, for rivers and often people are prepared to deliberately live in flood hazard areas and put up with occasional flooding in order to have the amenity which a river offers. There have even been a number of cases where residents have refused flood defences because it would spoil their view of the river, - for example in Bradford upon Avon (which subsequently suffered from serious flooding).

In the upper reaches of the Thames, waterfront property values are on average £48,000 higher than comparable properties elsewhere<sup>89</sup>. This desire for the amenity value of living by a river is quite understandable, so long as such people do not expect to be subsidised by cheap flood insurance rates.

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<sup>86</sup> Takeuchi, K., 2002. “Flood Management in Japan – From Rivers to Basins.” *Water International* Vol 27, No 1 pp 20-26, Illinois, USA.

<sup>87</sup> DEFRA/EA R&D Project FD 2411

<sup>88</sup> For details, see Crichton, D. 2004. “*Temporary local flood protection in the United Kingdom. - An independent assessment.*” A Benfield Hazard Research Centre technical report. Free download from: [http://www.benfieldhrc.org/SiteRoot/activities/misc\\_papers/Temporary\\_local\\_flood\\_protection.pdf](http://www.benfieldhrc.org/SiteRoot/activities/misc_papers/Temporary_local_flood_protection.pdf)

<sup>89</sup> McGlade, J., (2002). “Thames navigation and its role in the development of London.” Proceedings of the 2002 London’s Environment and Future (LEAF) conference at University College London

One non structural solution which could be used with great effect in Britain is the insurance price mechanism so that those who chose to live in flood hazard areas pay the true cost of the consequences<sup>90</sup>, rather than be subsidised by the rest of society.

## The Flood Warning and Dissemination Problem

An important way to reduce the risk to life from a flood event is by the actions taken to warn the public before the flood. Flood warnings can also reduce the damage to property by more than 25% if communicated<sup>91</sup> in sufficient time<sup>92</sup>. Of course it needs to be stressed that for some types of flood, it is not feasible to give an early warning. This is particularly the case for steeply sloping catchments, as was seen at Lynmouth in 1952 and Boscastle in 2004. It should be noted that the insurance template (see Appendix 1) makes special provision for such circumstances and requires a higher standard for new developments at risk of flooding from "Flashy Catchments".

Flood Line, a customer dial up telephone service, was set up with funds earmarked for the purpose after the Easter 1998 floods. It was introduced in England and Wales in 1999, and extended to Scotland in 2001.

New codes are used for warnings: Flood Watch, Flood Warning and Severe Flood Warning. These are backed by clear graphic symbols, which are used on television and on printed warning material. Flood Line provides a single national number (0845 988 1188) for the public to ring on any matter associated with flooding throughout Britain. All calls are charged at local rates, and during the Autumn 2000 event, Flood Line received 467,200 calls, costing the EA £300,000<sup>93</sup>.

The current Floodline system is excellent, but it could be better. There are two main problems:

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<sup>90</sup> Crichton, D. (2002) "UK and Global Insurance Responses to Flood Hazard." *Water International* Vol 27, 1. Pp 119- 131. Illinois, USA.

<sup>91</sup> Parker, D., and Penning-Rowell, E. Middlesex Flood Hazard Research Centre, (1991). "Institutional design for effective hazard management: flood warnings and emergency response" Paper presented at ESRC/LSE seminar on "Rethinking system failure, hazard management and institutional design", 1991.

<sup>92</sup> Parker, D., and Penning-Rowell, E. Middlesex Flood Hazard Research Centre, (1991). "Institutional design for effective hazard management: flood warnings and emergency response" Paper presented at ESRC/LSE seminar on "Rethinking system failure, hazard management and institutional design", 1991.

<sup>93</sup> Penning-Rowell, E., Chatterton, J., Wilson, T., Potter, E., (2002) "Autumn 2000 Floods in England and Wales: Assessment of National Economic and Financial Losses." Middlesex University Flood Hazard Research Centre, London.

Lack of sufficient rain gauges and river flow gauges with appropriate telemetry for monitoring. Remote gauges are prone to vandalism and can be expensive to maintain. However more gauges can mean earlier warnings and fewer false alarms.

Problems with disseminating warnings. Flood victims report that there is still some confusion about the meaning of the new warning codes, and that warnings do not always reach those who need them. Also the media often issue conflicting or incorrect information<sup>94</sup>.

As regards dissemination, for many years, flood warnings were disseminated by the police, using loudspeaker vans and even door to door calling. This service was unilaterally withdrawn by the police in England and Wales in 1997, and was one of the main drivers for the EA's original flood warning service, which had to be introduced in some haste to fill the gap. The police continued to disseminate warnings in Scotland until 2001, waiting until the Scottish Flood Line service was introduced and operational.

Dissemination of flood warnings is provided by telephone to pre registered properties at risk of flooding using Automatic Voice Messaging (AVM), but this relies on people answering the telephone (if they have registered their number). In Scotland, there is also an informal use of "rings" of people organised by local businesses and emergency services. The leader of the first "ring" is telephoned manually by SEPA, and undertakes to telephone everyone in the ring. Each of them in turn telephones their own ring of people, and in this way information can be rapidly disseminated.

This is not the end of the problems; in areas where flats are rented, there tends to be a mobile population who may not be aware of the AVM service and do not register. People living in ground floor flats are particularly vulnerable as there is no where safe for them to go or to take their valuables. There is also some anecdotal evidence that landlords do not repair such properties adequately after a flood.

In addition, there are many people who decide not to register either because they refuse to believe they are at risk or because they fear that their insurer will find out and charge more premium, or withdraw cover. The author suggested some years ago that those insurers which support the Neighbourhood Watch system, might encourage local co-ordinators to also act as flood wardens to disseminate warnings and assist the elderly and infirm. This suggestion has been implemented to some extent through the flood warden scheme.

Another idea that the author suggested some years ago is for insurance company call centres and helplines to become proactive during a flood event by calling their customers to see if they need any help. Insurers have said they are reluctant to do this in case it is a false alarm and the customer sues them for additional expenses incurred in taking precautions. This seems to be a rather spurious argument, and there seems

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<sup>94</sup> "Floodforum.net – an online discussion. Summary of the findings from an online discussion during January and February 2002". Postnote April 2002, published by the Parliamentary Office of Science and Technology.

to be no reason not to try it out on an experimental basis, perhaps even offering physical help to people who are elderly or infirm.

Most people in Britain are still inadequately prepared for floods, and do not realise just how much damage even a small flood event can cause. (see table).

Table 4

Cost of damage caused by a flood depth of 0.6m.

Building sum insured £100,000, Contents sum insured £30,000

National Flood Insurance Claims Database, 1999.

<b>Type of house</b>	<b>Building losses (£)</b>	<b>Content losses (£)</b>
Semi detached	16,072	8,731
Detached	16,981	9,834
Ground floor flat	17,119	7,922
Terraced	16,340	6,834
Bungalow	15,860	10,635

In an effort to raise awareness, both the EA and SEPA have annual “Flood Awareness Weeks”. During these weeks, press releases are issued, and exhibitions organised to help to inform the public of the hazards of flood and what they can do about it.

The Environment Agency spends around £2 million a year showing people how to take action to protect themselves and their property - like fitting flood boards or airbrick covers.

As part of the EA activities for 2002, they commissioned research into flood awareness, and an extract from their findings is contained below.

## **Environment Agency Flood Awareness Campaign 2002.**

### **Research findings on flood awareness.**

Respondents almost universally (95%) agree that 'flooding is a serious issue', with 45% agreeing that it is an issue 'which affects me'.

57% agree that they will take action to reduce the impact of flooding - BUT only a tiny minority (5% or 1 in 20) actually does anything in advance.

78% agree that there are things they can do to prepare for flooding - a 25% increase on the previous year.

Just over two in five respondents (44%) were aware that their property might be at risk from flooding. This increases to 52% amongst respondents living in areas covered by the Agency's full flood warning service.(i)

18% of respondents said they or a close friend or relative had been flooded in the last 10 years – and nearly nine in 10 (89%) of these respondents mentioned that this had happened in the last 5 years.

(i) The survey, carried out by BMRB Social Research, was conducted amongst a sample of 1,200 residents who live in an area at risk from flooding. Of these, 572 (48%) live in areas in which the Agency offers a full four-stage flood warning service. The remaining 628 (52%) live in areas at risk from flooding where the Flood Watch stage applies but where they do not receive the full four-stage warning service.

Source: Environment Agency

The survey found that while there was a big increase in awareness that there were things that could be done to prepare for a flood, only 5% of respondents would actually take any action in advance of a flood. The Environment Agency think this could be not just apathy, but also fears that acknowledging the risks and taking steps to protect against flooding could in some way have a negative affect on the value of properties.

In launching the 2002 flood awareness week, the Environment Agency Chief Executive Barbara Young said<sup>95</sup>:

"This is very worrying. Floods are extremely dangerous. They can be a threat to life as well as property. If you can take precautions to reduce the risk you should. Pretending you're not at risk is not a defence – it's a delusion. The Agency works extremely hard to protect and warn people and Government has announced extra investment for defences. But, as recent events in Europe and around the world show, no country can guarantee absolute protection against the forces of nature. In addition to our work, individuals need to take action of their own."

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<sup>95</sup> Environment Agency Press Release, 23 September 2002.



There has been considerable research into this subject in Australia. In March 2001, a flood warning was issued for the town of Grafton in New South Wales. The potential threat was so serious that it was decided to evacuate all 12,000 residents in the flood hazard area. Fewer than ten percent of residents left the city during the nine hours the evacuation was in effect. Following this, a research project was set up to discover why so many people remained in the danger area. The researchers used interviews combined with telephone samples<sup>96</sup>. The research also examined the different methods used to disseminate the warnings to see how effective they were. Space does not permit a full description of the results, but one outstanding feature was that 75% of the residents believed that the city would not be flooded. It was not that they expressed any great faith in the local flood defences, but because they had not experienced the direct effects of flood since the defences had been constructed, a huge level of inertia had built up, with a very low perception of the risk. Many aspects of life in Grafton continued as normal; people went to the pub to discuss the evacuation with their friends, some went to the local river flow gauge to check the readings for themselves, several logged onto the internet to get the latest projections. Many asked older residents for advice.

In the event, the flood defences held, although water came within 0.2m of the top of the levee. The question is, whether flood defences, by protecting against most floods, give rise to a feeling of complacency which could lead to loss of life in a really big flood where the defences fail?

More natural, non-structural measures would perhaps be safer; flooding would happen more gradually and people would be more likely to evacuate if they could see the water getting closer. Also of course, people would be less likely to live in the danger area in the first place.

There have been a number of papers published in Australia regarding research into the effectiveness of various types of flood warning dissemination methods using large scale surveys and sophisticated analyses methods<sup>97</sup>. It is to be hoped that the authorities in Britain will take into account such results in their future strategies.

## **The Lack of Preparation Problem**

In the previous section there was reference to a survey conducted by the EA, which found that only 5% of people who receive flood warnings actually take any action in advance to reduce the impact of flooding.

Much effort has been put into helping the public with information about how to prepare for and deal with floods. Both the Environment Agency and SEPA have been active in

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<sup>96</sup> Pfister, N. (2002) "Community Response to Flood Warnings: the case of an evacuation from Grafton, March 2001" The Australian Journal of Emergency Management Vol 17 No 2, August 2002. Pp19-29

<sup>97</sup> For details, contact Emergency Management Australia <http://www.ema.gov.au>

this area. However this assistance is a relatively recent development. During the serious floods at Easter 1998 in England, the only advice available seemed to be from press and radio advertisements issued by insurance companies, particularly General Accident, which published full page "cut out and keep" advice (prepared by the author) in local newspapers in affected areas. (Some general advice for flood victims is contained in Appendix 4.)

In 2001, CIRIA published useful advice on its Website ([www.ciria.org.uk](http://www.ciria.org.uk)), and in February 2002, DTLR, now the Office of the Deputy Prime Minister (ODPM), published a report called "Preparing for Floods"<sup>98</sup> to give advice to the public on how to deal with flood events.

The report was co-funded by the Scottish Executive, the ABI, the Building Research Establishment (BRE) in England, and others. It is available on the Internet or in book form by telephoning Floodline (0845 988 1188).

While it contains much useful advice, there is certainly room for improvement:

- Though it was part funded by the ABI, there is no reference to the ABI supported National Flood Insurance Claims Database, (The "Dundee Tables"<sup>99</sup>). These tables contain detailed information from thousands of flood claims thanks to access agreements negotiated by the ABI with the top 25 insurers in the country, and would have been of considerable assistance to the authors of the report. It is to be hoped that they will be taken into account in any follow up work. (The author has offered data from these tables to the consultants who produced the report, and has given a copy of the data analysis tables to the relevant government department.)
- Despite the many excellent similar publications available from the USA,<sup>100</sup> this new report only refers to one USA publication, produced back in 1995, and there is no mention of the recent pioneering "Fortified for safer living" initiative of the Institute of Business and Home Safety in the USA<sup>101</sup>.
- It is to be hoped that in future revisions the opportunity will be taken to consult with experienced loss adjusters and insurers to tap into their knowledge.

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<sup>98</sup> Available from <http://www.safety.odpm.gov.uk/bregs/floods/01.htm>

<sup>99</sup> Black, A and Evans, S (1999) "Flood damage in the UK: New insights for the insurance industry." University of Dundee. ISBN 0 903674 37 8. Dundee, Scotland.

<sup>100</sup> For example, Federal Emergency Management Agency publications such as:

"Reducing Flood Losses Through the International Code Series"

"Avoiding Flood Damage: A checklist for Homeowners"

"Floodplain Construction Technical Bulletins" - see [www.fema.gov](http://www.fema.gov)

<sup>101</sup> see [www.ibhs.org](http://www.ibhs.org) and [www.fortifiedhome.net](http://www.fortifiedhome.net)

- It contains a basic checklist of action to take in the event of a flood, but it is a pity that it does not contain any advice about the importance of putting sandbags in the toilet and the bath, one of the most common sources of water entering the house.

Flood boards, sandbags and other temporary measures are just that, temporary. In a prolonged flood, water will find its way through the brickwork or the foundations into the house. In such cases the only answer is to pump the water out, and properties in high hazard areas should be fitted with a sump under the floor with a water activated sump pump. Ideally this should have a generator to provide power in case of a failure of mains electricity.

Modern property with cavity walls can be particularly vulnerable to structural damage from the weight of water pressing from the outside. There is the added problem of cavity wall insulation, which can become saturated with water and is hard to dry out. Cavity walls only became fashionable because they help to reduce damp penetration from windblown rain. The cavity gives little protection against flood seepage. There is a case for filling in the cavity with cement in order to give the walls more strength, but while this would increase the structural strength it could increase the drying out time unless the wall is properly waterproofed. Further research is needed. (For more information on resilient construction, see Appendix 5.)

There have been questions raised about whether the authorities themselves are properly prepared for floods. In the Autumn 2000 floods in Lewes, the ambulance and fire depots and their control rooms were amongst the first buildings to be flooded and cut off by flood water. In the 1993 floods in Perth, the main emergency control centre was in a basement beside the river.

So it is clear that preparation and scenario planning is an important issue for the authorities. This is particularly important in situations where there a flash flood, mud slide, or landslip could put lives at risk. In such cases, careful monitoring of hillsides using satellite transponders should be used to check for stability, drainage ditches should be constructed or repaired, and planners should avoid allowing new buildings to be located in exposed areas.

Flash floods and landslides are considered in the next two sections. This is followed by a section on rising groundwater.

## **The Flash Flood Problem**

Climate change scenarios predict that average summer rainfall will reduce, but that summer rainstorms could become more severe, resulting in an increasing number of summer floods. Most of these will be caused by the failure of urban drainage systems, as in Bishopbriggs in July 2002, but the most severe freshwater floods seem to have several attributes in common:

- Steep sloping catchments
- Convergence of two or more weather fronts

- Static thunderstorms

Some examples of severe flash floods which were all greater than the 1 in 100 year return period: Lynmouth, 1952; Martinstown (Dorset), 1955; Ffestiniog, 1973; Hampstead, 1975; Halifax, 1989; Boscastle, 2004.

In August 2002, Fylingdales, North Yorkshire, had 115mm of rain in 24 hours. In the same month, there were localised floods in the London area, with some places receiving 60mm of rain in just one hour, resulting in the closure of several railway stations. Severe summer rainfall events are quite common, but are they becoming more frequent, as climate change experts predict?

The European Environment Agency (EEA) recently published a report<sup>102</sup> which examines the impacts of Europe's changing climate. This suggests that between 1975 and 2001, the annual number of flood events increased. According to the report, climate change is likely to increase the frequency of extreme flood events, in particular the frequency of flash floods.

Flash floods occur where torrential rain falls and it cannot be soaked up or drained away. This leads to run-off, with water running over the ground, rather than through it, resulting in flooding.

The Met Office was recently quoted<sup>103</sup> as saying:

"In general terms the number of 'intense' rainfall events during the summer is likely to decrease, but the intensity of the rain on the days that it does so will probably increase. Thus episodes of severe flooding may become more frequent, despite a general trend towards drier summer conditions."

Here are two examples of flash floods:

### **Lynmouth, 16th August 1952**

This was one of the most extreme British weather events of the 20<sup>th</sup> century. The catastrophic floods at Lynmouth, north Devon, were as a result of heavy rain on Exmoor on the 15-16<sup>th</sup> when an unprecedented 225 mm of rain fell in 22 hours at Longstone Barrow, draining into the West Lyn river (275 mm is estimated to have fallen over parts of Exmoor). The East and West Lyn rivers reached record levels where they

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<sup>102</sup> European Environment Agency, 2004. "Impacts of Europe's changing climate" EEA (European Environment Agency) OPOCE (Office for Official Publications of the European Communities). ISBN: 92-9167-692-6. Available from [http://reports.eea.eu.int/climate\\_report\\_2\\_2004/en](http://reports.eea.eu.int/climate_report_2_2004/en)

<sup>103</sup> [http://news.bbc.co.uk/2/hi/uk\\_news/3581118.stm](http://news.bbc.co.uk/2/hi/uk_news/3581118.stm) downloaded August 2004.

converge near the seafront in town. It rained most of the day over most of Devon, with a seven hour long intense downpour from late afternoon. The flood came in darkness, with a sudden surge of water. There was a loss of 34 lives, 93 buildings were destroyed or severely damaged, 420 people were made homeless, 130 cars were washed into the Bristol Channel, and 28 bridges were swept away. The water moved large rocks, trees, telegraph poles, and cars.

There were subsequent allegations that the severity of the flood was due to government cloud seeding tests. This has never been proved, but cloud seeding experiments in China are reported to have been very effective (so much so, that cloud seeding near Beijing resulted in the city being cut off by heavy snowfall in winter 1999/2000.)

#### **Boscastle, 16th August 2004.**

Boscastle is a picturesque village, popular with tourists, on the north coast of Cornwall, England. Not only was the date the same as at Lynmouth, 52 years earlier, the circumstances of this flood were similar to Lynmouth, in that it was caused by a heavy localised rainstorm over a steep catchment. While the rainfall was not nearly as extreme as at Lynmouth, provisional estimates suggest it was a 50 year return period event. The heavy rain was caused by Westerly winds carrying the remnants of Hurricane Alex, which had picked up vast amounts of water from the Atlantic on its journey towards the UK. Winds hit the peninsula of Cornwall from the sea to the North and South of the peninsula, converging over the hills in the centre of the peninsula, pushing clouds up to 40,000 feet high. This produced a prolonged, stationary thunderstorm resulting in 130mm (6 inches) of torrential rain in six hours (the monthly average is 70 to 90mm).

Much of Boscastle is within a steep and narrow valley leading to the sea. The River Valency, flows through the valley which is just downstream of a confluence of the River Valency and the River Jordan. On the afternoon of the 16<sup>th</sup> August, a torrent of water was reportedly initially dammed by a car which became lodged under a bridge, but then the water suddenly broke through and smashed into the village without warning. Within 15 minutes, the water was inside riverside properties and the road bridge in the centre of the village had been swept away. One holiday maker, Wayne Grundy, was quoted as saying "... I actually saw a caravan and two cars washed over the top of a bridge. ... (the) tea shop just filled with water. One minute they were ankle deep and the next they were up to their chests..."

120 people were rescued from rooftops, trees and vehicles by a fleet of seven helicopters. Over 50 cars were washed into the sea. The harbour's seafront was partly destroyed.

Up to 1,000 people were affected in Boscastle and the neighbouring village of Camelford, as the River Camel also burst its banks. Tintagel, and Crackington Haven were also affected. Fortunately there were no deaths or serious injuries, probably mainly because the event happened during daylight and near an RAF base, a Royal Navy base, and an HM Coastguard base each with rescue helicopters and highly

trained search and rescue crews who were at the scene within 20 minutes of the first notification. They did an amazing job. However the effects of shock after such an event could be long lasting.

A report on the Boscastle floods<sup>104</sup> contains many stories of heroism and community spirit, it also shows some interesting features:

- It was pouring with rain and many people went to the Long Bar of the Wellington Hotel. Few were aware that this 400 year old hotel is built on top of a culvert containing the River Jordan near its confluence with the Valency. The owner and a former employee did know and checked the culvert. They decided to evacuate the crowded bar and the rooms upstairs, but people were not keen to go out into the rain. Meanwhile the back wall of the bar had become a dam, and the water was rising fast. Minutes after the hotel was evacuated, thousands of tons of water came through the first floor windows at the back and suddenly filled the bar area with mud and water 4 metres deep. Many could have lost their lives.
- The village was full of tourists, and some 50 cars floated away in the current, not only that, witnesses spoke of a strong smell of petrol from the waterlogged cars, so there would have been a fire risk.
- There were some mini skips used for collecting bottles, clothing etc for recycling. These floated away and could have caused serious damage. A giant oven from the bakery also floated away, smashing through the walls of the shop.

One resident remembered the 1958 flood and when she saw the river rising she evacuated people from her shop, deployed flood boards and sandbags and went to higher ground in good time. Her shop which was 300 years old, crumbled and was completely washed away. If she had not acted so quickly, many could have drowned

### **Insurance aspects**

Each of these major summer floods happened with very little warning and involved rivers described as “Flashy” meaning prone to flash floods. This is why the author’s insurance template (See Appendix 1) calls for a 500 year return period standard for the location of new properties near flashy rivers.

### **The Landslide Problem**

Steep hillsides can not only lead to flash floods, but also to landslides and mud slides. This is particularly the case after deforestation, or where the soil is unstable, sandy or peaty. The worst British landslip in recent times was in 1966 at the Welsh village of

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<sup>104</sup> Rowe, D. November 2004. *“Boscastle 16 August 2004 – the day of the flood”* 64pp Truran Books Ltd, Truro, Cornwall. ISBN 1 85022 193 6.

Aberfan. 116 children and 28 adults were killed after heavy rain caused waste from a coal tip to slide onto a school.

Peat slides are a particular problem after a period of dry weather. The peat dries out, and becomes like a sponge. A heavy rainstorm then soaks through the peat to the ground beneath, where it acts as a lubricant, making the ground unstable.

Landslides seem to be becoming more common, due mainly to reduced rainfall in summer months, combined with more severe short duration rainfall events associated with thunder storms. For example:

#### **Shetland, 19th September, 2003<sup>105</sup>**

The summer of 2003 was a very dry one for Shetland. The winter and summer the year before had been dry too. For the first time in living memory, drinking water had to be imported in bulk to some of the outlying islands by ships from the mainland. In September 2003, however the weather broke, and torrential rain fell, just to the south of Lerwick. This caused a series of dramatic peat slides all morning which destroyed or damaged five miles of the A970 main road. A bridge collapsed in the southern part of the main island, and a newly installed water main to the south of the island was breached, along with several sewage pipes.

Although the area is relatively remote, several cottages and farm buildings were destroyed, along with a number of sheep which were washed into the sea, but fortunately no human lives were lost.

If the rain had fallen just a few miles further north, the outskirts of the town of Lerwick could have been devastated, as it is surrounded by peat covered hills. Fortunately where the rain fell the exposure was low due to the remoteness of the area, and the vulnerability was low as the slips happened in daylight hours.

On the same night in Ireland, there were 40 slides recorded in County Mayo, followed a month later by another massive peat slide in County Galway.

Ironically, a crofter badly affected by the Shetland peat slides, received a letter from an insurance company the day after the landslides, telling him Shetland was classed as a "no flood zone" and offering him a cheaper premium.

This was clearly not from the insurer which had commissioned the author a year previously to conduct a survey of the flood and storm risk for Shetland, as he had concluded in his report that there was a severe peat slide risk, and identified some specific areas at risk of river and coastal flooding. With the permission of the insurer concerned, he had passed a copy of this report on to the Shetland Islands Council.

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<sup>105</sup> This section is based on an information bulletin from Shetland Islands Council and several contemporary reports in "The Shetland Times", and "Shetland Today" Prince Alfred Street, Lerwick, Shetland, UK, ZE1 0EP

### **Perthshire, August 2004**

Perthshire suffered from two major landslide events in 2004, fortunately again no lives were lost but there was considerable disruption. First, heavy rain caused a sand gravel and mud landslide which blocked the A9, the main trunk road from Inverness to the south, then the following week another heavy rainstorm, associated with the biggest electrical storm on record in Scotland, resulted in two landslides in Glen Ogle near Lochearnhead, trapping 20 vehicles on the A85 including a bus. 57 people had to be airlifted by helicopter from the scene. Again it was fortunate that the slips happened in daylight hours and that no buildings were affected. Glen Ogle was the site of two previous landslides in 1965 when the railway line was blocked, resulting in the permanent closure of the line.

### **Mapping**

The British Geological Survey has produced a map showing that large areas of the country are at moderate or significant risk of landslides. They have been quoted<sup>106</sup> as saying “The past few years do seem to have had an increase in landslide activity over the country as a whole. If the forecasts of the climate change experts are correct, we are likely to get more frequent, intense rainfall. That can cause more of the kind of landslides we’ve seen.”

### **The Rising Groundwater Problem**

Generally insurance policies in Britain do not cover flood caused by rising groundwater. In practice, loss adjusters will not refuse such a claim, however, if it occurs during a general flood event, when pressure from rising groundwater has been known to burst through concrete floors with explosive force. This can happen if the property is protected by a nearby flood defence and the flood level is higher than the ground floor of the property. The reason for the exclusion dates back to *Young v Sun Alliance* (1976)<sup>107</sup> which held that flood does not include seepage of water from an underground watercourse. To make matters clear, both personal and commercial property policies now usually specifically exclude rising groundwater.

Nevertheless, insurers should not ignore the problem, because rising groundwater is becoming a serious issue in some areas, particularly London and Liverpool. It is beginning to threaten the foundations of tall buildings, (including insurance company offices), telephone cables and other utilities, and the London Underground, which is already pumping large amounts of water out of its deeper tunnels. The reason that groundwater is rising is that in the past, there used to be large amounts of groundwater extraction by industry in large cities – for example for the brewing and paper industry.

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<sup>106</sup> Alan Foster, BGS principal engineering geologist, quoted in the Sunday Herald, 22 August 2004.

<sup>107</sup> *Young v Sun Alliance and London Insurance* [1976] 3 All E.R. 561



This has now stopped, and since the 1960s the groundwater has been inexorably returning to its natural levels.

An interesting example of rising groundwater occurred in August 2004 at the new Scottish Parliament building in Edinburgh. The building was constructed on the site of an old brewery which had been built over two underground springs, which supplied the water for the beer. For some reason the architect had not taken this fully into account, and before the building was finished, the basement was flooded by rising groundwater.

In 1992, London Underground set up a group to examine the problem of rising groundwater in London. The group is called the General Aquifer, Research, Development and Investigation Team (“GARDIT”). The team includes representatives from:

- Thames Water utilities
- Environment Agency
- London Underground
- Corporation of London
- Metropolitan Water Company
- British Property Federation
- Association of British Insurers
- British Telecom

Plus Professor J.A. Barker from University College London.

This produced a submission to the Deputy Prime Minister who instigated a 5 year combined Pumping Strategy for London being project managed by Thames Water Utilities. In March 1999 they launched their strategy to solve the problem<sup>108</sup>. In a £30m programme, existing boreholes have been brought back into use and new ones created. Groundwater from three locations in Islington is being pumped into a reservoir in Hackney, where the plan is to treat it if possible and put it into the water supply.

In the future, rising groundwater may be a problem in other areas, due to the increasing use of sustainable drainage systems (“SUDS”). With SUDS, increasing amounts of

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<sup>108</sup> For details of the problem and the solution, see  
[http://www.thameswateruk.co.uk/clrg/solution\\_frameset.html](http://www.thameswateruk.co.uk/clrg/solution_frameset.html)

rainwater will be allowed to soak away into the ground rather than going into rivers or drains. Already some fears have been expressed that small rivers may be starved of water, with effects on wildlife.

## The Insurance Claims Handling Problem

Flood claims can be very complex to handle. For a claim of any significant size, the first people on the scene from the insurance industry will usually be from the loss adjuster. Their job it is to assess the amount of damage and the work needed to reinstate the property. The loss adjuster will then be responsible for checking policy cover, estimating costs, carrying out the ongoing supervision of the work, and making recommendations about interim and final payments.

### Loss Adjusters

Loss adjusters have a difficult time when a major flood happens. For years, their margins have been squeezed by insurance companies, reducing the possibility of any spare resources for dealing with major events, and increasing their dependence on less highly trained staff.

A recent report<sup>109</sup> shows the results of a survey based on 289 responses to 37 flood damage scenarios from loss adjusters (60%), consultant surveyors (23%) and other experts. The report analyses the ways in which the respondents would deal with different types of flood damage. The report represents a fascinating exploration of the approaches of experts in flood damage repair. It highlights that frequently the methods selected are more influenced by the expectation (real or perceived) that the insurer is looking for the cheapest possible solution, rather than the best or most resilient one.

Insurers have added to loss adjusters' difficulties by each insisting on a different set of information requirements and reporting formats. When the loss adjuster is called out, he has to check what information the principal wants, and the principal's attitudes on topics such as delegated authority for urgent interim payments, salvage disposal and alternative accommodation. This lack of standardisation slows down claims handling enormously, and the lack of consistency in dealing with different claimants can often lead to dissatisfaction. Some aspects have improved since the Towyn floods in 1990, which made 6,000 people homeless. This event caught the industry unprepared, especially in dealing with fraudulent claims<sup>110</sup>. Problems still remain, however, and these led to a damning report by Warwickshire Trading Standards after the 1998

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<sup>109</sup> Proverbs, D. and Soetanto, R., 2004. *"Flood Damaged Property a guide to repair"* 225pp. Blackwell Publishing, Oxford., ISBN 1-4051-1616-1

<sup>110</sup> Welsh Consumer Council, 1992 "In Deep Water: a study of consumer problems in Towyn and Kinmel Bay after the 1990 floods." Welsh Consumer Council, Cardiff.

floods<sup>111</sup>. Similar problems were reported by Lewes Council after the 2000 floods<sup>112</sup>, with comments such as “adjusters under resourced”, “The loss adjuster kept changing”, “Slow on making interim payments”.

A system has been developed to help to speed up the handling of flood claims and storm claims after a major event. Extensive field-testing has demonstrated its effectiveness, but, despite strong support from insurance underwriters and loss adjusters, claims managers could not see any direct benefits to them and the system was shelved. The system is called “FASTER” (Flood and STorm Event Reporting), and more details appear later in this report and in Appendix 3.

### **Property Damage Restoration Specialists**

Before a flooded property can be repaired, it has to be dried out. This is a job for specialist firms such as Munters who have the expertise and equipment needed. Sometimes it can take several months for the property to be dried out, especially in an autumn or winter flood. Generally the longer it takes to start the drying out process, the bigger the claim will be as water soaks into the fabric of the building and capillary action plus evaporation spreads the dampness to upper floors. There is also the very real issue that the longer it takes before the claimant sees action being taken, the more likely the claimant will be to inflate the cost of the claim and complain about the handling of the claim.

As with loss adjusters, property damage restoration companies have problems with a disjointed approach from the insurance industry. Each insurer has different requirements and favours different companies. Munters estimate that if they were to do a whole street of similar houses, instead of doing the same number of houses but scattered all over the flood damaged area, they could save the insurance industry up to 40% in costs through economies of scale and efficient use of labour and equipment<sup>113</sup>. Munters argue for a more co-ordinated approach with better communication.

### **Builders and ancillary trades**

Finally the builders should move in, but only after the property has been fully dried out by specialists. Such specialists can predict when the building will be dry, and builders

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<sup>111</sup> Warwickshire Trading Standards, 1998 “A flood of claims: how insurance companies have measured up in the aftermath of the Warwickshire floods.” Warwickshire County Council

<sup>112</sup> Magness, J.,(Director of Finance and Community Services, Lewes Council) 2001 “The October 2000 floods” Proceedings of an ABI seminar, June 2001

<sup>113</sup> Phillips, A., (Divisional Director, Munters Property Damage Restoration), 2002. “*Property Damage Restoration*” Proceedings of a conference “Climate Change: An Insurance Perspective” Post Magazine, the CII Insurance Hall, London, October 2002.

can plan their work properly. If rebuilding is done too soon, before the building has fully dried out, mould can develop and the work may have to be taken down and re done.

### **Is there a better way?**

It is certainly true that a much more efficient use of resources could be achieved if expertise and resources were to be pooled and standardised claims handling structures and procedures were put in place. In this way, each householder could get equal treatment and service in a smooth efficient operation, and “claims surges” which can lead to shoddy work by cowboy builders can be reduced.

At present the situation is reminiscent of the old private fire brigades in Britain. These were set up and owned by insurance companies. They would only deal with fires in buildings that displayed the relevant insurer’s fire mark. With the likelihood of floods becoming more frequent in the future, perhaps a national flood response service would make more sense? For example, the fire brigade could do more than just pump water out of basements, they could co-ordinate the employment of property recovery specialists, as they used to do 30 years ago with the Salvage Corps. The Salvage Corps was a “blue light” service funded by the insurance industry acting collectively to salvage property after a fire. They worked alongside the fire brigade, but the service was abolished in the 1970s. Meanwhile in Germany, storm and flood damage account for the biggest part of all fire brigade exercises and the German fire brigade have a set of tactics for dealing with all adverse weather scenarios<sup>114</sup>.

The average house fire has a 340-year return period, whereas the flooding return period for at least 400,000 houses in England and Wales is less than 100 years. Is there not a case for the insurance industry resurrecting something like the Salvage Corps in flood hazard areas to co-ordinate flood salvage and recovery work?

Insurers will no doubt argue that their claims handling skills give them the chance to gain competitive advantage, but that was when insurers were looking to gain and keep business in flood hazard areas. Surely it would be to their benefit to look for ways to reduce claims costs in such areas, without the risk of standing out as providing a lower customer service than their competitors?

As it is, there is growing dissatisfaction with the insurance industry, and demands from flood victims for some sort of league table of claims handling performance<sup>115</sup>.

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<sup>114</sup> Menzinger, I., and Brauner, C., (Swiss Re), 2002. “Floods are insurable” Swiss Re Focus Report, Zurich, 2002.

<sup>115</sup> Holland, G., 2002. “Public Policy Issues” Post Magazine Conference on “Climate change: and insurance perspective” October 2002. London

## The Flood Claims Excess Problem

Insurers will increasingly be applying substantial claims excesses for flood claims in flood hazard areas. Already, excesses as high as £5,000 (more in exceptional cases) have been mentioned, but £1,000 to £2,500 is more common. While the author can understand the reasons for insurers applying such excesses, the move is essentially a “knee jerk” reaction, which may not achieve any benefit and may result in increasing alienation.

The usual reasons for applying an excess are:

- To reduce average claims costs.
  - but the average flood claim is over £30,000 and an excess of even £5,000 will make little difference to the overall claims total. Besides, in a really major event, where reinsurance is triggered, the excess will simply save the reinsurer money, rather than the primary insurer.
- To encourage the policyholder to act to minimise the loss
  - while this may work in motor insurance or theft insurance where the policyholder has an important part to play in risk management, this is rarely the case with flooding, where the cause of the flood is outside the policyholder’s control.

A large excess which does not appear fair or justified to the policyholder is likely to cause:

- Inflated claims demands to make up for the excess
- Collusion with builders to have two sets of estimates and invoices. There is already widespread anecdotal evidence of collusion between builders, even those on insurers’ accredited lists<sup>116</sup>.
- Reluctance to protect the property or move contents to a safe place since all that will achieve is to save the insurer money, not the policyholder.

An alternative, which might be worth trying, would be to waive the excess in certain circumstances as outlined below, or even to apply a “negative excess”. Under a “negative excess” system, the loss adjuster would be authorised to reward policyholders with a cash sum in certain cases after a flood, for example:

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<sup>116</sup> Holland, G., 2002. “Public Policy Issues” Post Magazine Conference on “Climate change: and insurance perspective” October 2002. London

- Where the policyholder has made serious efforts to reduce the claims cost, by moving contents out of harms way or by deploying temporary defences
- Where the policyholder did not receive sufficient warning, or is too old or infirm to be able to take action to mitigate the loss.
- Where the policyholder is prepared to spend money to make the property more resilient to flood in the future.

## The Buildings Regulations Problem

Recommendation “e” of the Select Committee Inquiry into the Autumn 2000 floods<sup>117</sup>, gave the government a deadline of July 2001 to produce tougher building regulations for flood hazard areas in England and Wales. There is still no sign of these tougher regulations at the time of writing.

Instead, the report “Preparing for Floods” (referred to earlier) has been produced. It outlines some measures that can be taken to reduce vulnerability by making changes in construction and materials and to this extent it supplements the excellent report produced in 1996 by the Building Research Establishment in Scotland<sup>118</sup>.

There seems to be no sign of any sense of urgency on the part of the Building Regulations Advisory Committee (BRAC) in England and Wales about adapting building regulations to produce buildings that are more resilient to flooding or the other impacts of climate change. Nor do they seem interested in seeking advice from loss adjusters or insurers, or in looking at what is happening overseas. Time and again, events have shown that just a small increase in the severity of a flood or storm event can generate multiple increases in the amount of damage, and this is likely to increase dramatically with climate change. Conversely a small increase in building resilience could have big and continuing savings in costs, not just to insurers but to society. Some more enlightened architects are starting to realise this.

In her recent book<sup>119</sup>, Sue Roaf, an eminent professor of architecture, has along with colleagues, given an excellent, up to date, and comprehensive guide to social and environmental indicators, aimed at architects and their clients. She emphasises the importance of resilience as a key factor in sustainability, and discusses the implications

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<sup>117</sup> The Environment Transport and Regional Affairs Select Committee Report on the Autumn floods in 2000. Published on 20<sup>th</sup> December 2000. HMSO, London.

<sup>118</sup> Building Research Establishment (Scotland), 1996. *Design Guidance on Flood Damage to Dwellings*, (ISBN 0 11 495776 2) Scottish Office, Edinburgh.

<sup>119</sup> Roaf, S., with Horsley, A. and Gupta, R., 2004. *Closing the loop. Benchmarks for sustainable buildings.* Edited by Thompson, M.. RIBA Enterprises, London, ISBN 1 85946 118 2. 531pp.

of climate change and growing demands for the use of renewable energy. She also contrasts the approaches in England and Scotland on issues such as flooding and resilience, along with a consideration of insurance aspects.

As part of their sustainable development strategy, government is trying very hard to reduce the amount of waste which is sent to landfill, yet after a flood or storm, buildings are gutted and much of the fabric ends up in landfill. Sustainable development must include an element of resilience for it to be effective.

Meanwhile there is a distinct impression of complacency amongst those responsible for building regulations in England and Wales. Efforts seem to be concentrated on energy conservation and disabled access. These are “nice to have” but of little relevance if the building is going to be severely damaged whenever there is an extreme flood or storm.

A likely outcome of this type of complacency has already been seen in the USA and Australia. Insurance companies and mortgage lenders simply get together and produce their own set of building standards. A good example of this is the “Blue Book” in Australia. Originally produced by the Commonwealth Savings Bank of Australia, it is now used by most insurers and mortgage lenders in Australia and is regarded as the standard for new building and upgrading of residential cottage style property. The author understands that it is very hard to get a mortgage or insurance for such houses unless they have been constructed or upgraded to the Blue Book standards<sup>120</sup>.

As a result, Government standards have become irrelevant to the construction industry for this type of housing: builders follow the Blue Book instead. Perhaps the insurance and mortgage lending industry should forget about lobbying the government for better standards, and get together with the National House Building Council to produce their own form of “Blue Book” for better flood and storm resilience?

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<sup>120</sup> Llwellyn, R.,(undated) “*Structural upgrading for older houses.*”. (a copy of the “Blue Book” is reproduced in this series of handbooks produced by the Insurance Council of Australia and Standards Australia.)

## The Dams and Reservoirs Problem

### Disaster in Dolgarrog

On Monday, 2nd November, 1925, there was a blow out of the lower section of a portion of the Eigiau dam in the Conwy valley in North Wales. The water scoured a channel 70 feet wide and 10 feet deep, as 50 million cubic feet of water surged down to the Coedyt reservoir below. Coedyt reservoir was nearly full at the time and the spillway had to cope with a surplus discharge well in excess of its designed capacity. The dam was overtopped, washing away the embankment, and the core collapsed. There was an almost instant release of 70 million gallons of water. A wall of water, mud, rock and concrete hit the village of Dolgarrog at 9.15pm. Fortunately many of the villagers were attending a film show at the village Assembly Hall out of the path of the flood, and 200 workers were working late in the nearby aluminium factory, otherwise more lives would have been lost. As it was, ten adults and six children were killed and many houses were destroyed. At the subsequent inquest, the deputy coroner said that "as Dolgarrog had a floating population, ... it was impossible to estimate the extent of the catastrophe in regard to human life". A rather unfortunate turn of phrase, especially as one body was not found until ten months later, having been carried away down the River Conwy.

Huge boulders, the size of houses, can still be seen in the village.

It later transpired that the general manager and board of directors of the company which owned the dams knew that there were defects in them from the beginning, but chose to keep the facts secret. No one was ever held to account, and two of the streets in the rebuilt village were named after directors of the company<sup>ii</sup>.

(i) Thomas, D., W., 1997 "Hydro Electricity in North West Wales" National Power plc, Llanrwst, Wales.

(ii) Draper, C., 2002 "Walks in the Conwy Valley" Gwasg Carreg Gwalch, Llanrwst.





It should be emphasised that no lives have been lost in the UK from dam failure since the Dolgarrog disaster in 1925, however failures do occur around the world. In 1959 when the Malpasset dam in France failed, 421 people died, and in 1963, overtopping of the Vaiont dam in Italy caused by a landslide resulted in 1,189 deaths, even though the dam itself remained intact. In 1972, a dam in West Virginia, USA failed causing 125 deaths. In 1976, the Teton dam in Idaho, USA, failed during its initial filling, killing at least 11 people. The worst dam disaster was the failure of the Banqiao Dam which collapsed in 1975 during a typhoon. 85,000 people were killed, and a further 145,000 died from the subsequent epidemics and famine. (30,000 reservoirs in China have serious safety problems, according to the Chinese government. Between 1954 and 2003, 3,484 dams collapsed in China.)

Dam failures are increasing<sup>121</sup>:

- In May, 2004, a coffer dam collapsed in China, killing 14. It had been built by the same company which is building the Three Gorges Dams.
- In June 2004, after heavy rain, the Camara Dam in Brazil burst. It killed five people and left 3,200 homeless. It had only been completed in 2002.
- In July, 2004, heavy rainfall destroyed 13 small dams in New Jersey in the USA. 19 dams have burst in New Jersey alone since 1999. (According to the US Association of State Dam Safety Officials, the US needs to spend \$10billion on the most dangerous dams.)

There still seems to be a defensive and complacent attitude amongst dam engineers in Britain who point out that modern British dams and reservoirs are designed and built to very high standards. This may well be true, but most dams in Britain are over 100 years old and built of earth.

In the future, the safety margins will increasingly be eroded by climate change<sup>122</sup>. So far as current safety standards are concerned the main concern is the secrecy surrounding the condition of dams and raised embankments. There are also concerns about the secrecy surrounding dambreak inundation maps, and the lack of preparedness of the emergency services in dealing with a catastrophic failure. The author was a member of a steering committee for a detailed report on reservoir risks

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<sup>121</sup> Bosshard, P., and Switkes, G., 2004. "Rash of Dam Failures Raise Safety Concerns" World Rivers Review Vol. 19 No. 4, p7. August 2004. International Rivers Network, Berkeley, California, USA.

<sup>122</sup> Babbie Group and the Institute of Hydrology, 2002. "Climate Change Impacts on the Safety of British Reservoirs" Report commissioned by the Department of the Environment, transport and the Regions (DETR) now DEFRA, through their reservoir safety research programme. (Unpublished).

produced by CIRIA, in 2000<sup>123</sup>, and had access to a great deal of information which is not in the public domain. While the author is not at liberty to disclose such information, the following public domain information should be enough to illustrate the scale of the issue.

The Reservoirs Act, 1975, applies to all reservoirs holding or capable of holding more than 25,000 cubic metres of water. There are over 2,500 such reservoirs in the UK of which 530 are large enough to be included in the World Register of Large Dams. Owners of dams covered by the Act are obliged by law to have them inspected every ten years by a civil engineer from a special panel, but the law does not specify the details of the inspection nor that the results should be published. In practice, the thoroughness of the inspection depends almost entirely on how much the dam owner is prepared to pay, and the author is not aware of any case where the results have been published, or even given to local authority emergency planning officers or the emergency services. (The author would welcome details from anyone who knows of such a case.)

Dam owners also refuse to issue dam break flood inundation maps. This could mean (and indeed this has happened) that planning officers for the local authority might grant planning permission for new housing developments within the area which would be flooded if the dam failed, simply because they did not know that the area was within the danger zone.

By contrast, in France, everyone living in areas at risk from dam break is fully aware of the fact, and these areas are subject to frequent evacuation exercises. Informal comments from engineers would seem to indicate that they believe the British are more likely than the French to panic if they were given such information.

In Sweden, detailed flood maps which include dam break inundation maps are readily available to the public. Why not in Britain?

Climate change could well lead to an increased risk of failure of British dams, some of which are more than 200 years old. Failure can be caused by many factors, - for example climate change could lead to subsidence of the dam foundations, landslip into the reservoir, or overtopping due to heavy rainfall. Around half of the 2,500 large UK dams have earth embankments, most of them constructed before heavy soil compaction equipment was available. Little is known about the content of such embankments, especially the core, or the extent of internal settlement or disturbance, for example from rabbit burrows.

Droughts could lead to cracking of the embankment wall, and climate change will lead to more droughts in the summer, followed by more rain in the autumn. This could

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<sup>123</sup> Hughes, A; Hewlett, H W M; Samuels, P G; Morris, M; Sayers, P; Moffat, I; Harding, A; Tedd, P. 2000 "Risk Management for UK Reservoirs." Construction Industry Research and Information Association (CIRIA) Research project report C542. London.

impose additional loads, which were not considered when the reservoir was planned. There could also be additional loadings from increased snowfall in upland areas, followed by rapid snowmelt due to rainfall. Higher windspeeds over the reservoir surface could cause more frequent overtopping, leading to erosion of earth embankments unless suitably protected.

Other possible causes of failure include vandalism of valves, pipe work or controls, terrorism, or aircraft crash.

Many dams are in or near urban areas, for example there is a large reservoir in Brent in London which is very close to housing and aircraft flight paths.

Most UK dams are over 100 years old. A detailed record is kept of defects in dams but this is not published. The reasons for the secrecy surrounding the condition of the nation's dams are not clear, but prudent underwriters are always inclined to assume the worst when information is withheld. The record of dam safety in the UK has been excellent since 1925, but climate change fears might cause some underwriters to reassess the situation. It would seem quite likely that there are people living and working within the danger zone of large dams in the UK. In the USA where information is more readily available, it is known that there are more than 2,000 communities that have been identified as being at risk from dams which are believed to be unsafe.

Growing population and wealth, especially in the south east of England, will lead to greater demand for water, while supply will be reduced by summer droughts. Demand management controls such as water meters can only have a limited effect and groundwater abstraction is near its limit in some areas.

(In other areas, such as Liverpool and London, abstraction of groundwater has ceased, and rising groundwater is becoming a problem – see “The Groundwater Problem” section.)

It is therefore likely that more dams will need to be built, and in Southeast England, these are likely to be near urban areas.

Meanwhile, in 2000, Government introduced a research programme for dams, with some of the survey work sub contracted to the Transport Research Laboratory because of their expertise in checking earth embankments.

One cost effective way to monitor the condition of dams and raised reservoirs is to use “Synthetic Aperture Radar” (SAR) instruments on satellites, using a technique called “PSInSAR” (Permanent Scatterer SAR Interferometry), which can detect sub millimetre movements in the ground or structures. All that is needed is to install special “corner reflectors” on the walls or embankments, and then monitor them for movement. Once a system is established, monthly reports can be produced at relatively little cost. The corner reflectors cost around £1,000 each, but a new technique using SAR transponders costing around £100 each is showing great potential

Italy is so impressed with the technology that it has already installed large numbers of SAR transponders and reflectors. Thames Water has installed seven satellite “reflectors” on the embankments of the Wraysbury Reservoir in West London to detect and monitor sideways or vertical movements using regular satellite images<sup>124</sup>. (RADARSAT passes over every 24 days, while ENVISAT passes over every 35 days.) This technique should ideally be used on all dams and reservoir embankments, not to mention flood defences and bridges.

This new technology could give early warnings of possible breaches in dams, embankments and flood defences.

More dams are likely to be built because of climate change, either retention dams as part of flood alleviation measures, or reservoirs for hydro power or water supply in response to the moves away from fossil fuel power generation and increasing summer droughts.

While dam break inundation maps are confidential, the software used to construct such maps is not. It would be quite possible for insurers to create their own dam break maps and take action to reduce their exposure in areas subject to this hazard. This could become easier after the completion of a major European research project under the EU Fifth Framework Programme called “IMPACT” (Investigation of Extreme Flood Processes and Uncertainty) which is being co-ordinated by HR Wallingford. The project is costing €2.3m and as it is publicly funded, the results are expected to be disseminated publicly when the project is completed<sup>125</sup>. It is examining breach formation, flood propagation, sediment movement and process uncertainty. Early results are extremely interesting, but there is a great deal of work still to do. One of the aims is to produce more user-friendly software for producing inundation maps for dam break throughout Europe. This would make it easier for insurers, local Councils, and the Health and Safety Executive to produce their own inundation maps, and this might encourage the government to end the long standing but unjustified exemption which dam owners have from the requirements of the Control of Major Accident Hazard Regulations 1999 (COMAH).

Meantime, so long as dam condition reports and inundation maps remain secret, prudent insurers may be increasingly likely to assume that properties near to reservoirs may be at risk of flooding from a breach, particularly in the case of older earth embankments, or concrete dams constructed more than fifty years ago.

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<sup>124</sup> For more details, see [www.npagroup.com](http://www.npagroup.com)

<sup>125</sup> For details, see [www.impact-project.net](http://www.impact-project.net)

There are also general environmental problems relating to dams, because although they are a source of renewable energy, they can actually increase greenhouse gas emissions and lead to polluted rivers<sup>126</sup>

### Case Study

(This is an actual case, which is in many ways typical, but the author has omitted details that might identify the dam in question, in order to protect the engineers who provided the information.)

This is a large reservoir originally formed by an earth dam constructed around 150 years ago. The dam wall was raised in the 1970s, on top of the old earth wall, which now forms part of the upstream toe. The reconstruction involved a 330m long, 9m high dam covered in rock armour on both sides to the height of the spillway, with a 1 m wave wall.

It is subject to the Reservoirs Act 1975 as a "Category A" dam, and therefore must be independently inspected every ten years. The last inspection was in 2001, and it is not due to be inspected again until 2011.

The seismic category is "C" (low risk). The latest panel engineer's inspection report makes no attempt to predict what the condition of the dam will be in ten years time, but reports some deterioration and cracking at the time of the inspection. No attempt was made to determine the condition of the core. There is no instrumentation to give advance warning of failure, and no warning or evacuation procedure. The only recommendation from the engineer was to repeat the 1991 recommendation (which had not been actioned) that a security fence be erected to prevent access by children to the dam.

A formal dam break inundation map has not been produced, but a risk assessment report produced in 2002 contains an inundation map showing that 63 recently built domestic properties are at risk. Local planners had allowed these houses to be built because they were unaware of the hazards, and there are no contingency plans for evacuation. The report suggests that a major breach or failure of the dam could produce a flow of 7257 cubic metres a second, with the potential for 338 deaths, owing to these recently built properties, making this a risk "Level 1" dam, in accordance with the CIRIA reservoir risks manual<sup>1</sup>. (The author was a member of the steering committee for the team that produced this manual).

The spillway leads to a double culvert under a major trunk road that leads downhill to a large town. The diameter of the culverts is 1.2m and they are only inspected annually. There are no trash guards. If the reservoir were to be full, a severe rainfall event could cause a significant flow over the spillway and the trunk road could become a "river" leading flood waters into the centre of a housing area nearby.

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<sup>126</sup> For more information about dams, see:

[http://www.panda.org/about\\_wwf/what\\_we\\_do/freshwater/what\\_we\\_do/policy\\_events/dams/problems/environmental.cfm](http://www.panda.org/about_wwf/what_we_do/freshwater/what_we_do/policy_events/dams/problems/environmental.cfm)

The hills surrounding the reservoir are covered in a layer of peat, overlying moraine and rock. The inspecting engineer did not mention (and perhaps is unaware) that peat on a sloping surface is very vulnerable to sliding if a long dry summer is followed by a wet winter, which could cause the peat layer to become top heavy. A significant peat slide into the reservoir could lead to sudden and catastrophic overtopping. There is no monitoring of movement of this peat layer, and the dam owner was unaware of the PS InSAR<sup>ii</sup> satellite monitoring systems that could give early warning of such an event. The author is currently attempting to persuade the dam owner to commission research into the peat slide risk from a peat expert, and to install satellite transponders.

Dry summers and wet winters are predicted to become more common with climate change, according to the UK Climate Impacts Programme projections<sup>iii</sup>.

<sup>(i)</sup> Hughes, A; Hewlett, H W M; Samuels, P G; Morris, M; Sayers, P; Moffat, I; Harding, A; Tedd, P. 2000 *"Risk Management for UK Reservoirs."* Construction Industry Research and Information Association (CIRIA) Research project report C542. London.

<sup>(ii)</sup> Permanent Scatterer Synthetic Aperture Radar Interferometry

<sup>(iii)</sup> Hulme, M., Turnpenny, J., Jenkins, G., 2002. *"Climate change scenarios for the United Kingdom. The UKCIP 02 Briefing Report."* Tyndall Centre for Climate Change Research, University of East Anglia, Norwich, UK

Climate change could also threaten the safety of this reservoir in other ways. A recent report for government suggests safety margins could be reduced by some 20% with climate change<sup>v</sup>.

Council planning and emergency planning officials are not aware of the government's report on climate change implications for dams, and have not been given access to the panel engineer's report, the risk assessment report, or the inundation map<sup>v</sup>. The local Council recently allowed three sheltered housing complexes to be built in the area and, until the author intervened, was looking at proposals to build a new hospital and primary school there.

<sup>(iv)</sup> Babbie Group and the Centre for Ecology and Hydrology, 2002. *"Climate Change Impacts on the Safety of British Reservoirs"* Report commissioned by the Department of the Environment, Transport and the Regions (DETR) now DEFRA, through their reservoir safety research programme. (Unpublished).

<sup>(v)</sup> Dam condition reports are confidential documents, as are dambreak inundation maps. The Dam Owners Society forbids its members from publishing them in case it causes public concern.

## The Canals and Waterways Problem<sup>127</sup>

British Waterways owns and manages over 540km of navigable rivers and 2600km of canals which in turn interact with the major river basins and land drainage systems of

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<sup>127</sup> Much of this section is based on the following paper: Sim, S., Morgan, L., and Leftley, D., British Waterways (2002) *"British Waterways' role in flood mitigation and emergency response."* Municipal Engineer, 151, pp305-311

the UK. Most of the canals were constructed more than 200 years ago, and are very vulnerable to flood events. Often the waterways cross different catchments and can thus transfer flows from one catchment to another. British Waterways also own and manage 89 reservoirs in the UK, some of which are managed entirely for flood storage.

Canals are usually "still" waters, and do not clean themselves as with flowing rivers, so pollution is a particular problem, for example from sewage backup from drains.

Canals generally operate with only 300mm of freeboard, and there are over 650km of embankments to be maintained. Overtopping of embankments, especially those over 200 years old, can lead to failure, which could have a catastrophic impact especially in urban areas.

British Waterways is very aware of the risk and has a system of sluices, weirs, pumps, and floodgates to control the flow into canals. They have a thorough system of emergency procedures that have worked well so far, but climate change is going to impose a major challenge to our 200-year old network of canals, and this challenge does not yet seem to be fully recognised by government.

## The Water Framework Directive Problem

### The Water Framework Directive

Agreement was reached on the Water Framework Directive (WFD)<sup>1</sup> between the European Commission and the European Parliament on 28 June 2000. Once ratified, it became the responsibility of member states to transpose the Directive into their own legislation and to implement it. The Directive establishes a framework for the hitherto fragmented legislation in this field and is designed to protect surface water, coastal and territorial waters and groundwater.

The Directive also establishes a management structure for future European water policy, with the following main objectives:

- expanding the scope of water protection to all waters, surface waters and groundwater;
- achieving "good status" for all waters by a certain deadline;
- water management based on river basins;
- "combined approach" of emission limit values and quality standards;
- getting the prices right: charges for water and waste water reflecting the true costs;
- getting the citizen involved more closely; and
- streamlining legislation.

This EC Directive will result in the most important changes to UK legislation protecting the water environment since 1974 when the Control of Pollution Act was passed. It will extend environmental protection for

1. Point and diffuse sources of pollution
2. Impacts associated with water abstractions, dams and engineering work.

At the core of the directive is the requirement that the issues are handled on a whole catchment basis, using what is called “integrated river basin management” (IRBM), managing catchments at a River Basin (RB) level.

### **Diffuse Pollution**

The Directive’s main aim is to reduce diffuse pollution. This is a major problem in Britain, but the details are unfortunately outside the scope of this report. For those who wish to know more about the problem, an excellent report was produced recently by the Chartered Institute of Water and Environmental Managers<sup>1</sup>. In this report, which was funded by the EA, SEPA and the Scottish and Northern Ireland Forum for Environmental Research (SNIFFER), diffuse pollution has been defined as: “Pollution arising from land-use activities (urban and rural) that are dispersed across a catchment, or sub-catchment, and do not arise as a process effluent, municipal sewage effluent, or an effluent discharge from farm buildings.”

<sup>(1)</sup> D’Arcy, B.J., Ellis, J.B., Ferrier, R.C., Jenkins, A., and Dils, R., 2000. *“Diffuse Pollution Impacts: The environmental and economic impacts of diffuse pollution in the UK.”* Chartered Institution of Water and Environmental Management, London.

Legislation is currently being prepared to implement the Directive in the UK, and this will give the environment agencies (EA and SEPA) more powers to protect the environment. So why does this create a problem for flood insurance?

The answer is that while the Directive is intended to cover every conceivable aspect of water, it has virtually no mention of urban flood risk at all, and no flood risk directive is planned. In other words, the key limitation of the draft legislation under the Directive is that so far, it is only concerned with flooding where flooding or flood management, for example, flood defence works, could affect ecological status. However, other Member States in Europe intend to use river basin planning and a catchment approach under the Directive to manage flooding in a more holistic way.

Another problem is that the River Basins envisaged are enormous, perhaps only three for Scotland and five for England and Wales. What chance is there for local community involvement in such massive areas? There is even a proposal that all of Scotland’s lochs will be treated as one national river basin.

The author worked with no fewer than 32 leading ecological charities and NGOs in Scotland in a consortium called “Link” to lobby the Scottish Parliament for changes in the draft legislation (for details, see [www.scotlink.org](http://www.scotlink.org) ). This lobbying was successful and the resulting legislation, The Water Environment and Water Services (Scotland) Act 2003 should ensure a more satisfactory situation. There are, however no signs of a similar approach in England and Wales.

Please note that most of the following comments could apply equally to the proposed legislation in England and Wales, but the author is not aware of similar lobbying in England.



The following is an extract from WWF's submission to the Scottish Parliament about the proposed legislation in Scotland, the "Water Environment and Water Services Bill".

"The Scottish Executive must take the opportunity presented by the WFD to create a national, strategic flood planning body, linked to River Basin Planning and underpinned by statutory Flood Liaison and Advice Groups, with a strong remit for environmentally sustainable flood management.

"This will overcome the current problems of flood management, which stem from a lack of a catchment approach to flooding, severe fragmentation of responsibilities for flooding and a reactive approach to flood management.

"WWF strongly believes that national, strategic flood planning, linked to the WFD and underpinned by statutory Flood Liaison and Advice Groups with a strong remit for environmentally sustainable, catchment level flood management will enable Scotland to tackle flooding properly and face the reality of climate change. The WFD is the best opportunity Scotland has ever had for catchment-level, sustainable, flood management. We must make sure that this opportunity is taken and that we can manage flooding better for the long-term in the context of climate change.

"In order to make best use of the WFD and Flood Liaison and Advice Groups, legislation transposing the WFD must make strong links to sustainable flood management. Provision should be made for the creation of a national body or Flood Appraisal Committee to set strategic principles and feed into the River Basin Planning process. NPPG7 on Planning and Flooding and flood legislation need to be reviewed to strengthen the role and membership of Flood Liaison and Advice Groups. Flood Liaison and Advice Groups should have a statutory advisory role firmly based in sustainable flood management principles, and their membership should be expanded in line with sub-basin planning to include non-planned land-uses, like agriculture and forestry. A Flood Appraisal Committee and Flood Liaison and Advice Groups could provide useful input to the proposed plan-led approach to engineering works within the RBMP."

WWF and the author were optimistic that the combined onslaught of so many leading environmental organisations would have an effect on the proposed legislation in Scotland. This in fact turned out to be the case, and the final legislation in Scotland "The Water Environment and Water Services (Scotland) Act, 2003 responds to concerns about flooding issues. It remains to be seen whether this will influence legislation in England and Wales.

WWF point out that

"Climate Change is an issue that we cannot afford to ignore. Climate change experts in Scotland estimate that a 100-year return period flood in the 1990s will, by 2050, have a 60 to 65 year return period for rivers and a 10 year return period for coastal flooding<sup>128</sup>.

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<sup>128</sup> D.J.Price & G.McInally, (May, 2001), Climate Change: Review of Levels of Protection Offered by Flood Prevention Schemes, Scottish Executive Research Unit.

This means we can expect floods like the Perth floods of 1993 every 60 or so years. Many thousands of homes in Scotland lie in 1:100 year flood risk areas and this figure will rise with climate change. The Association of British Insurers recently advised government that guaranteed cover for homes and shops will be withdrawn in December 2002 unless flood planning and defences are improved.

“The impacts of flooding and the severity of flood events have been exacerbated by human activities in catchments, including built development, poorly planned flood defences, intensive agriculture and forestry. As floodplains have lost their wetland habitats so they have lost many of their natural functions, such as pollutant filtering and flood storage, with resultant costs to the taxpayer in terms of water purification and flood defence.

“There are three major obstacles of sustainable flood management in Scotland today:

- Flood management does not take river systems approach, taking account of the causes and effects of flooding at catchment level. This is reflected in a lack of detailed flood information at catchment scale. Although the technology is available, in the form of Laser altimetry and hydrodynamic modelling, that could be linked to the internet, SEPA lacks the resources to do this.
- Responsibilities and powers for flood management are extremely fragmented. For example, urban planners have little control over the effects of intensive agriculture or farmland flood defences on flooding downstream. This point was made repeatedly at the RTPI conference on Flooding and Climate Change, held in Edinburgh on 19 September 2001.
- Flood management tends to be reactive, not strategic. It deals with the effects of flooding in urban areas rather than its causes elsewhere in the catchment.
- Flood Liaison and Advice Groups have a great potential to contribute to better flood management. They provide a forum for communication between interest groups and for information exchange. They can take a more strategic approach to flood planning and influence development of good local flood policies. They provide an independent body that can support the Planning Authority and SEPA in reaching decisions on specific developments. They are a good forum for awareness raising and training, and they can provide a vital link between flood risk and the management of wetland habitats.

“There are great cost benefits to taking advantage of the tools we have - Flood Liaison and Advice Groups and the Water Framework Directive. With climate change a reality we need sustainable, catchment-level flood management, and the WFD offers this general approach to water planning.”

Perhaps there should be similar lobbying in England and Wales, but unfortunately they do not have Flood Liaison and Advice Groups as in Scotland.

If the proposed legislation is not changed, there is a real danger that priorities will shift from protecting people from flood to protecting the habitats of wildlife. The need for new legislation offers the chance to protect both and one hopes that the opportunity will not be wasted.

## **The ODPM versus Defra Problem**

The demand for housing, especially in the South East of England, combined with house-building growth targets from the Office of the Deputy Prime Minister (ODPM), is leading to a huge number of new houses in flood hazard areas.

Nearly a third of these are built against the advice of the Environment Agency, whose objections are overruled nearly 40% of the time. For many of these houses, flooding will be inevitable, as new flood defence building cannot keep pace.

Defra is responsible for flood defence spending in England, and must be aware that the ODPM actions are creating an ever increasing need for flood defence spending. The way they propose to deal with this is to establish a new priority scoring scheme. It is interesting that this announcement was hidden away in an obscure reference in the "notes to editors" section of a press release which announced an additional £22m for capital projects and studies in 2003-4, raising DEFRA's funding from £114m to £136m.

## **The Priority Problem**

### **Summary**

Defra's new priority scoring scheme should be of some concern to the insurance industry:

- From April 2003, Defra will give priority to protecting certain specific areas. It may or not be coincidence that these are areas of particular interest to Defra, such as wildlife habitats, listed buildings, and economically deprived areas.
- Significantly, it will no longer give priority to areas that have been flooded before. All this will be at the expense of wealthier areas, (where potential insurance claims costs are higher) and areas which have suffered from recent flooding.
- Defra's new priority scoring will not give any incentive to design defences to high standards of service or to take into account climate change.

For details see below or:

<http://www.defra.gov.uk/corporate/regulat/forms/flood/LDW14.pdf>

### **Priority Scoring Scheme**

This scheme introduces additional factors into the question of eligibility for government grants for flood defences. For example protection of wildlife habitats where there is a legal obligation under the Conservation (Natural Habitats etc) Regulations 1994 will not

be scored and will be funded if “cost effective”. (This seems to be saying that such schemes will have priority over schemes that are designed to protect life and property provided benefits exceed costs.)

For cases that do not come within the terms of the Conservation Regulations, the scheme has an environmental score to “give greater priority to those schemes that are expected to provide additional benefits to the natural environment”. Priority will also be given to heritage sites and “Scheduled Monuments”.

For people who do not happen to live in a habitat conservation area or a heritage site, the following scoring applies.

### **How the scoring works**

Each year, the Ministry will announce indicative minimum priority scores. For example, the threshold for 2003/4 is 22 points, for the next year 15 points and the year after 10 points.

#### **1. Economic score**

While in Scotland, benefits only have to exceed costs, to get the full 20 points from the economic factor in the English system, benefits will now have to be more than 10.5 times costs. Even then, this is not enough in itself for the 22 points needed for 2003/4.

#### **2. “People” score**

This is based on the number of residential properties benefiting from the proposed defences per £1,000 of the project cost. The number of residential properties is multiplied by 75 and divided by 1,000 to produce a score. The maximum score allowable is 8. This means for example that a flood defence will need to cost less than £100 per house if it is to have any chance of a maximum score.

Hotels “and similar” properties are considered as single residences. Presumably this means that a sheltered housing complex with 100 elderly residents gets the same score as a ground floor flat occupied by one student (upper floor flats are excluded). While the vulnerability of people can be taken into account, this is based on deprivation indices for which only 15% is made up of consideration for the elderly or infirm, or patients in hospitals. In any case, only the 300 most deprived electoral wards (out of 8,400) can get the maximum score of two points, whereas the 1,400 least deprived wards can have their score reduced. Exceptionally, a further two points can be added for very high risk flood areas, that is areas where floods more than 2 metres deep can be expected with little chance of an effective warning.

### 3. Environment Score

Up to 12 points can be awarded for sites of special scientific interest, wildlife conservation areas, special monuments, or heritage buildings. In other words the environment scoring is potentially equal to the “people” score.

#### Comments

- **Hospitals and Sheltered Housing**

The scheme seems to give no special treatment to hospitals or sheltered housing. Nor does it take the age profile of the population into account. This seems indefensible.

- **Urgency**

Under the old system, there was recognition that areas recently flooded and likely to flood again needed an element of urgency. Thus there was an “urgency” score as follows:

Failure already occurred	10 points
Flood expected within five years	6 points
Flood not expected within five years	0 points

This has been discontinued, despite the many promises made by members of the government to flood victims that they would get flood defences as a matter of urgency. For example, according to the National Flood Forum, the second stage of the Bewdley scheme now scores only 7.9 points, and despite government promises that it would be implemented urgently it may now be postponed for several years. Lewes, which was so badly flooded in 2000, may now not get a flood defence for another five years.

- **Commercial and Industrial properties**

Because the scoring is dependent on residential properties, there now seems to be little chance of a government flood defence grant for commercial or industrial estates in England or Wales for the foreseeable future, no matter how much the economic benefits of a flood defence exceed the costs.

- **Standard of Service**

The previous scoring scheme allocated increased scores to projects with higher standards of service. For example, if the current standard of service was less than 1 in 75 years, points would have been allocated to improve the standard, for example:

Increase standard from 5 year to 200 year return period	10 points
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Increase standard from 20 year to 100 year return period      6 points

Increase standard from 50 year to 100 year return period      2 points

The new scheme does not offer points for a higher standard of service, and the scoring system will effectively discourage schemes which cost more than £100 per house. It seems unlikely that many defences with a 200 year standard of protection will be eligible for grant aid in the future, and cheaper defences with a much lower standard of protection will be the norm.

### **Insurance implications**

The ABI Statement of Principles emphasises the importance of the insurance template and the need for a 200-year standard of protection if insurance is to be available at normal terms. In addition if the standard is less than 75 years, insurance may not be available at all. The ABI have been lobbying DEFRA for more spending on flood defences, but have only had partial success. DEFRA's new scheme prioritisation seems to ignore these considerations, and is likely to lead to a lowering of standards of protection for new defences. We already have the example of the £98m Jubilee River scheme designed to protect Windsor and Maidenhead which only offers a 60 year standard of service, and which therefore will not do anything to make insurance easier to obtain in such areas. Such examples are likely to become more widespread.

This is happening at a time when climate change scenarios for flood are becoming increasingly serious. A report in Nature last year<sup>129</sup> demonstrated that, based on the 19 leading climate change models in the world, the risk of a very wet winter in the UK and central Europe will increase fivefold in the next 100 years. The implications of climate change and the need for a higher standard of protection in the future seems to have also been ignored by DEFRA.

By contrast, in Scotland, flood defence funding will not be granted unless the defence offers at least 100 year protection including climate change impacts to 2060. In effect this is resulting in a minimum standard in today's terms of around 140 years protection plus an additional freeboard allowance of around 300mm. Most new defences are being built to much higher standards than this. For several years now, almost every Scottish local authority will not allow new developments where the flood hazard exceeds 1 in 200 years.

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<sup>129</sup> Palmer, T.N., and Rälsänen, J. (2002) 'Quantifying the risk of extreme seasonal precipitation events in a changing climate' Nature, Vol 415, pp.512-514

## The Participation Problem

This is perhaps the fundamental problem in the whole area of flood risk, namely lack of participation of the stakeholders in local decision making. The Environment Agency has recently come to express this in their new flood strategy<sup>130</sup>. They state:

“Flooding is a natural process – we can never stop it happening altogether. So tackling flooding is more than just defending against floods. It means understanding the complex causes of flooding and taking co-ordinated action on every front to reduce flood risk. This calls for long-term planning and truly ‘joined-up’ action from the full spectrum of partners, from policy makers to vulnerable communities.” (EA website)

The UK has a democratic tradition of making land use planning decisions at a local level, following national guidelines. It is all very well for the insurance industry to lobby at a national level for better planning guidelines, but if actual decision making takes place at a local level, taking local economic and political pressures into account, it is here that stakeholders such as the insurance industry need to devote their attention. The author has extensive experience since 1995 in advocating insurance interests on a face to face basis with local planning authorities in Scotland and arguing the insurance case in meetings at which all the major stakeholders are present.

This high degree of participation in local decision making has been remarkably effective, and has resulted in the majority of local councils changing their strategy significantly. Almost all councils in Scotland have now adopted some or all of the full insurance template shown in Appendix 1.

If one person can have such an effect, imagine what would be the result if the insurance industry as a whole were to mobilise to influence all local councils with a flood hazard problem? There are no legal impediments to prevent councils in England and Wales from establishing participation groups along the lines of the Flood Advisory and Liaison Groups (“FLAGs”) which have been so successful in Scotland. As climate change increasingly impacts on the flood hazard and as an increasing number of buildings are constructed in flood plains, near to flashy rivers, or on low lying coastal areas, firm action is becoming increasingly critical if insurers are to be able to provide flood cover in England and Wales.

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<sup>130</sup> Environment Agency (2003) “*Strategy for flood risk management*” Download from: [http://www.environment-agency.gov.uk/commodata/105385/frm\\_strategy\\_v1.2\\_573731.pdf](http://www.environment-agency.gov.uk/commodata/105385/frm_strategy_v1.2_573731.pdf)

## The Consequences...

Figure 6: Uckfield, October 2000. Courtesy of Alan Thompson, Symonds Group Limited



### Availability and Affordability of Insurance

When the first draft of the new planning guidelines (PPG 25) for England<sup>131</sup> was published in the summer of 2000, the author and the ABI argued strongly for tighter control of planning procedures. Property developers, and the pressing need for more houses in Southeast England, clearly had a stronger influence, despite the floods in the autumn of 2000. The contents of the second draft of PPG 25 in February 2001, were disappointing for insurers. While some of the representations had been taken on board, the draft guidelines would still allow planners to permit new housing developments in high flood risk areas if there was nowhere else to build.

Property developers were no doubt delighted, but some insurers realised that their guarantee could not be sustained under such conditions<sup>132</sup>. Shortly afterwards, the ABI announced that its members would not be prepared to maintain the guarantee after 2002 unless planning guidelines were tightened up and more was spent on flood defences. In the meantime, insurers were free to start increasing premiums to more

<sup>131</sup> Planning Policy Guidance Note 25 (PPG 25). HMSO, London.

<sup>132</sup> Crichton, D, 2001 "Flood news from the insurance front line". *Town & Country Planning* 70, pp.183-185



realistic levels. This statement went largely ignored by the Press and indeed the Government, even after some insurers “jumped the gun” and quietly stopped accepting new business in flood hazard areas<sup>133</sup>. In July 2001, John Greenway, MP, the chairman of the All Party Parliamentary Group on Insurance and Financial Services, wrote to the ABI to complain that some constituents had suffered from increases in premium of up to 250%.

If insurers were to withdraw insurance cover on a large scale, the Press and Government would find it hard to ignore the implications. According to the Environment Agency, five million people in England and Wales are at risk of flooding. They could all be affected by premium increases, with thousands being unable to obtain home insurance at any price. As home insurance is a requirement for a mortgage, mortgages could become more difficult to obtain<sup>134</sup>. Without insurance, will mortgage lenders refuse new mortgages? Will they foreclose existing mortgages? Will whole estates of new houses become blighted and abandoned?

The Council of Mortgage Lenders' Deputy Director General Peter Williams was quoted in a recent press release<sup>135</sup> as saying: "The ability to obtain insurance at a reasonable cost is a key requirement for both lenders and borrowers. Without the protection of insurance, the lender's security in the property is threatened, making it virtually impossible to obtain a mortgage." (Author's emphasis).

The household insurance market used to be highly competitive, which is one reason why the total annual written premiums for household insurance in Britain have stayed so stable in recent years. In 1994, the total household and domestic All Risks premium income for all ABI members was £4,871m. In 2001, it had only increased to £4,980m<sup>136</sup>. Typical premiums have actually fallen significantly in real terms despite increasing sums insured due to greater wealth and inflation. Average premiums are shown in the table below, along with average motor premiums for comparison:

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<sup>133</sup> Consumers Association (2001) "Which" Report, October 2001.

<sup>134</sup> Finance National Market review 2001/2002, Council of Mortgage Lenders 2001, cited by ABI in "Flooding: A Partnership Approach to Protecting People", ABI (November 2001).

<sup>135</sup> Council of Mortgage Lenders Press Release, 6<sup>th</sup> June 2002.

<sup>136</sup> ABI Circular to members dated 16 July 2002.

Table 5: Average household premiums change compared to average motor premiums. Source: AA Premium Index (Cited in Insurance Times, 10 October 2002)

Average premiums	July 1994	October 2002
Home – Buildings	£141.59	£139.99
Home – Contents	£109.54	£112.73
Car – Comprehensive	£373.73	£687.94
Car – Non-comprehensive	£423.63	£804.94

It would appear that we spend more on insuring our cars than our homes, and in relation to the size of the investment, it is likely that the market could probably stand a considerable increase in premium in flood hazard areas without a major loss of business. It is true that motor insurance is compulsory, but for those who have mortgages, home buildings insurance is effectively compulsory too.

Analysts such as Datamonitor suggest that the average contents and buildings insurance premium will rise from around £300 in 2002 to £330 in 2003. But the two million owners of properties in flood hazard areas who are already paying an average of £600 a year could see this rise by at least an extra £180, with flood excesses as high as £25,000<sup>137</sup>.

If insurance and mortgages become harder to obtain in flood hazard areas, this could have a major impact on property values. The Royal Institution of Chartered Surveyors estimate that even where insurance is available, house prices may have to be discounted by 20% to 40% in areas where flooding has occurred<sup>138</sup>.

UK house prices in 2002 are going through their fourth boom in thirty years, nearly doubling since 1996 for the UK as a whole and 2½ times their level in 1996 for London. Part of the explanation of the upward trend in house-price to income ratios in the south of England lies in the continuing housing imbalance there. However, according to Cambridge Econometrics<sup>139</sup> this is not enough to allow the current speculative housing bubble in the south of England to be sustained.

Cambridge Econometrics expects an increase of 200,000 households per year in the UK over the next decade, with over a million more households in the south of England (London, the South East, East of England and South West) by 2010. They say, “this fast growth in the south is driven by the continuing trends of north to south migration for work, declining household size and an increase in international migration centred on London. London, already facing the highest pressures for affordable housing is also the

<sup>137</sup> Datamonitor report cited in “Insurance Bills Soar” by Sean Poulter, Daily Mail, 24<sup>th</sup> August, 2002.

<sup>138</sup> RICS Working Party, 2001. “Flooding: Issues of concern to chartered surveyors” RICS, London

<sup>139</sup> Cambridge Econometrics Press Release 12 August 2002

prime destination for international migration, which will prompt further movements out of London into adjacent regions. All of this will put pressures on existing housing supply, transport infrastructure and public services in the capital and surrounding regions.”

They go on to predict that “The coming decade will see a relatively high burden of long-term debt repayments since the windfall gains from inflation that helped borrowers in previous decades are no longer likely to be available.”

In the author’s view, insurance and mortgage problems, even if confined to only a small proportion of houses, could burst the bubble. If so it might not just affect flood areas, but the whole country, as people start to realise that they can no longer take the availability of flood insurance for granted. Louis Armstrong, the Chief Executive of the Royal Institution of Chartered Surveyors (RICS) said recently<sup>140</sup>: “Hundreds of people’s lives and millions of pounds worth of property will be at risk this winter because of the failures of the planning system and inadequate defences.”

While the planning guideline PPG 25 has many good points, as mentioned before, it will still allow planners to permit houses to be built even where the flood hazard is more frequent than 1 in 100 per year, if there is nowhere else to build. Some councils such as Arundel have already reached the point where the only land available is prime agricultural, conservation areas, or floodplain. Politically it is easier to use floodplain, because groups such as English Nature seem to have more power than the EA in these matters. The problem is going to get much worse.

Cambridge Econometrics, forecast that London will be short of about 300,000 homes by 2010 as the number of households in London increases faster than the number of houses. They also estimate that the overall deficit between households and houses in the south east of England will grow from 49,000 in 2000 to 147,000 by 2010, despite the construction of a million more homes by 2010. This will lead to a continued increase in pressure from Government and developers on the planning community to release land for house building. Remembering that 11% of all new dwellings built in England between 1997 and 2000 were in areas defined as at flood risk by the Environment Agency, this could mean at least 110,000 additional houses in flood hazard areas in England by 2010.

Insurers have been quietly gearing up for a withdrawal strategy, investing in better flood maps, and introducing new questions on proposal forms. If insurance cover is withdrawn it will no doubt cause much grief on the part of householders who find that their mortgages are foreclosed. On the other hand, how would posterity (and shareholders) judge the insurance industry if it continued to enable houses in hazardous areas to be built and sold by guaranteeing to provide flood cover when it knows that flooding will be increasingly inevitable? It could be argued that it is better to

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<sup>140</sup> As reported in “Planning”, the Journal of the Royal Town Planning Institute, 3<sup>rd</sup> August, 2002.

grasp the nettle now, if that is the only way to persuade the planning community in England and Wales to act more responsibly.

Withdrawal of insurance would have a number of serious problems for society:

Property values would reduce, and in some cases mortgages might be foreclosed leading to blight

Society has become dependent on the insurance industry to help it to recover from flooding, not only with claims payments, but also the ability of insurance loss adjusters to mobilise repair and restoration specialist companies, and provide alternative accommodation.

### **The ABI Statement of Principles**

On 26th September, 2002, the ABI announced<sup>141</sup> that the insurance guarantee would indeed expire at the end of 2002. It would be replaced by a "Statement of Principles" from 1st January 2003. The ABI stated that its members would try to maintain flood insurance cover, provided the following conditions are met:

1. Flood defence spending in England meets the levels in the Treasury Spending Review
2. English planning guidelines are implemented fully (presumably only in England, although this is not stated)
3. The Environment Agency's flood asset database for England and Wales is published
4. The Cabinet Office's proposals for Emergency Planning in England are implemented
5. Consideration be given to integrated drainage management for England and Wales similar to that in operation in Scotland. (The author understands that this is a reference to the Flood Prevention and Land Drainage (Scotland) Act, 1997.)
6. Implementation of solutions to sewer flooding and adoption of water **companies** as statutory consultees. (Scottish Water is an authority, not a company, so presumably this condition only applies to England and Wales.)

In other words, continuation of flood insurance in Scotland and Wales appears to be dependent on what happens in England. It should be remembered that the cancellation of the flood insurance guarantee was entirely as a result of problems in

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<sup>141</sup> ABI Press Release, 26<sup>th</sup> September 2002.

England. This was despite all the hard work by the Scottish Executive and Scottish Councils since Devolution. (So far as the author knows, the ABI has never circulated their members to tell them about the different approach in Scotland.)

On 26th September, the ABI published a report to give details about the reasons for its action. (The report does not mention Scotland at all.) It says that during the last two years of the guarantee "There have been only a handful of cases where policyholders have experienced difficulties in renewing cover with ABI members."

The report outlines the ABI's new approach and this appears in the panels. (It is interesting to note that the report does not mention the complaint from John Greenway, MP, that some constituents had suffered from increases in premium of up to 250%.)

In April 2004, the ABI created a new page on its website dedicated to "flooding and insurance" issues. See: [www.abi.org.uk/flooding](http://www.abi.org.uk/flooding).

### The ABI's new approach

- I. Following an analysis of the Government's recent announcements, the ABI has agreed with its members a new Statement of Principles governing the provision of flood insurance for Britain's households and small businesses.
- II. The insurance industry is responding positively to the Government's plans. The partnership approach that has brought this recent progress needs to be continued. The ABI will continue to play a key role alongside other stakeholders in securing an effective system of flood management and protection.
- III. The new arrangement has five aims:
  1. full access to a competitive market for insurance for the vast majority of homeowners and businesses;
  2. improved security for those who live and work in high-risk areas;
  3. new provision for those who wish to sell their homes or businesses;
  4. better use of new solutions to make properties insurable, even in high-risk areas where improvements to flood defences are not planned;
  5. a clear incentive for Government and local authorities to continue to invest in flood defences.
- IV. The Statement of Principles is based on the Government's own target standards of flood defence. All ABI members (accounting for 85% of the household insurance market) will follow this statement.
- V. Premiums and excesses continue to be matters for the commercial and competitive judgement of individual companies. Insurers will base their judgements on their assessments of risk and likely damage levels, using information that is publicly available from the Environment Agency and others
- VI. In order for this approach to work in practice, the Government will need to provide early and accurate information on both risk levels and improvement plans. Where there is uncertainty, insurers will need to make prudent assumptions. There will need to be a continuing close partnership between Government, insurers and others to ensure an effective flood risk management process.
- VII. With this partnership in place, the new arrangement will enable the industry to fulfil its ambition, shared with the Government, that flood insurance should continue to be available to the vast majority of customers. It will encourage the development and use of innovative solutions to reduce the level of risk and cost of damage in difficult areas. It will also help to ensure that the momentum behind current efforts to improve flood protection is maintained.
- VIII. The agreement will be subject to a routine annual review by the ABI and the Government to assess progress.

Source: ABI

### ABI STATEMENT OF PRINCIPLES ON THE PROVISION OF FLOODING INSURANCE

#### General Policy

It is the intention of ABI members that flood insurance for domestic properties and small businesses should continue to be available for as many customers as possible. The premiums charged and other terms – such as excesses – will reflect the risk of flooding but will be offered in a competitive market.

This statement of principles will apply from 1 January 2003 but is subject to review in the event of significant external shocks such as withdrawal of flood reinsurance. Successful operation of the principles is dependent on planned information on risk levels and investment being available from the relevant flood defence authorities.

#### Areas currently defended to the DEFRA standards

The majority of properties in flood risk areas are already protected to the Department of Environment, Flood and Rural Affairs' indicative minimum standard of 1 in 75 years for urban areas, or better, the level to which properties are defended above this will vary considerably and premiums will reflect different degrees of risk; but flood cover will be available as a standard feature of household and small business policies.

### **High Risk Areas where improved defences are planned by 2007**

In a number of locations the risk of flooding is unacceptably high. Existing flood defences provide less protection than the Department of Environment, Flood and Rural Affairs' indicative minimum standard of 1 in 75 years for urban areas. Where improvements in flood defences sufficient to meet these standards are scheduled for completion within the next 5 years, insurers will maintain flood cover for domestic properties and small businesses which they already insure. The premiums charged and other policy terms - such as excesses - will reflect the risk.

If a domestic property in this category is sold the current insurer will continue to provide cover, subject to satisfactory information about the new owners of the property, especially their previous claims record.

Where a small business is sold the current insurer will consider whether to continue to provide cover; this will depend heavily on the proposed new use of the premises and the previous claims record of the new owner.

### **High risk areas where no improvements in defences are planned**

There are other locations where the risk of flooding is unacceptably high - and in some cases they have been shown to flood frequently - and no improvements in flood defences are planned. Here insurers cannot guarantee to maintain cover, but will examine the risks on a case by case basis, use their best efforts to continue to provide cover and will work with the owners of domestic properties and small businesses which they currently insure to see what action could be taken by the property owner, the Environment Agency and the local authority, which might make the property insurable in some form. This action might include the use of accredited products, flood resilient materials and temporary defences to defend the property.

### **Action from Government**

The implementation of these principles will depend on action from Government as detailed below with an annual review of progress:

actual expenditure on flood defences to meet or exceed that set out in the 2002 Spending Review;

implementation of the improvements in the system of flood defence planning set out in DEFRA's consultation "Flood and coastal defence funding review";

full implementation of PPG25 (Planning Policy Guidance on Development Planning and Flood Risk), with full reporting of the level of compliance by local authorities and consideration of administrative processes in the planned review of PPG25 in 2004;

the Environment Agency's flood asset database to be available to insurers by the beginning of 2003, and publicly available as soon as possible;

early improvements in the flood warning system, and implementation of the Cabinet Office's recent emergency planning review;

full and detailed consideration, including a benefit/cost analysis, to be given to integrated drainage management for England and Wales, similar to that in operation in Scotland;

implementation of realistic solutions to sewer flooding including increased investment in improvement programmes and adoption of water companies and sewerage undertakers as statutory consultees in the development planning process.

Source: ABI

## Comments on the ABI Statement

The government has so far refused to give in to insurance demands for changes in planning guidelines, although at the time of writing, a revised PPG 25 is being prepared. An increase in flood defence spending has been offered, but not nearly as much as the ABI had requested. Despite this, and no doubt under pressure from the mortgage lending industry, the ABI are effectively saying that its members will continue to offer insurance up to the 75-year return period hazard. If the hazard is higher than that, no cover may be available. Also, and this is quite significant, if an insurer provides cover on a house or small business premises, the cover will be available to anyone who wishes to buy that building, provided they themselves are acceptable to the insurance company (for example, no history of fraud or other convictions.) A similar principle already applies for subsidence problems. These measures will certainly help to maintain property values, because the buyer will be able to get insurance and therefore a mortgage.

It is interesting that so far as small businesses are concerned, the ABI Statement goes further than the 1961 guarantee. Retail shops were included in the 1961 insurance guarantee, so long as they were not part of a chain, but the guarantee did not cover other types of small business. The Statement would appear now to apply to any small business although the term is not defined.

However, the arrangements are to be reviewed annually, and therefore there is no guarantee that cover will be available in the future. Mortgage lenders will no doubt wish to take this into account. Insurance policies last for only a year, a mortgage could last for 25 years or more. If climate change increases the hazard, the insurer can walk away, but the mortgage lender could be left with worthless collateral.

There is anecdotal evidence that some mortgage lenders are now insisting on a new requirement. Not only must the insurance policy be transferred with the house when it is sold, but the buyer must also find a “back up” insurer prepared to write the property as new business if the tied insurer fails to maintain cover<sup>142</sup>. In any event, some householders are anxious about being able to sell their houses in the future and are too scared about losing their insurance to make a flood claim or to complain about how a claim is handled. Meanwhile, it is estimated by the ABI that there are 400,000 houses in England and Wales that are not defended against the 100-year event<sup>143</sup>. These houses would now appear to be not covered by the ABI Statement, and therefore are potentially uninsurable.

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<sup>142</sup> Holland, G., 2002. “Public Policy Issues” Post Magazine Conference on “Climate change: and insurance perspective” October 2002. London

<sup>143</sup> Milne, J., (ABI) 2002. “Public Policy Issues” Post Magazine Conference on “Climate change: and insurance perspective” October 2002. London



It is not clear how the decision was reached about the principle and detail of the ABI Statement. Certainly not all insurers were consulted, and it is likely to have arisen from a discussion only with the biggest insurers. This means that the whole market does not necessarily agree with the commitment made on their behalf by the ABI. On the other hand, the ABI was no doubt under great pressure from the mortgage lending industry to come up with some sort of guarantee of continued cover to prevent the collapse of property prices.

The guarantee applies only to properties where the flood hazard is lower than 75 years, but this figure is going to be difficult for insurers to assess, and it will change over time owing to the impacts of climate change. There is a very real possibility that most insurers will simply stick with the 100-year return period shown on indicative flood maps. This will leave the majors to pick up the higher hazard cases, thus concentrating such cases in the hands of perhaps five or six insurers, who will be free to charge whatever they want. This could not only lead to social exclusion issues, it could make those insurers vulnerable to a major flood event, or to intervention by the insurance regulator, and even suspicions of a cartel arrangement. While a cartel is unlikely, competition between insurers would effectively no longer exist in such areas, with householders at the mercy of their current insurer. Is this what the insurance industry really wants?

There seems to be a very real danger of a vicious circle situation arising where every time there is a flood, more and more citizens find themselves excluded from insurance and mortgages simply because of where they live. The situation is reminiscent of the inner city problems with crime insurance in the late 1970s when the government was forced to step in to put pressure on insurers to stop “red lining” and change their strategies. “Blue lining” for flood could have a similar result.

Is there a better and more sustainable way to solve the problems than issuing threats to government if they do not spend more on flood defences or comply with the rest of the seven conditions in the Statement? Has the insurance industry even attempted to address the planning issue where it matters, that is at a local level, by talking regularly face to face with the local authority planning decision makers?

This is what the author has been doing in Scotland, with some success, thanks to a positive response from the Scottish Executive and local councils. Most Scottish Local Authorities have now adopted some or all of the “Insurance Template” in their planning strategies. The template is a measure of the level of flood frequency which insurance companies would normally be able to underwrite at normal terms. In other words most Scottish local authorities will not now allow new housing to be built in areas where the flood hazard is unacceptable to insurers. The irony is that it is despite what has been achieved already in Scotland to manage flood hazards, continuation of flood insurance in Scotland and Wales appears to be entirely dependent on what happens in England. The partnership between insurers and government in England may have broken down because of government’s failure to respond to insurers needs, but if the partnership between insurers and government breaks down in Scotland, it will be entirely the fault of the insurance industry.

## Impact on property values

Thanks to insurance, flooding has so far not had a major impact on property values. Values may fall immediately after a flood, but once the area has been cleaned up and houses repaired, the values start to recover. Indeed in some cases values can be enhanced because the repairs make the houses look as good as new.

The author is not aware of any detailed research on the impact on property values of a flood event in Britain, although some research has been carried out in Australia<sup>144</sup>. Intuitively it would seem likely that if insurance is not available then this must have an adverse effect on property values, if only because of problems in obtaining a mortgage. Further research is needed, and potential loss of value should be taken into account in calculating cost benefit appraisals for new flood defences.

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<sup>144</sup> Yeo, S., 2002 *"Effects of Disclosure of Flood-Liability on Residential Property Values"* published by Risk Frontiers Natural Hazards Research Centre, Macquaire University, Australia. Available for downloading from <http://www.es.mq.edu.au/nhrc/web/yeopropertyvalues/propertyvaluereport.htm>

## Why is Scotland Different?

Figure 7: Uckfield, October 2000. Courtesy of Alan Thompson, Symonds Group Limited



Scotland is very different from England, both geographically and politically. One of the aims of this report is to argue that Scotland is better prepared for flooding, and that the action taken since the floods of 1993 and 1994 in Scotland, and particularly since Devolution in April 1999, makes Scotland a better flood insurance risk than England and Wales. This does not mean that Scotland is immune from flooding; the events of July 2002 demonstrated that. However, this flooding was mainly due to drainage surcharge caused by the unusually high levels of rainfall in Scotland in the first six months of 2002, and especially during June to August<sup>145</sup>.

There are a number of reasons why the position in Scotland is very different from England and Wales. First of all, it has a much smaller population at risk of flood than England. According to research commissioned by the ABI<sup>146</sup>, in England and Wales there are now some 907,000 residential and non-residential properties in the inland

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<sup>145</sup> August 2002 "Hydrological Summary for the United Kingdom" produced for the National Water Archive by the Centre for Ecology and Hydrology,(CEH) Wallingford, with data from the Met Office, Bracknell. Published by CEH, Wallingford.

<sup>146</sup> Entec Ltd and JBA Ltd, with contributions from Crichton, D, and Salt, J, (October 2000) "Inland Flooding Risks. General Insurance Research Report No 10" Association of British Insurers, General Insurance Research Report 10, London.

floodplain. By 2010, the figure could have increased by 110,000 to 1,017,000. The current figure of 907,000 is already 12 times higher than the corresponding Scottish figure of 74,700 such properties, according to the ABI report. (A later report for the Scottish Executive<sup>147</sup> gives a figure of 71,402 residential properties and 5,789 commercial properties.)

The above figures do not include properties at risk of coastal floods: there are no accurate figures for these in the public domain, only figures for numbers of properties below the 5 metre contour. This is not an accurate measure because:

- It does not take sea defences into account
- The five metre contour is itself not very accurate
- It does not take into account the differences in tidal range around the country
- It does not take into account differences in storm surge heights around the country
- It does not take into account the effects of bathymetry

#### **Coastal Zone Mapping**

There is a need for better mapping of the coastal zone. There is an important project running at present with Ordnance Survey, British Geological Survey, and the UK Hydrographic Office to integrate coastal zone data. The project is called "ICZMap" (Integrated Coastal Zone Map) and is funded directly by the Cabinet Office through the Treasury. The project is on target to produce pilot test data in three areas by November 2002. One of the areas is the Firth of Forth, the others are in England. The project was completed in April 2003, and "pilot" data sets were issued to selected organisations for testing. If the testing is successful and if funds become available hopefully they will go on to produce a map for the whole of the UK, covering the coast up to 5km inland and 20km out to sea. (For more information, see [www.ICZMap.com](http://www.ICZMap.com) )

It is clear that coastal flooding could be a major and growing problem in England. The main cause for concern regarding coastal flooding would be a repeat of the 1953 storm. However the storm which devastated the East Coast of England and cost 304 lives on land, did not result in any land based deaths in Scotland, although 17 trawlermen and two lifeboatmen died at sea<sup>148</sup>. This is partly because for storms from the North, the narrowing of the North Sea as the storm moves south causes surges to become more

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<sup>147</sup> Werritty, A., Black, A., Duck, R., Finlinson, W., Shackley, S., Crichton, D., "Climate Change, Flood Occurrences Review." Scottish Executive Environment Group Research Program Research Findings No. 19. Scottish Executive, Edinburgh. Available from [www.scotland.gov.uk/cru/resfinds](http://www.scotland.gov.uk/cru/resfinds)

<sup>148</sup> Hickey, K. R., "The Storm of 31 January to 1 February 1953 and its Impact on Scotland" Scottish Geog. J. 117(4), 283-295

severe. As it is, storm surges in Scotland could be bad enough, with the latest research showing that by 2100, the 100-year return period storm surge could be around 4 metres in the East Coast and 3.6 metres on the West Coast of Scotland<sup>149</sup>. The author is not aware of similar detailed research for England and Wales, but the Met Office chart shown as figure 4 earlier indicates that the worst storm surges will be in the South East of England.

Secondly, the Scottish figure for properties in flood hazard areas is relatively static, not rising rapidly, as in England. Cambridge Econometrics<sup>150</sup> estimate that in Scotland there will be a surplus of 202,000 homes by 2010 due to household growth of only 78,000 in ten years. The Scottish Executive<sup>151</sup> estimate a household growth of 260,000 by 2014, but whichever figure is correct, there is plenty of safe land available in Scotland to accommodate such growth rates without resorting to floodplains. This means that the ratio between Scotland and England of properties in flood hazard areas could rise to 14 or more within the next eight years.

Thirdly, Scotland is taking effective action in a number of areas, as set out below.

## Flood defences

In the 40 years before Devolution in 1999, only 60 flood defence schemes were approved in Scotland<sup>152</sup>. Since Devolution, local authorities have been actively encouraged to introduce flood management schemes. In 2001, there were more than 60 new schemes approved and in the pipeline in Scotland, costing some £29.5m<sup>153</sup> in central grants alone.

The amount spent on flood defences in Scotland has been substantially increased, and by 2001, was running at almost three times the 1999 levels<sup>154</sup>. Since Devolution, grant aid for flood defences has never been refused on the grounds of lack of money. The grant aid budget is simply topped up as required. This needs to be borne in mind when comparing Scotland and England: in Scotland, spending is effectively unlimited, provided the cost of the project is less than the cost of a flood (calculated in insurance claims terms) and provided the project gives adequate protection. The amount of

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<sup>149</sup> Dawson, A.G., Smith, D.E., and Dawson, S. 2001 *"Potential Impacts of Climate Change on Sea Levels Around Scotland"* Scottish Natural Heritage, Edinburgh.

<sup>150</sup> Regional Economic Prospects: July 2002. Cambridge Econometrics, 2002.

<sup>151</sup> Housing Statistics, July 2002. Scottish Executive

<sup>152</sup> Elliot Morley, Westminster Hall Debate on Flood Defences, 10<sup>th</sup> July 2002.

<sup>153</sup> Scottish Executive senior official, 2002. Personal communication.

<sup>154</sup> Scottish Executive senior official, 2001. Personal Communication

protection required can vary on a case by case basis, but increasingly the 200 year standard of service seems to be becoming the minimum. Projects in Scotland must also take climate change into account.

Annual capital spending by the Scottish Executive was more than doubled in 2002 to £8.5m, and further major increases are planned for each year at least until 2004, by which time annual capital spending should reach £10m.

This is effectively doubled, because normally the Scottish Executive pay a 50% grant and give the local authority consent to borrow the remaining 50% so the local council does not need to use its capital budget. In addition, the local authority can spend money directly from its own capital budget and this is usually on smaller schemes, which are not eligible for a central grant. In oil rich Shetland Islands, the Council has funded many flood protection schemes, and will even provide grants to individuals for coastal flood protection. (It is interesting to note that the UK Crown does not own the foreshore in Orkney and Shetland, which operates a 'udal' legal system rather than the 'feudal' system. This means that in most cases the foreshore is privately owned down to the lowest astronomical tide.)

Local authority spending on flood defences varies enormously from one area to another, and it is fairer to just look at central grant aid, in making comparisons between Scotland and England.

£29.5m for 60 projects may seem low compared with DEFRA's capital budget, but if one were to multiply Scotland's spend 12 times to allow for the different number of people at risk, the comparable budget figure for England would be £354m. That is nearly the capital amount spent in England in the two years since the Autumn 2000 floods and more than three times the planned central grant aid from DEFRA for 2002-2003. Similarly, England would have 720 schemes in the pipeline if it was doing as well as Scotland; instead it has approved only 274 in the two years since the floods in 2000, and many of these were for the reinstatement of defences damaged in these floods.

Another factor to consider is relative sea level rise and climate change. Due to natural factors, most of the land in Scotland is rising, while the south east of England is sinking, as the following table shows:

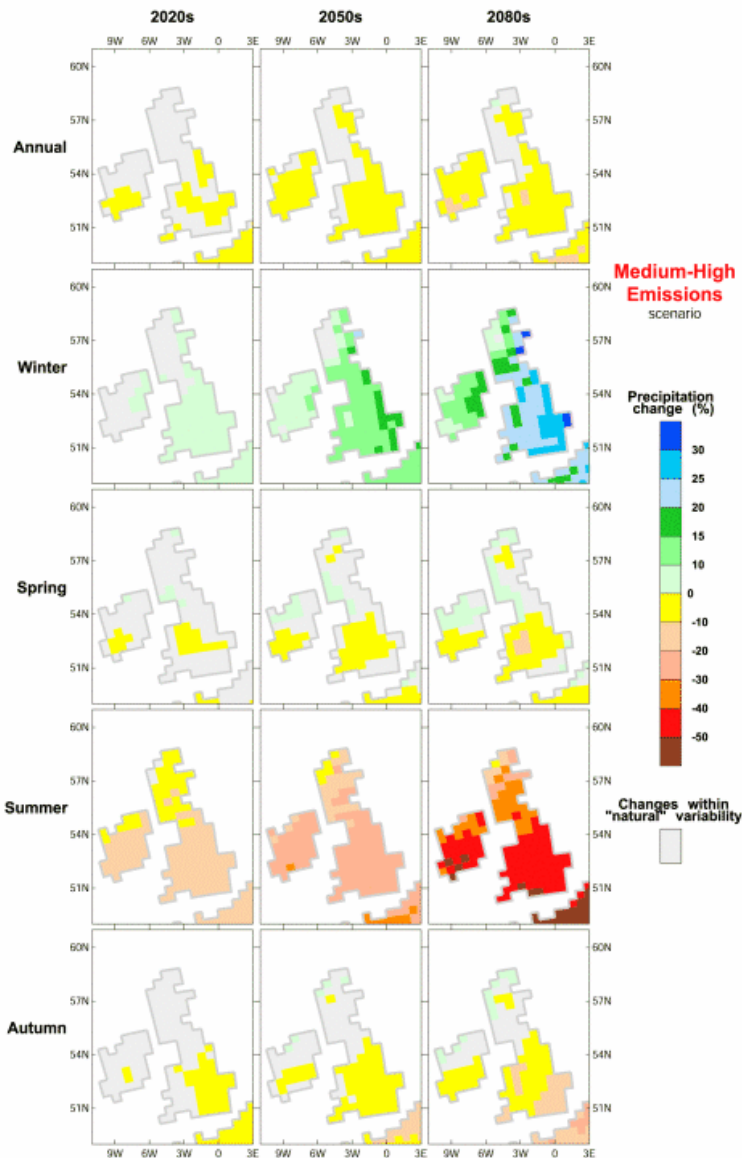
Table 6: Vertical Land Change and Sea Level Change. Source: UKCIP, 2002 Scenarios Report

Area	Vertical Land Change (mm/year)	Total Sea Level Change (mm) by 2080s
NE Scotland	+ 0.7	+ 610
SE Scotland	+ 0.8	+ 600
SW Scotland	+ 1.0	+ 580
Wales	- 0.2	+ 710
Yorkshire	- 0.5	+ 750
London	- 1.5	+ 860

This means that coastal defences in Scotland are not as badly threatened by sea level rise as in England and Wales.

Similarly with precipitation scenarios, Scotland will not be as badly affected in the future by climate change as England (see figure 8.)

Figure 8: Change in winter precipitation under the Low and High Emissions Scenarios for the 2050s and 2080s. Reproduced with the kind permission of the UK Climate Impacts Programme



Source: UKCIP02 Climate Change Scenarios (funded by DEFRA, produced by Tyndall and Hadley Centres for UKCIP)

Scotland has a different system for the cost benefit appraisal of new flood and coastal defence projects. The main criteria are that the design standard is high enough and that benefits exceed costs. Benefits in this case are of course mainly the savings in costs of damage caused by floods. There are three main differences between the different systems:

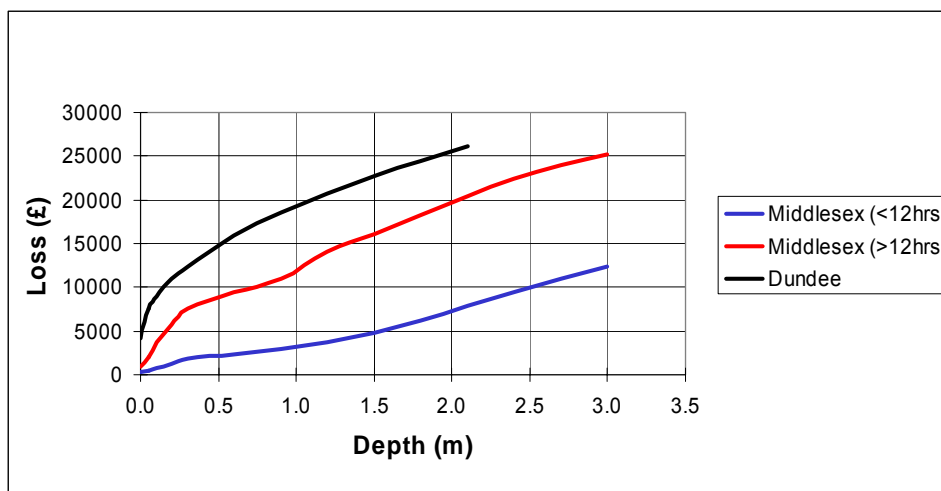
1. In Scotland, insurance claims data can be used to calculate benefits, using the National Flood Insurance Claims Database, (the "Dundee Tables")



produced by the University of Dundee<sup>155</sup>. These show financial benefits figures based on an analysis of thousands of actual insurance claims. In England and Wales, benefits are based on the economic costs of floods modelled by Middlesex University Flood Hazard Research Centre to the government's specification. This does not mean that the Middlesex figures are wrong, simply that they are calculated on a different basis, as laid down by the government.

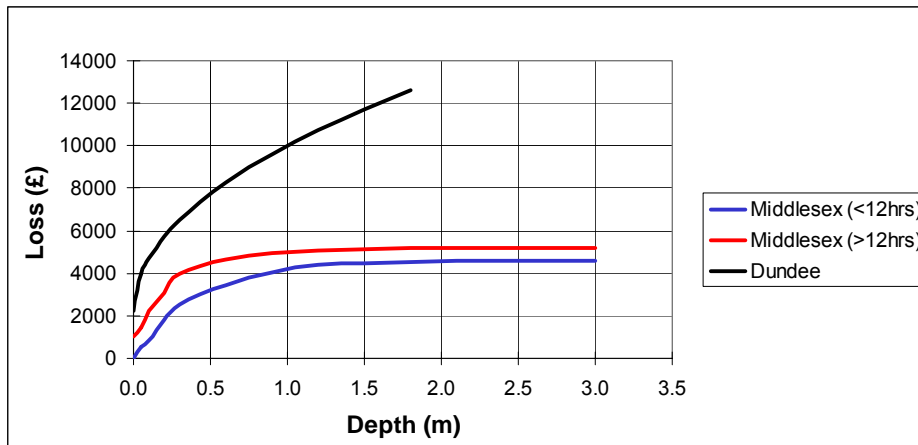
2. Another aspect arising from the economic losses basis is that unlike insurance data the costs of a flood are not calculated on a new for old basis. For example in England and Wales it is assumed that if your five-year-old carpet is damaged by flood, you will replace it with another five-year-old carpet instead of a new one. In Scotland, the actual costs on a "new for old" basis can be used for appraisals. It also means that, for example, in the English system if a town has two supermarkets, and only one is at risk of flood, only the direct damage to the supermarket can be included in the benefits, not the business losses, because people can always go to the other supermarket. The effect of these two aspects is to give figures that are considerably lower than the actual financial costs (see figures 9 and 10).

Figure 9: Domestic buildings property damage loss curves



<sup>155</sup> Tables published by the University of Dundee, based on a database of thousands of flood claims from the top 25 UK insurance companies. See Black, A and Evans, S (1999) "Flood damage in the UK: New insights for the insurance industry." University of Dundee. ISBN 0 903674 37 8. Dundee, Scotland.

Figure 10: Domestic contents property damage loss curves



3. In addition to the above, in Scotland, benefits simply have to exceed the costs of construction of the flood defence scheme, whereas in England and Wales, the benefits of a flood protection scheme must be three to five times greater than costs.

The Scottish system can actually mean that a number of sites might qualify for grant aid for a flood defence or management scheme, so a further refinement has been developed in Scotland to prioritise each competing site, so that the most deserving is dealt with first. Such a system is used in Stirling, for example, where consultants have developed a “prioritisation formula”. This formula is copyrighted and cannot be reproduced here, but the author has independently created a different set of criteria for assessing priorities.

The panel contains the author’s own version of a prioritisation scheme.

#### Prioritising flood management schemes

The Scottish Executive’s cost benefit appraisal requirements are such that a council in Scotland may have a number of potential sites where flood management schemes are likely to meet the requirements for a capital grant. Instead of ranking them purely by economic benefits, councils could consider the following criteria in turn:

1. Is there a risk to human life? For example hospitals, sheltered housing, or any housing beside rivers which can flood quickly with very little warning.
2. Is there a high risk of trauma or despair? For example social housing, or housing with a high proportion of elderly people, or single parent families. Such residents can be more vulnerable, especially as a high proportion of people may be uninsured.
3. Is flooding frequent?
4. Is there a good flood warning system?
5. Is there a need to protect access routes for evacuation or emergency services?
6. Are there a large number of properties likely to be affected?
7. Are there any businesses particularly vulnerable to flooding, for example the food and drink industry, or electronics. In such cases, stock is more easily damaged, and the cleaning up process has to be more thorough.

In England and Wales, they do not have the luxury of the Scottish system, and have to ration projects using a complex set of decision rules (see “The Priority Problem” earlier). Even where this rationing allows a defence to be funded, it is often at a reduced standard of protection. For example, the recent Windsor/Maidenhead relief river scheme which was opened in Summer 2002, and named the ‘Jubilee River’. This scheme is designed to a surprisingly low 1 in 60-year event standard, despite the catastrophic floods there in 1947, or the fact that since 1947, there are now twice as many houses in the flood hazard area. As the ABI Statement only guarantees flood insurance if the hazard is less than the 75-year return period, these houses could be uninsurable despite the multi million pound new relief river scheme. The new Defra priorities will make such situations more common (see “The Priority Problem” section earlier).

In Scotland new defences are now typically designed for much higher standards of service. These will vary on a case to case basis, but to obtain grant the scheme must have a minimum of a 100 year standard of service, plus freeboard, plus an allowance for climate change. In practice the usual standard of service is often much higher, usually around 200 years. Standards do tend to be increasing, as local authorities take on board the recommendations of a Scottish Executive research report on the need for design standards for defences to take into account climate change<sup>156</sup>. (There is no comparable research for England and Wales.)

The Scottish Environment Protection Agency (SEPA), unlike the EA, is not charged with the bureaucratic burden of seeking funds for defences, but simply provides statutory advice on flood risk within the planning process. The Scottish Executive actively encourages local authorities to promote flood management schemes. This is a good incentive for local authorities to prevent development in areas at risk of flood, because they know that they themselves will have to incur the cost and effort of building a flood defence.

One aspect of flood defence spending is that it is very vulnerable to other demands on the public purse. This is perhaps more of a problem in England, where the Treasury has additional calls on its budgets, such as defence, which do not arise in Scotland. Thus if the Ministry of Defence needed additional funds, for example for a campaign in Iraq, the flood defence budget in England might suffer, while the Scottish Executive budget might be less vulnerable.

## **Coastal Zone Management**

In 2002, the Scottish Deputy Environment Minister, Allan Wilson stated that

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<sup>156</sup> Price, D.J., and McInally, G. 2001: “Climate Change: Review of Levels of Protection Offered by Flood Prevention Schemes.” Scottish Executive Central Research Unit Report No 12. Edinburgh, May 2001.

“Scotland can proudly claim to be one of the leaders in addressing coastal management within Europe”.

“Within this latter initiative [Firths Initiative] we currently have a system of voluntary partnerships originally set up for our major Firths but developing to cover other areas where a need is recognised. This consensus-based approach has proved invaluable to coastal management and the partnerships have achieved a great deal. They deserve wide recognition of that fact.”

## Planning and the “Insurance Template”

The Scottish Executive recently published a review of flooding risk in Scotland<sup>157</sup> which highlighted the importance of land use planning in adaptation policies, particularly in adapting to the increased risk of flooding due to climate change. An awareness of the importance of planning as an adaptation tool does not seem to have been recognised to the same extent in England or Wales.

When comparing the different approaches to planning between Scotland and England, one important measure stands out, namely the existence in Scotland of Flood Liaison and Advice Groups<sup>158</sup>.

Most Scottish local authorities, including all with a potentially serious flood hazard, have set up “Flood Liaison and Advice Groups” in line with the recommendations of the relevant planning guideline<sup>159</sup>, and these now cover more than 90% of the population (see the panel at the end of this section).

The planning guideline recommends that Flood Liaison and Advice Groups should include a representative from the insurance industry, and the author is a member of all of them. He has been funded by the insurance industry since 1995 to represent insurance interests in considerations about planning strategy, flood defence work and maintenance of watercourses. Local authorities have all responded very positively and have accepted that they have a duty not to put people in danger by allowing inappropriate developments in flood hazard areas. Most have also accepted some or

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<sup>157</sup> Entec, University of Dundee, and Crichton, D. (2002) “*Climate Change: Flooding Occurrences Review*” Scottish Executive Central Research Unit. This also includes a copy of part of the insurance template (see below).

<sup>158</sup> Association of British Insurers, 1999 “*Land Use Planning and Insurance Risks*” ABI General Insurance Research Report No 4. ABI, London

<sup>159</sup> Scottish Office, 1995. “*National Planning Policy Guidelines; 7 - Flood*” (NPPG 7), Scottish Office, Edinburgh. (Advice given by the author on behalf of the ABI was incorporated into the guidance.)

all of the elements of the “Insurance Template”<sup>160</sup> (© Crichton, 1998) even if it is only the 200 year return period standard for housing.

A full copy of the template appears as Appendix 1, and an extract appears in the panel.

### The Insurance Template

Extract from the residential property section of the ‘insurance template’

Type of housing	Standard of protection Return period
Sheltered housing, and homes for the disabled and elderly	1,000 years
Children’s homes, boarding schools, hotels, hostels	750 years
Basement flats	750 years
Bungalows without escape skylights	500 years
Ground floor flats	500 years
‘Flashy’ catchments (little or no flood warning available)	500 years
Bungalows with escape skylights	300 years
Caravans for seasonal occupancy only, provided adequate warning notices and evacuation systems are in place	50 years
All other residential property	200 years

Return period up to the year 2050 in each case, taking climate change into account

© D. Crichton, 1998

This template provides the only consistent national standard of what levels of flood risk are acceptable to insurers, by showing what levels of risk can be insured at normal terms. (A copy of the template had appeared in the first draft of the new English planning guideline, PPG 25, but it was deleted from the second draft.) One advantage of the adoption of the template by many authorities is that it has produced a greater

<sup>160</sup> An extract from this template also appears in the publication “*Development and Flood Risk – ABI Guidance*”. This publication closely follows the author’s guidance notes for Scottish Councils and the ABI have sent it to all local authorities in Britain. A copy can be downloaded from the ABI web site ( [www.abi.org.uk](http://www.abi.org.uk) )

level of consistency and definition in planning strategies across Scotland. Previously, most planning authorities did not state any particular return period for flood risk for example, and where they did, it was generally 50 or 100 years. If the template or something like it, were to become a universal standard amongst councils, it would mean that property developers would be able to operate on a level playing field, and this would reduce the problems of developers playing one council off against another. Amy Tavendale, a researcher at Leeds University, conducted a survey of Scottish Local Authorities in July 2002, and found that more than 50% of respondents had incorporated the template in their strategies, or intended to do so.

It is interesting that while developers have been invited to Flood Liaison and Advice Groups since 1995, it is only in the last four years that they have started to send representatives, and this could well be a sign that the insurance template is making a real difference. Now that they are attending, this gives the members of the groups the opportunity to explain the extent of the flood problem and why it must be taken seriously.

The new Scottish Planning Policy for flood, SPP 7 was published in 2004 and contains a risk framework which is entirely consistent with the insurance template.

#### **Return Periods**

The Insurance Template refers to return periods in terms of years. It has become fashionable for government and academics to say that it is wrong to talk about flooding with a "100 year return period" because they say that people will assume this means that if they are flooded, they think that they will not be flooded again for another 100 years. They argue that instead we should talk about a 1% probability, or a 100 to 1 chance, because people understand that better.

This seems to the author to display a rather patronising approach to flood victims. They are probably more aware than anyone else that if they have been flooded once, there is a possibility that they will be flooded again, perhaps even in the following week or two (as many were during autumn 2000). Indeed, when a property has been flooded, there is a very good chance of it being flooded again quite quickly, because the ground will be waterlogged, the rivers still full, and possibly the defences still damaged.

The author has spoken to a great many people about this point, and finds that no one has ever had any difficulty in appreciating that a 100 year return period does not mean that the event need not happen regularly every 100 years. He therefore makes no apology for using the terminology.

In the first part of this report, some figures were given about the growing number of properties that were being built in England and Wales, despite EA objections on the grounds of the flood hazard. The reader may well be interested in the corresponding figure for Scotland. The answer is simple; while 27% by value of new building in England and Wales is against EA advice, the corresponding figure in Scotland is zero. SEPA have never officially objected to any development on the grounds of flood risk.

This does not mean that there are never any cases where the flood issue causes concern.

SEPA usually works by persuasion, often with the help of the relevant flood appraisal group. Flood Liaison and Advice Groups have helped to enable issues to be resolved in a non-confrontational way in Scotland, because all the stakeholders meet regularly and can discuss the issues in a spirit of co-operation.

While theoretically SEPA has the power to object, as at February 2005, SEPA staff have never felt the need to raise an official objection against a development on the grounds of the flood hazard, partly because the simple use of the word “object” in Scotland could automatically trigger a Planning Inquiry. On the other hand, the absence of any objection by SEPA to the proposed development does not imply approval of it. In order to clarify the position, a protocol was agreed between SEPA and Scottish Councils in September 2000, under which SEPA sets out guidance on how their statements should be interpreted. This protocol saves SEPA from having to use the “O word”, but the protocol also explains how SEPA can still trigger notification to Scottish Ministers who may then call in the application.

The system works well; it is efficient, effective, and minimises confrontation.

Table 7

Authority	FLAG?	Population	Total Properties	Coastal Properties below 5 m	Inland Properties at risk
Aberdeen City	Yes	212,650	104,543	571	309
Aberdeenshire	Yes	227,440	95,174	1,743	2,219
Angus	Yes	109,840	49,828	6,639	1,750
Argyll & Bute	Yes	89,730	45,191	5,748	1,172
Clackmannan	Yes	48,530	21,170	533	219
Dumfries and Galloway	Yes	148,800	65,939	2,854	2,518
Dundee City	Yes	144,430	74,032	1,476	348
E. Renfrewshire	Yes	89,280	36,075	0	409
East Ayrshire	Yes	120,940	52,497	0	3,118
East Dunbartonshire	Yes	110,890	45,966	0	1,288
East Lothian	No	90,430	39,505	6,099	1,127
Edinburgh City	Yes	451,710	222,246	2,241	8,861
Falkirk	Yes	144,370	64,382	4,406	7,997
Fife	Yes	349,200	162,013	2,939	1,097
Glasgow City	Yes	611,440	302,065	14,904	11,944

Highland	Yes	208,800	110,068	11,068	3,482
Inverclyde	Yes	85,190	40,479	2,042	38
Midlothian	D	81,680	33,193	0	130
Moray	M	85,210	54,967	3,780	5,355
N. Lanarkshire	Yes	327,940	136,935	0	658
North Ayrshire	Yes	139,410	62,951	4,590	2,973
Orkney	No	19,600	9,269	89	No data
Perth and Kinross	Yes	134,030	64,882	1,193	5,205
Renfrewshire	Yes	177,230	86,749	5,771	5,146
S. Lanarkshire	Yes	307,520	129,386	0	1,023
Scottish Borders	Yes	106,400	50,649	181	4,394
Shetland Islands	Yes	22,740	9,891	No data	No data
South Ayrshire	Yes	114,250	50,112	7,119	490
Stirling	Yes	85,220	36,228	2,361	1,377
West Dunbartonshire	Yes	94,980	43,890	2,755	2,364
West Lothian	Yes	154,880	65,647	2,378	163
Western Isles	No	27,560	13,540	347	No data

#### Notes:

**Column 2:** "Yes" means the council is represented on one or more flood appraisal groups to which the author is invited. "M" means an internal group with no stakeholder representation. Note that for the Strathclyde area, the author also attends the overarching flood appraisal group, which covers all the authorities in the former Strathclyde Region, and three catchment based flood appraisal groups.

**Column 3:** Population figures estimated as at 30th June 1999, source, Statistical Group, Scottish Executive

**Column 4:** The total number of properties in the Council's area.

**Columns 5 and 6:** The maximum number of properties potentially at risk from coastal or inland flood, not taking flood defences into account. The figures are from Scottish Executive Research Report No 19 (May 2002). The coastal figure refers to the number of properties below the 5-metre contour, rather than properties identified as being at risk. The figures do not take composition of property into account, for example flats compared with houses.

As at March 2005, there are 18 flood appraisal groups in Scotland, several of which are established on a catchment basis involving all the relevant local authorities. Dumfries and Galloway and the Scottish Borders also invite representatives from adjoining English councils.

The 18 groups are listed below:



#### **Full Groups with insurance representation**

1. Almond River (West Lothian, Edinburgh City)
2. Angus
3. Argyll and Bute (coastline longer than France)
4. Ayrshire (South, East, and North Ayrshire Councils)
5. Cart River and Lower Clyde (Glasgow City and Renfrewshire)
6. Clackmannan
7. Dumfries and Galloway “DAGFLAG”
8. Dundee, City of
9. Edinburgh, City of
10. Falkirk
11. Fife
12. Highland
13. Kelvin River and Forth/Clyde Canal. (N. Lanarkshire, E. Dunbartonshire, Glasgow City)
14. North East Scotland “NESFLAG” (Aberdeenshire and Aberdeen City)
15. Perth and Kinross
16. Scottish Borders
17. Shetland Islands
18. Stirling

The only Scottish planning authorities without an involvement in a FLAG which meets the requirements of the Scottish Executive are:

1. East Lothian
2. Moray
3. National Parks
4. Orkney
5. Western Isles

These represent less than 2% of properties at risk of flooding in Scotland. Almost all of these are in Moray.

In fairness it has to be said that while almost all councils in Scotland have made great progress in reducing flood risk, there is one exception. Despite the author’s efforts, and the strong recommendations from the Scottish Executive, Moray, which has the worst record for flooding in Scotland, does not have a Flood Liaison and Advice Group. It

regularly suffers from summer floods, and was the main area affected by the Great “Muckle Spate” in August 1829.

Although little known, “The Muckle Spate” (“Big flood”) was the biggest flood ever recorded in Scotland. It devastated much of the North East of Scotland, and particularly Deeside and Moray. The severity of the flood is hard to imagine: for example, the level of the River Findhorn rose by 50 feet, giant boulders weighing over 8 tons were washed aside, and many bridges were destroyed. It is reckoned to have been a 500 year return period event, caused when three powerful weather fronts converged over Moray. A local clergyman described the weather conditions as being “like the ordnances of heaven being let loose, the lightning was like liquid fire filling the sky.”

Despite its severity, there were only eight deaths. There is a detailed contemporary description in the book “An account of the floods” by Sir Thomas Dick Lauder. This is long out of print although two copies are held in Elgin public library.

Heavy floods in the summer are relatively common in Moray, and in recent years these have caused a lot of damage because of the rapid increase in the number of properties being built in the flood plain<sup>161</sup>.

Some of the most serious floods in Moray have occurred in July or August:

- 1956 (twice)
- 1957
- 1958
- 1970
- 1978
- 1982
- 1997
- 2004.

These are in addition to winter floods which have also been serious, but due to different weather conditions, such as snowmelt. In almost every case, damage is confined to buildings constructed since the 1960s, and located in the floodplain. (Moray is almost the only Scottish council which ignores insurance recommendations in its planning decisions). Because of this increase in exposure, another Muckle Spate would be a

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<sup>161</sup> Crichton, 2004. “Flood risks in the former Grampian Region since Devolution” WWF Scotland, March 2004. Download from: [http://www.wwf.org.uk/filelibrary/pdf/grampian\\_flooding\\_report.pdf](http://www.wwf.org.uk/filelibrary/pdf/grampian_flooding_report.pdf)

much more serious matter than even the 1829 event, especially as many businesses and households can no longer obtain flood insurance in the area.

## Legislation

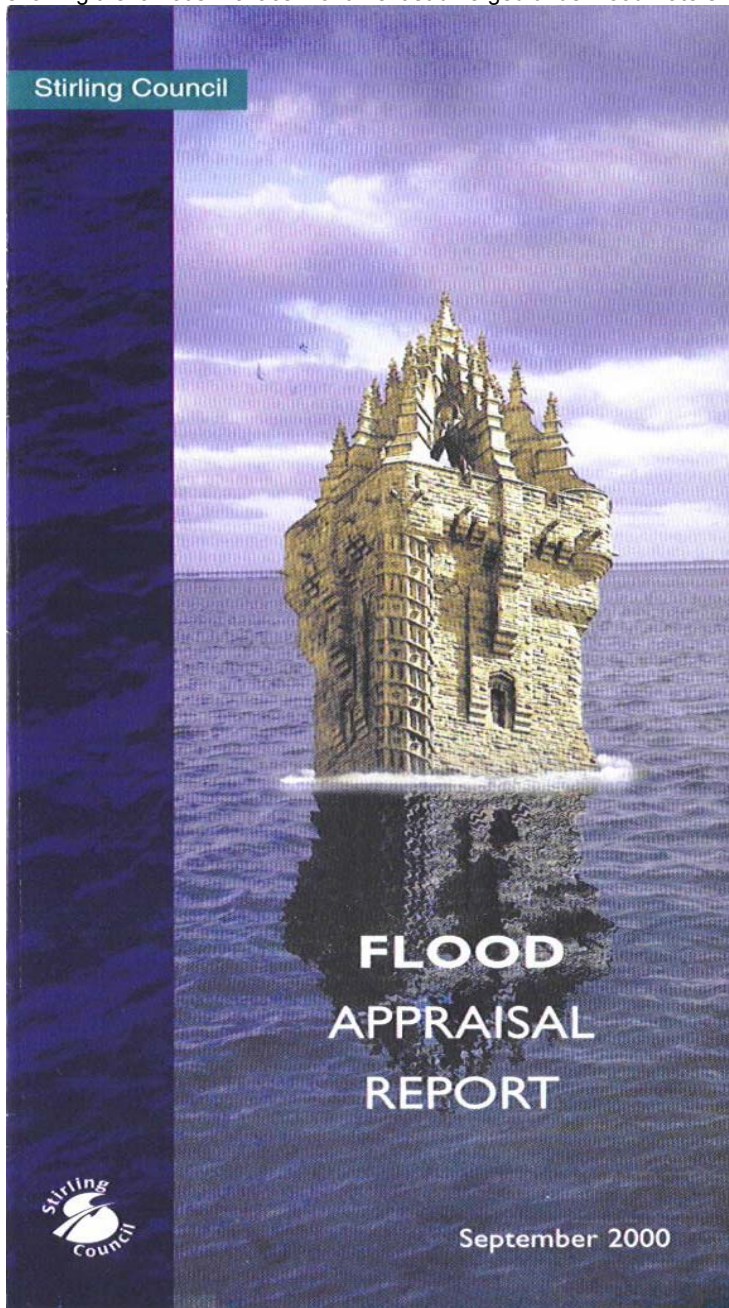
The Flood Prevention and Land Drainage (Scotland) Act 1997 imposes a clear statutory duty on local councils to maintain watercourses, initiate flood defence projects, and issue reports every two years on all flooding problems and what they are doing about them. There is no similar legislation in England. The Act could potentially give rise to a legal liability on the part of the Council to compensate flood victims or their insurers. The first such case was announced in September 2002<sup>162</sup>, and is currently sub judice, so the author is not at liberty to give details at the time of writing. According to press reports in September, it will involve a consortium of insurers and loss adjusters seeking to recover between £50m and £70m in damages from Edinburgh City Council in respect of flood claims payments arising from the April 2000 floods.

For some years, the author has made most Councils in Scotland very aware of their potential liabilities through discussions in Flood Liaison and Advice Groups, and they take their duties seriously. Each has a duty to publish reports every two years under Section 6A of the Act, showing all flood events in their area since the last report, along with details of properties affected, causes of the flood, and what action they are taking to prevent a recurrence. Most of these reports are very detailed and demonstrate that most local authorities are working hard to ensure that watercourses, drainage channels and culverts are properly maintained. . The reports provide a wealth of free information which can help insurers to review their strategies for insuring properties in a council's area. Increasingly the full reports are being published on the councils' web sites.

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<sup>162</sup> "Leith flooding sets off £50m court battle" Sunday Times, (Scottish Edition) 8<sup>th</sup> September 2002.

Figure 11: Front cover of Stirling Council's Section 6A Flood Prevention Report issued in 2000 showing the famous Wallace Monument submerged under flood waters.



## Surface water drainage and sewer overflows

Sewage overflows are a problem in Scotland, as they are in the rest of Britain, but again Scotland seems to be doing more to tackle the issue. Scotland did not privatise its water industry, so instead of a number of private water companies dealing with the problems in England and Wales, in Scotland there is a single water authority (Scottish Water).

In some ways, sewage overflow could be seen as the biggest flood problem in Scotland, simply because floodplain floods (as defined by the indicative floodplain maps supplied by CEH) have been relatively rare in recent years. Indeed, since the Elgin/Moray floods in 1997, all the major flooding events in Scotland have been predominantly drainage related<sup>163</sup>. For example, as mentioned previously, the Boxing Day storm in 1999, where only 40 out of 240 claims were within the CEH floodplain, or the April 2000 floods in Edinburgh, where, according to an unpublished report for the ABI by the Centre for Ecology and Hydrology, less than 600 out of nearly 2,400 claims were in the CEH floodplain. (However, this figure is almost certainly inaccurate due to errors in the insurance claims datasets supplied to CEH. It is firmly denied by the City of Edinburgh Council's hydrologist<sup>164</sup> who has carried out a detailed survey of flooded areas in Edinburgh.)

Research in Scotland<sup>165</sup> has suggested that the number of sewer surcharge events could increase dramatically due to climate change – as much as 20% in Edinburgh by 2080, (45% in Fort William). Similar research has only just started in England, but in the meantime, Scottish Water has already committed an additional £270m over the next four years to upgrade sewers in Scotland<sup>166</sup>.

Scottish Water is very active in Flood Liaison and Advice Groups in Scotland, which gives them the opportunity to work closely on flooding issues at a local level with the planning community and SEPA. (It also gives the author opportunities to safeguard insurance industry interests.)

Scottish Water are well aware of the problems they face. The Asset Management Director of Scottish Water said recently:

"Scottish Water is acutely aware that it has inherited sewers – some dating back to Victorian times – which for years have had little or no investment. These are now in critical need of upgrading and replacement.

"However, it has to be stressed that the flooding which hit parts of Glasgow in July was due to an exceptional rainfall event which no sewerage system is designed to cope with. The entire month of July's rainfall fell in just 10 hours and the storm was assessed as a one in a 100-year event.

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<sup>163</sup> ABI flood seminar, July 2002

<sup>164</sup> Alvin Barber, Edinburgh City Council Hydrologist. Personal communication.

<sup>165</sup> Futter, M and Lang, I (2001) – Montgomery Watson "Implications for Scotland of Recent Developments in Design Rainfall Estimation and Climate Change" Scottish Wastewater Planning Users Group (WaPUG) Meeting 12th June 2001, Dunblane (see [www.mw.com](http://www.mw.com))

<sup>166</sup> Scottish Water Press Release, 12<sup>th</sup> September, 2002.

"But as the climate changes, flooding events of this severity can be expected. It must be recognised that although Scottish Water cannot prevent flooding single-handedly, by working more closely with local councils, the Scottish Environment Protection Agency and other key organisations we can, together, look at addressing flooding problems both in the short and longer term."

## **Sustainable Drainage Systems (SUDS)**

Earlier in this report, the author outlined the importance of the SUDS initiative and its benefits for drainage systems. One of the biggest problems of SUDS is the question of who is responsible for maintenance after a scheme has been installed? Scotland has the benefit of a framework agreement between Scottish Water and local authorities as to the division of maintenance responsibilities for SUDS. There is no similar agreement in England and Wales, although CIRIA has been attempting to produce one.

In Scotland there is specific provision under the Water Environment and Water Services Act 2003 for Scottish Water to take over the maintenance of SUDS schemes at a future date, when they have finished producing a technical specification for SUDS which can be agreed by all stakeholders. This maintenance work will be funded by the Scottish Executive.

Even though SUDS was not part of the original remit of flood appraisal group meetings, in practice, the subject has been discussed in great depth at many of the regular flood appraisal group meetings in Scotland over the last two years. This has had great value in encouraging and helping local authorities introduce SUDS correctly. Scottish Water and SEPA have been able to address the problems and queries raised by local authority staff, and the author has been able to influence the way in which SUDS have been adopted to protect the interests of insurers. The author is, however concerned that the many questions and misconceptions which have been resolved in Scotland through flood appraisal group discussions may still exist in England and Wales, where planners do not have the benefit of regular meetings with experts who can give advice and spread best practice. (It is interesting that while SEPA seem to be mainly concerned about water quality issues, the Environment Agency is equally concerned about using SUDS in the context of flood alleviation. It is certainly an important factor in any consideration of flood issues, and it seems to the author perfectly appropriate as a topic for flood appraisal group meetings.)

The author is a member of the North East Scotland Flood Appraisal Group (NESFLAG) which has produced a guidance note booklet for developers and regulators which contains helpful advice on Drainage Impact Assessments (DIA). This booklet has been very successful in helping many local authorities in Scotland<sup>167</sup>. The author would

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<sup>167</sup> North East Scotland Flood Appraisal Group (2002) *"Drainage Impact Assessment: Guidance for Developers and Regulators."* Aberdeenshire Council, Stonehaven, 2002. (A version is to be made available on the Aberdeenshire Council Web site [www.aberdeenshire.gov.uk](http://www.aberdeenshire.gov.uk) )

strongly endorse the guidance given in this booklet, which would be of value not just in Scotland but for local authorities throughout the UK. It recommends that the DIA includes sensitivity testing for new drainage schemes to assess the flood risk, including “consideration of the flow route for 50 and 200 year return period rainfall events showing no detriment to land or property as a result of overland flow.”

In other words, the drainage system should be able to cope with a 200-year flood without causing damage to property or gardens.

The author has also prepared a set of frequently asked questions based on questions raised at numerous flood appraisal group meetings, and this is available in electronic format from the author on request (david@crichton.sol.co.uk)<sup>168</sup>

## **Flood Resilience**

Earlier in this report, there was reference to the government advice booklet called “Preparing for Floods”, which was produced in response to a recommendation from the Select Committee Inquiry into the Autumn 2000 floods that more flood resilient building techniques be used in floodplains.

“Preparing for Floods” is all very well as a first step, but how are changes in building regulations as required by the Select Committee to be implemented? To implement different building regulations in flood hazard areas would require a close relationship between planners and building control officers at a local level, and in the author’s experience this has not happened in the past.

To implement changes in existing properties would require “resilient reinstatement” which insurers are unwilling to pay for because it constitutes “betterment”. (Attitudes may change following the ABI Statement of Principles, which can lock an insurer into insuring a flood risk property, and lock a customer into staying with the same insurer.)

Gillian Holland of the National Flood Forum has spent the best part of a year touring the country, talking to flood victims, and reports that many loss adjusters have refused resilient reinstatement, even where no additional costs were involved or where the customer was prepared to pay any additional cost<sup>169</sup>. She recommends “Go for tiled floors, plugs at waist level, a finish on the walls that doesn’t involve gypsum plaster, a kitchen that doesn’t incorporate MDF. You may be surprised to find that your loss adjuster doesn’t think this is a good idea. Argue. Use the money due to you, add your own money, approach your mortgage lender.<sup>170</sup>”. All of this is excellent advice. Insurers and loss adjusters should be encouraging resilient reinstatement, not resisting it.

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<sup>168</sup> Crichton, D. (2002) “Floods and SUDS A guidance note for local authorities on SUDS issues.”

<sup>169</sup> Holland, G., 2002. “Public Policy Issues” Post Magazine Conference on “Climate change: and insurance perspective” October 2002. London

Scotland is moving towards solutions:

- Flood Liaison and Advice Groups are bringing planners and building control officers together in a welcome “joined up thinking” approach.
- There is an insurance representative (the author) on the Research Committee of the Scottish Building Standards Advisory Committee, so that vulnerability and insurance issues and expertise are borne in mind when developing new standards. (By contrast, there is no consultation with insurers on new building Regulations in England and Wales.)
- The consultation paper for new Building Standards Primary Legislation in Scotland followed the author’s suggestion that insurers should be required to use resilient reinstatement techniques for buildings damaged by floods or storms<sup>170</sup>. This will cost insurers more in the short term but in the long run, it will reduce claims costs and wastage. (The Bill completed its final stage on 19<sup>th</sup> February 2003 and after Royal Assent, came fully into effect in July 2004 when the Scottish Building Standards Agency was established. While the resilient reinstatement provision no longer specifically appears, there is a new section on sustainable development. The author has it on good authority that the Act does indeed give the Scottish Executive powers to require resilient reinstatement, as well as additional powers related to sustainable development.) Whether the Executive will use these powers remains to be seen.
- Flood vulnerability is very dependent on the physical strength of the building. Just keeping flood waters out of a building does not protect it from damage because the lateral pressure on walls, windows and doors from flooding outside a house can be very strong and can break windows or knock walls and doors down<sup>171</sup>. This is especially so if there is waterborne debris. Building standards in Scotland are already higher than in England, mainly because of the higher frequency and severity of windstorms. This makes them better able to withstand floods as well.

An additional point worth considering is that the huge demand for building labour and materials in the South East of England, means that the costs of repairing flood damaged properties is bound to be much higher there than in Scotland.

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<sup>170</sup> Scottish Executive, 2002. *“Improving Building Standards: Proposals”* Scottish Executive, Edinburgh (Available from [www.scotland.gov.uk](http://www.scotland.gov.uk) )

<sup>171</sup> Kelman, I., 2002. *“Physical flood vulnerability of residential properties in coastal, Eastern England.”* PhD Dissertation submitted September 2002 to the University of Cambridge. (unpublished).



Examples of resilient reinstatement methods are shown in Appendix 5. At the time of writing (August 2004), a major new report on resilient reinstatement is in course of preparation by BRE Scotland for CIRIA172.

## Emergency Planning

A very effective way to reduce the costs of flood damage is to provide emergency support before, during and after the event. For example the provision of sandbags, assistance with evacuation and clean up, etc.

The 1948 Civil Defence Act promoted the philosophy of a national structure of trained personnel, dedicated facilities, integrated plans, a vertical command structure and material stockpiles for dealing with emergencies. Additional legislation in 1986 gave permission for Civil Defence resources and funds to be used for peacetime emergencies. The announcement by the Home Office Minister, Mike O'Brien at an emergency planning conference on 3rd July 2000 that the Civil Defence Grant was in future not to be used for peacetime emergencies in England and Wales caused some concern. The timing was particularly bad, as only three months later England suffered from the worst inland flooding on record. It is interesting to speculate whether the aftermath of these floods might have been better managed if the Home Office had not, in effect, repealed the 1986 Act without Parliamentary debate or consultation.

More than four years after Mr O'Brien's statement, the emergency planning community in England and Wales was still awaiting new legislation to safeguard their future funding, although a discussion document was issued in August 2001<sup>174</sup>.

The new legislation finally received Royal Assent on 18 November 2004, and is called the Civil Contingencies Act 2004.

The Act applies to the whole of Britain and while it has a number of good features, it has been criticised on some important aspects:

- It has been described as "the most draconian and powerful piece of legislation since the 1920 Emergency Powers Act".
- It contains no indication of what constitutes an emergency
- There no penalties for or precautions against malicious or fraudulent declaration of an emergency
- It does not provide the money for state of the art emergency communications systems, equipment, trained personnel, or large scale realistic training exercises.
- It would make it easier for an authoritarian government to seize power.

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<sup>172</sup> Garvin, S., Reid, J., Scott, M., McCreadle, M., Trotman, P., Sanders, C., Phillipson, M., Building Research Establishment, East Kilbride, Scotland. in press "*Standards for the repair of buildings following flooding*" Manual C623. Construction Industry Research and Information Association (CIRIA), London.

For more details about the latest position in England and Wales, see <http://www.ukresilience.info/home.htm>. This Web site is to be recommended for its information on the latest developments and links to many other relevant sites.

### **The Bellwin Scheme**

The Bellwin Scheme was set up under section 155 of the Local Government and Housing Act, 1989. It exists to give special financial assistance to local authorities which would otherwise be faced with an undue financial burden as a result of providing relief and carrying out immediate work due to large-scale emergencies (usually storms). Where the criteria of the scheme are met, grant is payable to authorities at 85 per cent of the eligible costs incurred above a threshold set for each authority.

After the Autumn 2000 floods, the government improved the Bellwin Scheme in England and Wales by increasing the level of assistance available to local authorities for emergency work from 85% to 100%, pending a full review. This review is now under way.

It should be noted that the Bellwin scheme is intended to provide for additional costs incurred by the local authority, for example staff overtime, and replacement of essential infrastructure. It is not intended to be used for individuals or businesses. Any incident for which assistance is sought must involve conditions which are clearly exceptional by local standards, and the damage to the local authority infrastructure or communities must be exceptional in relation to normal experience. Similarly, any application for assistance must demonstrate that an undue financial burden would otherwise fall on the local authority.

## **Information for insurers**

From an insurance company point of view, the work of Flood Liaison and Advice Groups, and the provisions of the Flood Prevention and Land Drainage Act in Scotland allow insurers to obtain the sort of local information that is notoriously difficult to access in England and Wales. The ability to access local authority reports on flood risk and actions taken by Scottish Councils will greatly assist those insurers who take the trouble to ask for it.

## **Is Scotland ahead? - The response from the Department of Environment, Food and Rural Affairs (DEFRA)**

On 10th July 2002, in a Westminster Hall debate, it was suggested by Mr Mark Todd (MP for South Derbyshire) that Scotland is ahead of England and Wales in a number of areas relating to flooding. Mr Elliot Morley, the Parliamentary Under-Secretary of State for Environment, Food and Rural Affairs, responded vigorously to this suggestion, and made a number of statements on the subject. The author believes some comments are necessary to set the record straight. The author has attempted to do this below, and apologises if some of these comments repeat what has gone before in this report.

What really matters if there is to be any improvement in flood hazard and insurability is the appropriate attitudes and commitment to improvement not only at a national level but also within local government. Nevertheless, spending on flood defences is important, so before examining Mr Morley's comments it would be useful to go through the numbers again.

As demonstrated earlier in this report, the number of properties at risk from inland flooding in England and Wales is around 12 times higher than in Scotland. Coastal figures are still quite inaccurate, but for the sake of comparison, the coastal risk is included in the following.

- According to the latest figures from the EA<sup>173</sup>, 2 million homes and 185,000 businesses are at risk of flooding in England and Wales— property, land and assets to the value of £214 billion.
- According to a recent Scottish Executive research report<sup>174</sup>, in Scotland 171,021 homes and businesses are at risk, if coastal flooding is included.

In other words, if coastal flood figures are included and are correct, the number of properties at risk in England and Wales is not just 12 times higher, but 12.8 times higher than in Scotland. Earlier in this report, the author highlighted the fact that between 1997 to 2000, 11% of new properties were built in flood risk areas in England and Wales. Perhaps it would be more accurate to take the up to date figure of 27% of the value of new properties which are currently being built in flood hazard areas, a big increase over the 1997-2000 figure.

Even if this proportion now stays constant, with a million more houses to be built by 2010, it would appear that we could expect the number of properties at risk in England and Wales to increase by 270,000, to 2,455,000. By contrast, effective planning controls in Scotland mean that the Scottish figure should remain at around 171,000. This means that by 2010, the factor could rise to 14.4.

The other important factor is that while the Scottish Executive have never refused flood defence grant aid on the grounds of lack of money, in England, the government's own research shows that they need to increase their spending by up to 85%.

These points should be borne in mind in what follows.

### **Mr Morley's points:**

#### **Point 1**

**Mr Morley:** "The annual budget of £150 million of capital works supported by DEFRA grant represents a 25% increase over the £110-120 million average in recent years."

#### **Comment**

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<sup>173</sup> Environment Agency Press Release, 23<sup>rd</sup> September, 2002

<sup>174</sup> Werritty, A., Black, A., Duck, R., Finlinson, W., Shackley, S., Crichton, D., "Climate Change, Flood Occurrences Review." Scottish Executive Environment Group Research Program Research Findings No. 19. Scottish Executive, Edinburgh.

Presumably this includes the “one off” payment from the Deputy Prime Minister of £50 million following the floods in 2000. Mr Morley did not mention that the DEFRA spending in 2002-3 was due to **reduce** again to £114m.

## Point 2

**Mr Morley:** “The total spend on flood and coastal defence in Scotland is about £10 million a year on capital and £2 million a year on revenue. In England, we spend a combined total of more than £400 million.”

## Comment

The planned spending in England and Wales for 2002-3 was actually £394m, of which £280m is to come from local authorities. This is only a plan, and local authorities are not obliged to spend this amount. Going by past performance it is almost certain that local political pressures will mean that the actual amounts spent in some areas will be much less. A fairer comparison would be to compare the central grant aid figures. Scotland central grant aid for 2003-2004 was to be £8.5m, while the corresponding figure for England and Wales announced in the spending review was to be £114m. In terms of spending per property at risk, this is a comparable level to Scotland.

In this case, comparing the amounts spent does not reflect the true position. There is no point in spending money if it is not needed. Mr Morley did not mention that in Scotland, central grant aid has never been refused for a flood defence on the grounds of lack of money available. Scottish budgets are simply increased to meet demand, and if the benefits of a defence exceed the costs, then money would be found. In England and Wales, money is “rationed” by artificial constraints to limit the size of the benefits calculation and even then, benefits would normally have to be at least five times bigger than costs, and under the current rules, as much as ten times greater than costs in many cases.

## Point 3

**Mr Morley:** “In the 40 years since 1961, 60 schemes have been approved in Scotland. More than twice that number are approved each year in England. Since the floods of 2000, my Department has approved a total of 274 new flood and coastal schemes, at an approved cost of £386,417,694. That is the difference in scale.”

## Comment

It is rather misleading to simply quote the pre- Devolution figures without mentioning what has happened since Devolution in 1999. By 2001, there were 60 new defences in the pipeline in Scotland. Using the factor of 12.8 calculated earlier, this would be the equivalent of England and Wales having 768 schemes in the pipeline.

## Point 4

Mr Todd raised a useful follow up question:

**Mr. Todd** : “While my hon. Friend is on the subject of comparisons with Scotland, will he discuss the primary legislation that exists in Scotland but not in England that obliges local authorities to perform various duties in respect of flood defence?”

**Mr. Morley** : “I am grateful that my hon. Friend raised that matter, because such legislation does not exist in Scotland. There is no duty to undertake capital works in Scotland, in the same way that there is no duty to do so in England. There is a duty to carry out maintenance of watercourses if they represent a risk of flooding in urban areas and there is, in effect, a duty to maintain the existing defences in our country through the regional flood defence committees, but there is no real difference between the two countries.”

#### **Comment**

It is inappropriate for Mr Morley to be so dismissive of the importance of the Flood Prevention and Land Drainage (Scotland) Act, 1997. Scottish local authorities have been working extremely hard to implement the Act, and are given additional funding to enable them to do so. They are obliged to publish a biennial report on progress made in fulfilling their statutory duties to maintain watercourses and culverts, and to bring in appropriate flood management measures. These are not always flood defences, there is considerable use of river restoration techniques, emergency detention basins and designated flood plain storage land. If such duties do exist “in effect” in England, they are frequently neglected. Mark Todd MP had previously stated:

“I was staggered by the evidence (in answers to written Parliamentary Questions about watercourse maintenance) that a large number of local authorities (in England) had responded by saying either that they did not have the resources to do the job or that they did not have the expertise to do it and that it would therefore have to be postponed until a more appropriate time or until they could find such expertise.”

The ABI does not seem to be convinced by Mr Morley’s answer either, as they have specifically made it a condition of future flood insurance availability that government consider similar legislation in England.

Another aspect which Mr Morley did not mention is that the Scottish act, by creating a statutory duty, could give rise to a cause of action by insurers or property owners against local authorities to recover the costs of flood damage.

#### **Point 5**

**Mr. Morley**: “I am not aware that Scotland has agreed to the higher defence standards that have been proposed by the ABI.”

#### **Comment**

As far as the author knows, the ABI has not proposed higher defence standards. The ABI has proposed that planners take into account the author’s Insurance Template but this simply highlights potential insurance problems if the flood hazard exceeds the 200-

year return period. Whatever the ABI may have said to Mr Morley, it is not up to the insurance industry to set design standards for flood defences, or to tell planners where they can or cannot build. They do have an obligation however, to warn society if the consequences of planning decisions mean that a significant number of properties may become uninsurable, or insurable only at a much increased premium.

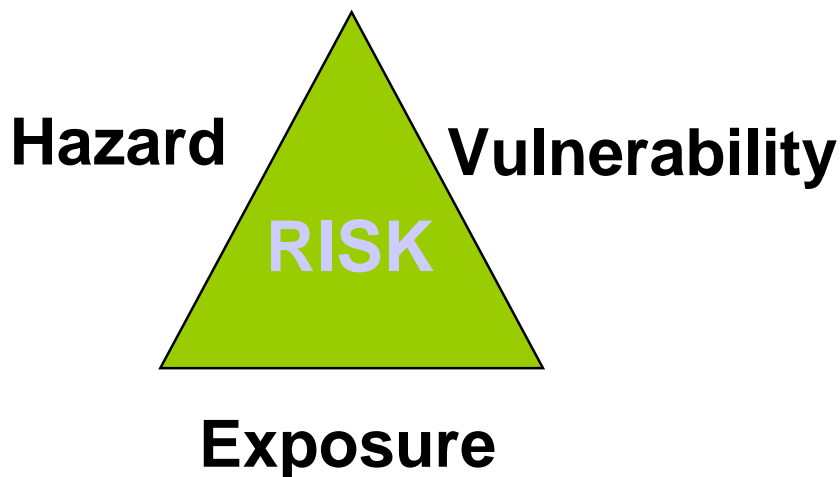
Thanks to Flood Liaison and Advice Groups, all the major local planning authorities in Scotland have decided not to allow new building where the flood risk exceeds the 200 year event. This has been done voluntarily by individual councils, taking into account local circumstances, because they can see that it makes sense. How many Councils in England or Wales have done likewise?

## Flood Risk and Insurance Modelling

### Modelling

Risk consists of three elements, hazard, vulnerability and exposure<sup>175</sup>. If you think of these as the three sides of a triangle, the area of the triangle measures the risk (see figure 12).

Figure 12: the Risk Triangle. © Crichton 1999



This is similar in concept to the “Fire Triangle”. In the fire triangle, the three sides are heat, fuel and oxygen. If any one side is missing, there is no fire. So it is with risk, if any one side of the risk triangle is missing, there is no risk. One of the differences

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<sup>175</sup> Crichton, D. 1999 “*The Risk Triangle*”, in *Natural Disaster Management*, Ingleton, J., (ed), Tudor Rose, London, England.

between a fire and a flood from an insurance point of view is that there is a 1 in 340 year chance of a fire in a property<sup>176</sup>, but in many parts of England the odds are three or four times higher.

To model the effects of a flood, it is necessary to calculate all three elements of risk. The calculation is only as accurate as the weakest component, and all the data and sophisticated mathematics in the world will not alter that fact. This is why initiatives such as the National Flood Claims Database are so important, for example, so that insurers and reinsurers can calculate vulnerability more accurately.

The earliest detailed flood model was made possible by the work carried out by Sir Wm Halcrow and Partners for the ABI in 1994 and 1995 on coastal flood hazards in England and Wales<sup>177</sup>. Halcrow produced maps of the areas likely to flood due to the absence of adequate coastal flood protection, or protection which would fail in a 50 year storm. (Many insurers still use these maps today for underwriting purposes.)

River flood models took longer to develop, owing to the absence of accurate flood maps, or even accurate elevation data. This had to wait until sophisticated remote sensing methods and geomorphology techniques resulted in better maps. Around the same time, data from the National Flood Insurance Claims Database became available<sup>178</sup> to give accurate figures for the relationship between depth of flood and damage costs.

Currently work is progressing well at Benfield Group Ltd with the hardest task of all, modelling the losses from business interruption<sup>179</sup>.

The most advanced flood mapping and modelling in the UK is carried out by reinsurance brokers such as Benfield Group Ltd, because reinsurers are very interested in knowing how much a major flood event could cost. Reinsurers operate on a global basis, and very few countries have such a high market penetration for flood

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<sup>176</sup> Green, C., and Penning-Rowell, E., (2002) *"Flood risk and insurance; strategic options for the insurance industry and government"* Middlesex University Flood Hazard Research Centre, London.

<sup>177</sup> Sir William Halcrow & Partners Ltd (October 1994). "Identification of Coastal Flood Areas in England and Wales" and Sir William Halcrow & Partners Ltd (August 1995). "Identification of Coastal Flood Areas in England and Wales : Supplementary Report - Updating the Sea Defence Survey" Unpublished reports for the Association of British Insurers, London.

<sup>178</sup> Black, A and Evans, S (1999) "Flood damage in the UK: New insights for the insurance industry." University of Dundee. ISBN 0 903674 37 8. Dundee, Scotland.

<sup>179</sup> Gascoigne, J., 2002. "Can we model flood risk and business interruption?" *Catastrophe Risk Management*, September 2002.

insurance, indeed, most countries have little or no privately available flood insurance at all<sup>180</sup>.

## Reinsurance

This means that for many reinsurers, flood insurance is still a bit uncertain and the more uncertain a risk is, the more cautious the reinsurer, or insurer has to be.

Reinsurers operate by spreading risks across the world. If flooding was taken as a peril in isolation, there is not sufficient spread for reinsurers because most of the risks arise from Britain. In practice, the flood risk is usually spread across other reinsured perils, which helps to avoid the need to charge the full reinsurance rate technically required. Similarly the primary insurers can spread the flood premium across other perils in the package household policy, as well as across the spread of policyholders in general.

It could be argued that if reinsurers were to charge separately for the flood exposure, and if insurers were to charge the full technical rate for flood, then customers may not be willing to pay the full price, because many will perceive the risk to be too remote<sup>181</sup>. There is a real danger that if insurance becomes unavailable or unaffordable for large numbers of people, the volume of business may fall below critical mass and lead to spiralling premium increases and a vicious circle situation.

In the meantime, it is likely that reinsurance costs are going to increase dramatically as the market becomes harder following the terrorist attacks on September 11th 2001. There is even the suggestion that reinsurers might revise the "hours clause" for flood from the current 72 hours to a lower figure so that they in effect limit their exposure to damage from major flood events.

## A more positive role for the insurance industry?

The flood models produced by reinsurance brokers such as Benfield Group Ltd and other leading brokers like AON, Guy Carpenter, and Willis, or major reinsurers like Swiss Re, are becoming increasingly sophisticated. Surely this expertise and these sources of data would be of great value to the government and the EA/SEPA? For example, government could commission studies to set priorities for flood defence spending, or to select areas for "managed realignment", based on the potential flood losses from building damage and business interruption. In this way, the insurance industry could make a positive contribution to helping to solve the problem rather than being perceived as simply asking for more spending on flood defences all the time.

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<sup>180</sup> Crichton, D. (2002) "UK and Global Insurance Responses to Flood Hazard." *Water International* Vol 27, 1. Pp 119- 131. Illinois, USA

<sup>181</sup> "Floods: Causes, effects and risk assessment." Partner Re Group, Bermuda, 1997.



Insurers could perhaps also press for the Swedish “social tolerance” approach<sup>182</sup> in which flooding is expressed in terms of impact. Thus inner city areas with a high level of people at risk and a high level of investment have the lowest tolerance.

## The Pooling Solution

From time to time over the last few years, various people have suggested pooling solutions for flood hazard areas. A pool of insurers would take the highest hazard flood risks, and spread the risks across the market, perhaps with some form of government support. A pool reinsurance solution has also been suggested many times, on the same lines as the pool for terrorism. Such an idea has attractions:

- Risks can be underwritten by specialist underwriters
- Profits from the pool can be used to invest in better flood maps, and even the construction of flood defences, perhaps in a public-private finance scheme.

On the other hand there are a number of problems:

- Any form of pool would imply a subsidy from policyholders in safe areas or from government, or both. Otherwise the premiums would be too high for many people to afford, especially in social housing areas. Such a subsidy is very unlikely to be forthcoming without some element of compulsion.
- The return of insurance availability in high hazard areas would simply encourage more building in such areas, as would the construction of defences by the pool.
- Property owners in such areas would be unable to shop around for the best deal.
- Such a pool would need its own reinsurance arrangements, and global reinsurers, are unlikely to find such exposures attractive in isolation, unless a substantial premium was on offer.

While pool arrangements may work for very low frequency, high severity hazards such as earthquake, they are not satisfactory for flood hazard, where the hazard is confined to specific areas and adverse selection is a major issue.

For any kind of insurance arrangements, the basic principles of insurability must apply whether it is a pooling arrangement, or private insurers working independently. For more details, see Appendix 7.

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<sup>182</sup> Thorsteinsson, D., Semadeni-Davies, A., and Larsson, R., (In press, in a book series by Natural Hazards) *“Planning for river induced floods in urban areas – experiences and key issues for Sweden.”* Department of Water Resources Engineering, Lund University, Box 118, SE 22100 Lund, Sweden.

## Future Outlook and Recommendations

Figure 13: Uckfield, October 2000. Courtesy of Alan Thompson, Symonds Group Limited



The DEFRA report discussed earlier<sup>183</sup> suggested two alternatives for flood defence spending. Either increase spending now by up to 85%, or concentrate spending on those areas where it will provide most benefit and give up defending other areas. The second option implies some sort of “managed retreat”, or what the government would prefer to call “managed realignment”.

The EA have also considered future options to reduce flood risk, and will focus on increased public awareness and preparedness, and flood defence systems which work with nature instead of against it<sup>184</sup>.

In 2003, they published a new strategy document which emphasised the need to manage flood risk in all its aspects, not just build defences<sup>185</sup>. During 2003/2004,

Defra has led Government work towards revising this strategy to produce a new strategy for flood and coastal erosion risk management in England. Called “Making Space for Water” the aim is to:

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<sup>183</sup> “National Appraisal of Assets at Risk from Flooding and Coastal Erosion, including the potential impact of climate change.” DEFRA, July 2001

<sup>184</sup> Environment Agency Annual Report 2000/2001. “Reducing Flood Risk”.

<sup>185</sup> Environment Agency (2003) “*Strategy for flood risk management*” Download from:  
[http://www.environment-agency.gov.uk/commondata/105385/frm\\_strategy\\_v1.2\\_573731.pdf](http://www.environment-agency.gov.uk/commondata/105385/frm_strategy_v1.2_573731.pdf)

- Provide strategic direction for the next ten to twenty years, with commitments to review progress regularly and to set issues in the context of the longer term.
- Look wider than flooding from rivers and the sea to consider all aspects of flood and coastal erosion risk management, taking a holistic approach.
- Set flood and coastal erosion risk management firmly in the context of Defra's aim of sustainable development.
- Look at a broad range of drivers for change including climate change and planning and development pressures.

The Government launched a public consultation exercise on 29 July 2004 in order to seek views on the proposals from as many different stakeholders as possible.

**The full consultation document is available to download** from <http://www.defra.gov.uk/corporate/consult/waterspace/index.htm>. Paper copies are available from Defra Publications (08459 556000; [defra@iforcegroup.com](mailto:defra@iforcegroup.com)) by quoting reference PB 9792. Further information, including a series of background documents, are available from the strategy web pages via <http://www.defra.gov.uk/environ/fcd/policy/strategy.htm>.

In June 2002, the government established a Foresight project in Flood and Coastal Defences. The project aims to produce a long-term (2030-2100) holistic vision for future risk of pluvial, fluvial and coastal flooding in the UK, and to consider the options for responding to that risk. The results will feed into government policy, and anyone is welcome to contribute ideas through the web site. (for details see Appendix 2 and [www.foresight.gov.uk](http://www.foresight.gov.uk) ).

The first group of reports were published on the Foresight website in April 2004, and present a considerable body of data and detailed scenarios which will assist insurers in long term planning. (The author was closely involved with the preparation of some of them.)

In July 2004, the EU produced a "communication" on flood which contains much useful information and very sensible proposals which are well worth reading carefully. It can be downloaded from:  
[http://europa.eu.int/comm/environment/water/pdf/com\\_2004\\_472\\_en.pdf](http://europa.eu.int/comm/environment/water/pdf/com_2004_472_en.pdf)

In August 2004, the European Environment Agency published a valuable report on climate change impacts in Europe<sup>186</sup>.

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<sup>186</sup> European Environment Agency, 2004. "Impacts of Europe's changing climate" EEA (European Environment Agency) OPOCE (Office for Official Publications of the European Communities). ISBN: 92-9167-692-6. Available from [http://reports.eea.eu.int/climate\\_report\\_2\\_2004/en](http://reports.eea.eu.int/climate_report_2_2004/en)

Meanwhile, in Scotland two important planning documents<sup>187</sup> were published in 2004. A policy document, SPP7, was published to replace previous guidelines NPPG 7. This has a number of features including: a re-emphasis on the need for all local authorities to establish Flood Liaison and Advice Groups (FLAGs) formerly called Flood Liaison and Advice Groups, and the inclusion of a “risk framework” consistent with the insurance template. It was followed up by a new “Planning Advice Note” which gives details to help implement the Policy in SPP 7.

An interesting development in France, during 2004, was the introduction of new zoned regional maps, Plan de Prévention des Risques, (PPR) which show areas of flood hazard. Unlike the old system, PPRs are fixed by law by central government and will be difficult to change in the light of new information or local knowledge. There is a lack of local participation in drawing up these maps, which is creating resentment. The risk maps do not take flood defences into account, even if such defences increase the downstream hazard. The zoning maps are currently being rolled out to the 30,000 communes and about 5,000 should have them by 2005. The rigid, centrally controlled approach in France contrasts sharply with the almost *laissez faire* approach in England, where 56% of local authorities now have ignored Environment Agency advice, according to research by Manchester University.

Two major new flood reports were published in October 2002. They were commissioned by a consortium of insurance companies called “TSUNAMI”. One report is by the University of Southampton and the author<sup>188</sup>. It examines current insurance strategies and concerns based on a series of in depth, confidential interviews with senior underwriting managers of all the major insurance companies, as well as with representatives of the main brokers, loss adjusters, and other stakeholders.

The other report, by the Middlesex University Flood Hazard Research Centre<sup>189</sup>, outlines a whole range of ideas for the future strategies of insurance companies and government. The author was heavily involved with both of these reports, on behalf of the ABI. Hopefully the insurance industry and government will study and reflect on the content of these very important reports.

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<sup>187</sup> Scottish Office, 1995. “*National Planning Policy Guidelines; 7 - Flood*” (NPPG 7), Scottish Office, Edinburgh.

Scottish Planning Policy Guideline 7: Planning and Flooding (SPP 7). Scottish Executive, 2004. Available at: <http://www.scotland.gov.uk/library5/planning/spp7-01.asp>

Planning Advice Note 69 (PAN69) Planning and Building Standards Advice on Flooding. Available at : <http://www.scotland.gov.uk/library5/planning/pan69-00.asp> Hard copies of SPP7 and PAN 69 are also available by telephoning 0131 244 7543

<sup>188</sup> Clark, M., Priest, S. J., Treby, E. J., Crichton, D., 2002 “Insurance and UK Floods: a strategic reassessment.” A Research Report for TSUNAMI. University of Southampton, Southampton.

<sup>189</sup> Green, C., and Penning-Rowell, E., (2002) “*Flood risk and insurance; strategic options for the insurance industry and government*” Middlesex University Flood Hazard Research Centre, London.

While the author believes that the solutions adopted in Scotland are setting an excellent example for England and Wales to follow, the problems in the South East of England are already so great that it may be too late for such relatively mild measures to be successful. Some Lloyd's syndicates are already offering household insurance subject to flood risks exclusion, but from the author's discussions with the market, it seems that fortunately it is reluctant to go down this road as it would inevitably lead to adverse selection. In any case, experience in Australia and Canada shows that defining "flood" adequately is extremely difficult, and leads to numerous disputes and complaints. Increasing premiums to the full economic rate required is another solution, but this will reduce insurance penetration, especially in social housing and lead to social injustice. Insurance premium levels have traditionally been subsidised by returns on investments made by insurers in the stock market, but as the value of these investment returns falls, insurers can no longer afford to carry underwriting losses.

The following are some of the author's ideas on more radical long-term solutions to flood risks (see also the author's book on climate change<sup>190</sup>). They are listed according to the three sides of the risk triangle, hazard, vulnerability, and exposure.

Reducing any one side of the triangle reduces risk, and the most effective way to reduce risk is to look for "quick wins" on each of the three sides of the triangle in turn.

## **Hazard**

This can be reduced by flood defences and management schemes. We should gradually change the emphasis from hard engineering solutions to more sustainable, low maintenance soft solutions, such as wet lands and river restoration. Do we really want our river banks and coasts covered in concrete? We should be working with nature instead of against it, and create more areas for wild life. Some ideas for what could be done are shown below:

1. 614,000ha of land lies below sea level, much of it in the Fens in East Anglia. The Fens are no longer such a rich source of arable land as the peat dries out and blows away. Since drainage started in earnest some 350 years ago, some parts have sunk by 10 metres to well below sea level, and require continuous pumping to drain them. Why not return parts of them to their natural state?
2. Many properties are damaged by flood due to changes in agricultural practices. Local planning authorities have little or no control over these. Farmers should be encouraged or subsidised to adopt practices, such as planting hedges and digging ditches, designed to reduce surface water run off, and even to use their land as flood storage and wetlands. In other words

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<sup>190</sup> Crichton, D. 2001 "The Implications of Climate Change for the Insurance Industry." (ISBN 1-903852-00-5), Building Research Establishment, Watford, England.

they should be paid to “farm water” as part of an integrated catchment management policy.

This is already being done, with considerable success, in certain parts of the country. For example, in Aberdeenshire, farmers are being encouraged by the council, with the help of pressure from local residents, to “recontour” riverside fields and remove flood banks voluntarily to allow their fields to flood. In recognition and support of this pioneering work, the council was recently awarded substantial funding under the EU’s “Interreg III” North Sea initiative<sup>191</sup>, which has already seen partnerships develop between Germany and the Netherlands and between Wales and Ireland to address issues in common, such as flooding. In the Highland Council area, an important EU funded project being run by the Forestry Commission, is reducing flood hazards using soft flood defences such as timber and recycled materials under the EU’s “Strategies and Actions/Implementations for Flood Emergency Risk Management” (SAFER) initiative. This initiative is now operating successfully in Ireland, Germany and Switzerland, as well as Scotland.

3. There should be more use of Relief Rivers and detention basins to carry surplus water away during a storm event. These should not be constructed of concrete unless absolutely necessary, but should be made to look as natural as possible, using techniques pioneered by the River Restoration Centre<sup>192</sup>.
4. There should be a greater use of water supply and hydroelectric reservoirs to store flood water. Summer droughts, the need to replace or upgrade old reservoirs to cope with the increased risk factors from climate change<sup>193</sup>, and the move towards renewable energy is likely to increase the need for such reservoirs anyway. However, it is important that they are built in a safe and environmentally friendly way.
5. Tidal Barrages and wave power should be in widespread use, and could have a dual function of energy supply and storm surge control. Already there are well-developed plans to increase wave energy capacity around the world, and many schemes are due to come to fruition next year. A recent independent assessment for the UK’s Department of Trade and Industry indicated that on current technology, wave power costs have fallen so much that for an

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<sup>191</sup> For details, see <http://www.interregnorthsea.org/index.asp>

<sup>192</sup> “Manual of River Restoration Techniques” River Restoration Centre, 1999.

<sup>193</sup> Babbie Group and the Institute of Hydrology, 2002. “Climate Change Impacts on the Safety of British Reservoirs” Report commissioned by the Department of the Environment, Transport and the Regions (DETR) now DEFRA, through their reservoir safety research programme. (Unpublished).

investment of €750 billion they could produce as much as all the world's large scale hydro electric schemes put together<sup>194</sup>.

6. Legislation to transpose the Water Framework Directive in England and Wales should be amended as it has been in Scotland to adopt a holistic approach that includes consideration of flood issues. At present the legislation only applies to water quality and natural environment issues, with no consideration of the possible adverse effects on the built environment.
7. New drainage systems in Britain are still being designed for the two to five year rainfall event, despite climate change projections and the suffering caused by sewage surcharge. For new developments, local authorities should insist on a Drainage Impact Assessment following the pioneering guidance notes prepared by the North East Scotland Flood Appraisal Group<sup>195</sup>. These guidelines are increasingly being followed by local authorities in Scotland and include the requirement for sensitivity testing for the 200-year event. Similar sensitivity analysis should be applied to existing combined sewers to ensure that overflows are managed in such a way as to avoid damage to land or property and upgrading should be applied in a rolling programme. Such a programme could include one way flap valves to prevent sewage backup into toilets and baths, and "sewage paths" to direct surcharges into roads and detention tanks or basins rather than gardens and houses. Where the costs of upgrading are too high to be economically justified, then incentives should be given to people to move to new locations, as it can often be cheaper to build new houses than to upgrade a sewer system and treatment works.
8. Ofwat restrictions on how much the water companies are allowed to spend on sewage upgrading should be reviewed.
9. The extent of the flood hazard should be made clearer to the general public. The Scottish Planning Guideline, NPPG 7, recommended that where appropriate, planners should impose conditions that suitable permanent signs are erected warning that the area is susceptible to flooding<sup>196</sup>. In Australia, every flood hazard area has signs showing that the area is likely to flood and the level the flood waters could reach. While it has been known for people to pull down these signs when they want to sell their houses, in general it would

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<sup>194</sup> Thorpe, T., 2002 "Harvesting the waves" *Ingenia*, the Journal of the Royal Academy of Engineering Issue 13, London.

<sup>195</sup> North East Scotland Flood Appraisal Group (2002) *"Drainage Impact Assessment: Guidance for Developers and Regulators."* Aberdeenshire Council, Stonehaven, 2002.

<sup>196</sup> Scottish Office, 1995. "National Planning Policy Guidelines; 7 - Flood" (NPPG 7), Scottish Office, Edinburgh. Page 24, paragraph 65.

- go some way to ensuring that house buyers were aware of the hazard. If new housing estates had to display such signs, especially beside show houses and sales offices, this would help to inform prospective buyers.
10. Dams and raised reservoirs should no longer be exempted from the Control of Major Accident Hazard Regulations 1999 (COMAH), so that emergency contingency plans can be produced, and more information made available in the public domain. Indeed one of the outcomes of The Freedom of Information Act which implements the Aarhus Convention may be that dam owners will be obliged to release hitherto secret information. There should be a concentrated effort to fit all dams and raised reservoir embankments with satellite reflectors or transponders to take full advantage of PS InSAR technology to monitor them for safety.
  11. There is a desperate need for better flood maps in the public domain. Countries around the world are baffled that several insurance companies in Britain have better flood maps than the government. Britain has one of the best academic communities in the world, why could they not be mobilised to improve flood mapping and modelling for the benefit of society as a whole? The Natural Environment Research Council seems to be preoccupied with pure science and biology in the way it selects research projects for grant aid from the taxpayer. This is all very well, but if a tenth of its budget were set aside for five years for practical flood hazard mapping projects, then perhaps the government could start to catch up with the insurance industry. (in 2003, the Engineering and Physical Sciences Research Council posted an announcement of opportunity on their web site for research work on flooding and even before the posting was made, they were swamped with enquiries from researchers. Unfortunately none of the successful bids has any great relevance to insurers.) Much useful work has been done by the CEH and HR in Wallingford, the FHRC in Middlesex, and the ESSC in Reading for example, but such institutions each have to devote valuable time to bidding for limited research contracts to produce piecemeal solutions, or pilot studies. A concentrated and co-ordinated effort is needed by engineering consultants, universities and research institutes to produce a national set of flood maps with high quality dynamic models so that the public can have a much better picture of where the flood hazard lies. Perhaps in this way, public domain flood hazard maps and models might become as accurate as those held by major insurers and reinsurers, even if many wheels have to be reinvented. In Canada, the government response to the Red River floods was to establish a detailed LiDAR survey linked to three-dimensional dynamic modelling. The author has met with the researchers involved and they would be happy to share information with researchers in the UK. This would be a good starting point.



## Vulnerability

We know a great deal about how to design buildings to be flood proof or flood resilient, but much more could be done to encourage the use of such methods. This could be done by changes in building regulations or standards, or as part of planning consents. Also insurers could insist on resilience or flood proofing, as part of the policy conditions. Some ideas are listed below.

1. First, however, the vulnerability of people must be considered, and this includes the despair and distress which flood victims suffer. Councils could encourage social workers to develop contingency plans that include voluntary groups. The Samaritans are especially well trained and experienced in giving on site comfort to the victims of a major flood disaster, and can be mobilised very quickly and effectively. The presence of voluntary workers talking to flood victims has been known to cause resentment amongst social workers who may not have confidence in the training and abilities of the volunteers. There should be no grounds for concern about The Samaritans due to their high level of training and selection, but this may not be the case with other groups. These issues need to be explored in advance, before the flood happens, so that good relationships can be developed based on mutual respect for each organisation's role. The National Flood Insurance Claims Database has details of claims costs for every major flood from 1993 to 1998, including the Easter 1998 floods. This project was initially funded by AON and General Accident, but the resulting analyses were published so that everyone could benefit. The database is currently being updated, thanks to sponsorship from a major insurance company, to include details of floods from 1998 to date. Again, results from the enlarged database will be published in due course.
  
2. Another measure which could be taken would be for the insurance industry to agree to introduce the FASTER system (Flood and STorm Event Reporting System). In extensive trials, this system has been shown to speed up claims handling, improve customer service, reduce claims handling costs, check for fraudulent claims, and capture data which could feed into building standards reviews and flood modelling<sup>197</sup>. This system was extensively piloted amongst loss adjusters and was strongly supported by all who used it, because it allowed them to work more efficiently and deal more quickly with insurance claimants in the immediate aftermath of a flood event. There would be very little cost to the industry to introduce this system, which would pay for itself when the first major event occurs in terms of more efficient claims handling. However the industry still tends to resist change, especially if it means putting some money up front. A copy of the data collection form is shown in

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<sup>197</sup> For more details, see the Chartered Insurance Institute report on climate change on their web site at [www.cii.org.uk](http://www.cii.org.uk)

Appendix 3. The project was shelved in 1999, despite strong support from insurance underwriters and ABI's own expert committees. If it had been introduced, we would know a great deal more about the components of the costs of flood claims and the different causes of flood damage, because the system was designed to capture such information in a central point using automated computer scanning systems. The ABI would have then been in a much stronger position to lobby government, and insurers would have been better able to calculate accurate premium rates. The industry would also have been able to estimate much more quickly the overall costs of a flood or storm event.

3. There are many commercial flood-proofing products listed in SEPA's website but there is no official endorsement of any particular product. (The EA used to have a similar list, but dropped it presumably in case it was seen as an endorsement.) The Department of Trade and Industry has sponsored a research project to develop a National Standard Certification Scheme for temporary flood products. Two "Publicly Available Specifications" (PAS) have been developed by the British Standards Institute (BSI) and HR Wallingford. PAS 1188-1 is for temporary products to fit over openings, for example flood boards, while PAS 1188-2 is for items such as flood barriers designed for installation away from the property. Products are tested in a specially adapted tank at HR Wallingford.

Even if a product is awarded a kitemark, this may not have much influence on insurers' decisions regarding that property, for a number of reasons:

- Deployment – there is no guarantee for the insurer that the product will be deployed in time, or at all, unless the system is automatic, such as the Dutch "floating barrier system". In some cases, deployment may be complex, or may need two physically strong people, who may not be available at the time. It is also dependent on adequate warnings, and proper maintenance of the system.
- Water pressure has been known to demolish walls, so any system dependent on the strength of the building it is attached to will be limited to low depth and low velocity floods.
- Flood water can readily seep through standard cavity wall construction, nullifying the effectiveness of systems designed to block openings in walls.
- Debris impact may damage the system, so back up pumps will be needed to deal with possible leakage. These will need to be independent of mains power.
- Rising Groundwater and sewage backup are very common causes of flooding. There is no point in having an above ground defence, if the water is going to come up through the floorboards, or a ground floor toilet.

This latter aspect is not considered in the kitemark testing, and a more realistic test would be to flood a house built on normal foundations, with normal sewage and drainage pipes, rather than one resting in a tank. For full protection the system should have the following features:

- One way valves on all sewage and drainage pipes
- Waterproofing of below ground structures, including under the floor
- Sump pumps with power independent of mains electricity
- A barrier capable of withstanding the water pressure and velocity likely to be encountered without being entirely dependent on the structure of the building.

There is no certification scheme available as yet for such systems, but in the meantime, any systems that can provide some protection are welcome, so long as the buyer is made fully aware of their limitations. For more information on temporary flood defences, see the author's separate report on the Benfield web site<sup>198</sup>.

4. In the Zuider Zee museum in Holland, there are plenty of examples of flood resilient buildings constructed centuries ago and designed so that frequent flooding causes no damage. Some of the techniques used are hundreds of years old, but could easily be incorporated into current building methods.

For example, tiled floors with drains built in and a waterproof membrane underneath, alternatively solid wood floors with drainage holes and an under floor drainage system. Waterproofed external walls below and above ground, tiled internal walls, resilient furniture such as solid wood units on legs, are all less vulnerable.

Instead modern building design seems to be going the other way, with MDF, chipboard, plasterboard and other vulnerable materials. Concrete floors "floating" on a layer of insulation material are becoming more common and pose special problems (see Appendix 5).

More recently, new Building Regulations are designed to make new houses easier for disabled access, by requiring ground floor toilets and doing away with doorsteps.

A recent survey (not yet published) shows that:

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<sup>198</sup> Crichton, D. 2004. *Temporary local flood protection in the United Kingdom. - An independent assessment.* A Benfield Hazard Research Centre technical report. Free download from: [http://www.benfieldhrc.org/SiteRoot/activities/misc\\_papers/Temporary\\_local\\_flood\\_protection.pdf](http://www.benfieldhrc.org/SiteRoot/activities/misc_papers/Temporary_local_flood_protection.pdf)

- In order to avoid the costs of a long ramp to the doorway, builders are using lowered floor heights, and there have already been some cases of flooding as a result
- Ground floor toilets are vulnerable to sewage backup, yet builders are not fitting non return valves in the sewage system.
- The regulations are not in any case achieving their objective because hallways are still too narrow with no space to park or turn a wheelchair.

For more details see Appendix 5.

5. In the USA, programmes have been established by the US insurance industry and FEMA to help the public to make their property more flood proof or resilient and there is much to be learned from them. The British insurance industry does not have similar programmes, and indeed the ABI has been reducing its direct involvement with building research and loss prevention.
6. Tougher building standards should apply in flood hazard areas not only to make properties more resilient to flood damage, but also to safeguard health and safety. These should be developed in consultation with the insurance industry and loss adjusters to tap into their expertise and data. Apart from using materials that are undamaged by short-term exposure to water, and apart from routing electrical cables and sockets etc above flood height, the building itself needs to be physically strong. The pressure of floodwater on a building can break windows and knock down walls and doors. (For more details, see Appendix 5)
7. The new building standards should be made retrospective, so that after a flood the property owner or insurer would be required to reinstate to a more resilient standard, or to demolish the building altogether and restore the land to its natural state. In Scotland the Executive now have powers under the Buildings (Scotland) Act 2003 to introduce compulsory resilient reinstatement.
8. The new ABI Statement of Principles refers to insurers undertaking to maintain flood insurance on a property even when it is sold. This could mean that an insurer could end up being perpetually on risk for a property which is regularly flooded. In such cases, the total loss or demolition option would start to look very attractive to the insurer.
9. Over the years, Government has given grants for insulation, double glazing, replacing lead water pipes with safer materials, removing coal fires etc. Why not grants for flood proofing and flood resilience?
10. Low cost or “social” housing is often more likely to be located in flood hazard areas where the land is cheap, and occupied by people who are more

vulnerable, financially and in other ways. Special assistance may be needed to help such people, especially the old and infirm.

11. Older people often prefer single storey accommodation, which again makes them more vulnerable to flood because they cannot escape upstairs. Such properties should be located in safer areas as indicated in the Insurance Template. Or they should be fitted with emergency means of escape skylights in the roof.
12. New Emergency Planning legislation is urgently needed in England and Wales to deal with future disasters, not just flood, but also other impacts of climate change and terrorism. The insurance industry should be invited to contribute advice and comment.
13. Extensive research in Australia into flood warning methods could benefit British flood warning systems, but the author is not aware of any attempts to tap into this valuable work. Instead the wheel is being reinvented.
14. The government should support the UK Advisory Committee on Natural Disaster Reduction by starting to provide it with funding to commission research into natural disaster mitigation<sup>199</sup>. The author is a member of this committee, which is the UK focal point for the United Nations International Strategic Disaster Reduction Initiative (UN-ISDR)<sup>200</sup>. There are corresponding local committees all over the world, supported financially by their respective governments. However the UK committee receives no research funding from its own government to research disaster issues at home, even though the Department for International Development does provide funding directly to UN-ISDR to research disaster mitigation work overseas.

## Exposure

1. Students are the professionals of the future. The author makes a point of giving guest lectures to students taking courses in town and country planning, architecture, and in building standards, to inform them about the importance of adapting to climate change. He also writes articles for the journals of the relevant professional institutes and speaks at their national conferences. The whole education process could be speeded up if the professional institutes and other relevant authorities could review course work and the syllabus for

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<sup>199</sup> Crichton, D. (2002). In "Evidence to the House of Commons International Development Committee Inquiry into Global Climate Change and Sustainable Development." House of Commons HC 519-II, pp. Ev. 150 –Ev. 154. July 2002

<sup>200</sup> For details, see <http://www.unisdr.org>

these disciplines, preferably with input from insurance experts. There needs to be an increased awareness of the issues in environmental management courses as well.

2. Flood Liaison and Advice Groups should be given some form of statutory recognition all over Britain so that they have a role as part of the legislation being introduced as a result of the Water Framework Directive. The EA could actively promote the establishment of Flood Liaison and Advice Groups in England and Wales with insurance representation as in Scotland. These groups should ideally be established on a catchment basis where appropriate, and include representatives from all stakeholders, including adjoining local authorities, housebuilders, developers and insurers etc - again as in Scotland. Flood Liaison and Advice Groups could be encouraged to issue “certificates of conformity” for new property developments where the development conforms to the Insurance Template. This would ensure that the purchasers of such properties could obtain flood insurance at normal terms, and would safeguard property values.
  
3. The insurance industry and the EA should work together to reduce the number of new houses being built in flood hazard areas. Since the first edition of this technical report, the EA now uses “Target 12” requirements from its high level targets<sup>201</sup> to pass information to insurers about cases where they have objected to a new development on the grounds of flood risk. The ABI and the Council of Mortgage Lenders then write a joint letter to the local authority concerned to warn of possible insurance problems. They should also work together to alert valuation surveyors and individual insurers. Surveyors could reflect the risk in their valuations and underwriters would be able to take it into account when deciding whether to offer cover for those properties. This might well mean that no insurance cover would be available in many cases, and the developers would find the new houses hard to sell since mortgages would be not be available either.
  
4. The next step would be to persuade planners that there is no point in allowing a new housing development to take place in a flood zone if no one will buy the houses due to insurance problems. Where possible, planners should adopt the insurance template as an integral part of their structure plans, as in many parts of Scotland. However, it is not realistic to expect that the template can be applied throughout the south-east of England, given the lack of suitable land and the pressure for new housing. In such cases, planners

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<sup>201</sup> “High Level Targets for Flood and Coastal Defence and Elaboration of the Environment Agency’s Flood Defence Supervisory Duty” MAFF, November 1999.

- and building control need to work together as recommended by the Select Committee<sup>202</sup> to ensure that the new houses are more resilient to flood.
5. Insurers should lobby the Office of the Deputy Prime Minister to reconsider the targets given to planners for new house building in their areas. If a council has no land left other than floodplain, it should not be forced by government targets to allow building in those areas. It is these targets which are perhaps primarily responsible for the growth in floodplain development. Insurers should also lobby the ODPM to be allowed to offer assistance with the new policy on selecting growth sub regions to ensure that the government is aware of flood or subsidence hazard areas that might have insurance problems.
  6. It is appreciated that there is a high and growing demand for building land, but why do most of these houses have to be built in the South East of England? Government could introduce increased incentives for businesses to move from London to other parts of the country where “new towns” could be created in safer areas. For businesses that insist on remaining in London, better transport links and greater use of electronic working at home would still enable staff to live further away. UK government could start with its own departments and agencies. The Scottish Executive already has a policy of moving the head offices of its agencies out of Glasgow and Edinburgh, for example.
  7. If someone wishes to live in a flood hazard area, they should be made fully aware of the hazards. Signs should be erected in accordance with the recommendations of the 1995 Scottish Planning Guidelines so that prospective purchasers are also aware of the hazards.
  8. If the government wishes the insurance industry to continue to provide cover on an interim basis for such floodplain and coastal exposure, it would first have to consider modifying the risk-based strategy of the insurance regulator, the FSA, to allow insurers to accumulate such exposures. This might require the government to offer to provide support in the event of a major disaster. This would be preferable to the blight that might be caused by a lack of insurance cover.
  9. Valuation surveyors should be encouraged and enabled to give more detailed information than at present about flood hazards in their survey reports and should receive guidance about ways to reflect the flood hazard in the valuations placed on the property. (The RICS are already researching this.) Surveyors and solicitors should be required to explain the implications of an increasing flood hazard to prospective purchasers, who would then be

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<sup>202</sup> Recommendation “e” of The Environment Transport and Regional Affairs Select Committee Report on the Autumn floods in 2000. Published on 20th December 2000. HMSO, London.

obliged under insurance laws on disclosure of material facts to declare such information when seeking insurance. Failure to disclose such information could result in their claims being repudiated. If this happens due to professional negligence on the part of the surveyor, there may be a case against the surveyor's professional indemnity insurance.

10. Managed retreat and realignment may have to become more widespread, and measures may be needed to provide fair compensation to people living in these areas (compensation for such people is not government policy at present).
11. Government should have a programme of compulsory purchase of floodplain land in sensitive areas to ensure it is properly managed.

Government talk a great deal about issues such as social justice and sustainable development. Putting social housing in flood hazard areas satisfies neither of these principles and puts life and livelihoods at risk.

In Ontario, Canada, there is a very simple system<sup>203</sup>. Areas where the flood hazard is greater than one in 200 are mapped. Areas of recorded historic flood are added. For the last 30 years, local communities have been forbidden to allow new development in such areas except in very special circumstances, and do not spend any money on new flood defences there, other than to protect evacuation routes. People living in these areas are permitted to stay but can at any time sell their property, provided they sell it to the community. The community will pay a fair market price for the property and then demolish it.

While these practices may seem extreme to people living in Britain, it should be remembered that flood insurance is not available at all for homes in Canada. Over a 30-year period most residents and businesses have been happy to sell up, and relatively few buildings are left in the floodplain.

The author toured one such community, in London, Ontario, as the guest of the Thames River Conservation Authority in 2001, and was very impressed with the beautiful public parks and recreation areas in the centre of the City next to the Thames River. It was hard to believe that these areas had once been covered with housing and industrial buildings. Could such a policy be introduced in London, England?

Figure 14

The Thames River in the centre of London, Ontario, showing the contrast between structural and non-structural solutions. On the left bank is a 30 year old flood defence which is not maintained but has been left in place for safety reasons because there are still some houses and a sports stadium behind it. On the right bank all the buildings in the hazard zone have been removed and

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<sup>203</sup> Brick, J., and Goldt, R., 2001 "City of London Flood Plain Management". Upper Thames River Conservation Authority, London, Ontario, Canada



the area has been landscaped for flood storage and recreation.



The Ontario solution is not unique. In 1997, the Red River flooded the city of Grand Forks in North Dakota, USA. Almost immediately after the flood, the city identified the properties damaged by the flood, and began to purchase them and demolish them<sup>204</sup>. Around 100 were demolished before the official purchase had been completed, in order to prevent them being re-occupied. The USA devotes special federal funds to purchase a property that has been damaged by flooding, and this is subject to a “green clause” which requires that the land be left vacant in perpetuity, in order to prevent future damage and to provide flood storage. In all, the city has purchased over 800 homes and 42 commercial properties since 1997. Many of these properties were jacked up and loaded onto lorries to be taken to safe areas, in a process called “managed relocation”. Where this was not possible, or where properties were badly damaged, they were demolished. The city has also made many of the remaining properties flood resistant, and has embarked on new flood defence works behind the area of demolished properties. The total cost of the project is \$580 million. (Managed relocation is more difficult in Britain owing to the nature of traditional construction methods, although it has been carried out successfully in isolated cases<sup>205</sup>.)

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<sup>204</sup> Pepper, A., Stonecipher, C., and Vein, K. A. (2002) *Flood management: lessons from a US city.* Municipal Engineer, 151, pp 295-304.

<sup>205</sup> Mcglashan, D., (in press) *Managed Relocation* University of Dundee research paper.

## Special advice for insurance underwriting managers

Those underwriters who have read this far, must clearly be concerned about flood hazards and future strategies to deal with them. The author very much hopes that underwriters will think carefully about the differences between Scotland and the rest of the country and consider how best to persuade England and Wales to adopt a more prudent strategy which takes into account the realities of the way insurance works.

The author believes that if more insurers were to recognise the achievements in Scotland, this might encourage similar policies in England and Wales. After all, if England and Wales had adopted similar approaches before now, then the insurance guarantee would probably still be secure.

This is not to say that the whole of Scotland is safe from flood risk, but if the relevant local Scottish Council has an active flood appraisal group then the chances are that:

1. There is a presumption against allowing new developments in any area where the flood hazard exceeds the 200 year return period
2. SUDS are being actively implemented in such a way as to reduce the upstream or downstream flood hazard
3. New drainage schemes are subject to a 200 year sensitivity analysis to ensure that properties are not flooded by drainage surcharges
4. Watercourses, culverts, and flood defences are being properly maintained and details of the work done are published (often on the Council's web site)
5. Flood events are being recorded and details published, along with action taken to prevent a recurrence
6. The Council is working closely with Scottish Water, SEPA and the author to minimise future flooding hazard.

In addition to the above, since Devolution, there has been enormous progress in developing flood defence schemes to protect areas at risk.

## Conclusions

The so-called “insurance guarantee” has distorted the market for forty years, and is no longer sustainable, at least in the South East of England, owing to the high demand for housing and the shortage of suitable land. Perhaps a new form of insurance guarantee is required to restore stability to the market, and the author has outlined a possible new guarantee arrangement in Appendix 6 to stimulate discussion.

At the end of the day, the number of houses built in flood plains should depend upon whether the public thinks that the risk is outweighed by the benefits. Until recently, public perceptions of flood risk have been reduced by subsidised insurance premiums, and as these perceptions of risk increase, along with higher premiums, problems in obtaining insurance, and consequent reduced property values, there is likely to be more demand for structural solutions because they are quick and visible. The position has been reached where the flooding problems in England and Wales are going to get a lot more costly unless some drastic action is taken.

By contrast, the measures already being taken in Scotland are proving effective in preventing any increase in exposure to the flood hazard, while at the same time an increasingly active and effective flood management programme is reducing the hazard itself. Fundamental to the Scottish strategy is the network of Flood Liaison and Advice Groups in which stakeholders have an opportunity to influence local policies, and advise local planners. These groups are crucial in helping to balance the profit motives of the housing developers with environmental and wider economic issues, not least the future availability of insurance, and the health and safety of local citizens.

Perhaps the last word should go to Peter Graham, Chief Executive at esure, who was quoted in an esure press release as saying:

“There has been an exceptional response to the problems of flooding in Scotland over the last five years. We believe that Scotland has in place many of the key elements that England and Wales are lacking in terms of planning and co-ordination. Now we are working to revise our risk-ratings across Scotland because of the speed with which the Scottish Executive and local authorities have acted to improve planning and defences.”

“We congratulate the Scottish Executive and Flood Liaison and Advice Groups on their excellent work and will be calling for Parliament in Whitehall to become similarly enlightened in the measures it adopts.”

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## Useful Web sites

Association of British Insurers. In April 2004, the ABI created a new page on its website dedicated to "flooding and insurance" issues. See: [www.abi.org.uk/flooding](http://www.abi.org.uk/flooding).

AON in association with ESYS have produced a series of reports for the European Space Agency on earth observation for insurance. The reports have been published on their web site; see [http://www.aon.com/uk/en/risk\\_management/risk\\_consulting/eoreport1.jsp](http://www.aon.com/uk/en/risk_management/risk_consulting/eoreport1.jsp)

Centre for Ecology & Hydrology <http://www.nwl.ac.uk>

Civil Protection and Environmental Accidents  
Part of DG Environment of the EC. The purpose of Community cooperation in the field of Civil Protection is to help ensure better protection for people, the environment and property in the event of natural and technological disasters.  
<http://europa.eu.int/comm/environment/civil/>

Department for Environment Food and Rural Affairs <http://www.defra.gov.uk/>

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

Flood Defence Strategy for England and Wales  
<http://www.defra.gov.uk/environ/fcd/pubs/stratsum.htm>

Health and Safety Executive <http://www.hse.gov.uk/>

Joint Research Council of the European Commission. There is an excellent "lessons learnt" (sic) report on flood disasters in Europe, in the EC Joint Research Council website along with a report on NATECHS (i.e. natural hazards triggering technological disasters). See <http://nedies.jrc.it>

LiDAR maps <http://www.ordnancesurvey.gov.uk/productpages/lidar/home.htm>

Office of the Deputy Prime Minister <http://www.planning.odpm.gov.uk/>

Scottish Environment Protection Agency <http://www.sepa.org.uk>

UK Resilience [http://www.ukresilience.info/flooding\\_advice.htm](http://www.ukresilience.info/flooding_advice.htm)

United Nations International Strategy for Disaster Reduction <http://www.unisdr.org>

Water Watch Archive of data on monthly rainfall and river flows for the UK from March 1997 to date  
[http://www.nerc-wallingford.ac.uk/ih/nrfa/water\\_watch/index.htm](http://www.nerc-wallingford.ac.uk/ih/nrfa/water_watch/index.htm)

## GLOSSARY and ACRONYMS for Flood and Insurance

The website of the European Environment Agency provides an excellent [multilingual environmental glossary](http://glossary.eea.eu.int/EEAGlossary/searchGlossary). See <http://glossary.eea.eu.int/EEAGlossary/searchGlossary>

Environment Canada also has an excellent on line glossary, see

[http://www.ec.gc.ca/water/en/info/gloss/e\\_gloss.htm](http://www.ec.gc.ca/water/en/info/gloss/e_gloss.htm)

Table 8

Glossary & Acronyms

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ABI	Association of British Insurers
ACPO	Association of Chief Police Officers
AIRMIC	The Association of Insurance and Risk Managers, a UK trade association representing the interests of corporate insurance buyers.
ALARM	Association of Local Authority Risk Managers. Association for insurance buyers in local authorities.
AMP	Asset Management Plan. The Water Industry in England and Wales uses AMPs for their expenditure on improvements. The current AMP is AMP3, worth £5.1 bn, of which a third is allocated to CSO improvements. AMP1 ran from privatisation in 1989 to 1994. AMP2 ran from 1995 to 2000. AMPs are also used in Scotland
BBSRC	Biotechnology and Biological Sciences Research Council - has replaced Agriculture and Food Research Council
Bellwin Scheme	A UK Government scheme for providing emergency assistance to local authorities to help rebuild infrastructure after a disaster.
BHRC	Benfield Hazard Research Centre at UCL
BMP	Best Management Practice
BNSC	British National Space Centre. Administers and co-ordinates UK commercial satellite instrument projects and development. Funded by the DTI
CASI	Combined Airborne Spectrographic Instrument. Used in conjunction with LiDAR for aerial surveys to help establish land use information.
CEH	Centre for Ecology and Hydrology. Formerly the Institute of Hydrology. Based at Wallingford, Oxfordshire, on the same site as HR Wallingford, a separate research centre, which researches hydraulics and has large physical laboratories.

CII	Chartered Insurance Institute. The body which sets academic standards for insurance practitioners.
CILA	Chartered Institute of Loss Adjusters
CIRIA	Construction Industry Research and Information Association.
CIWEM	Chartered Institute of Water and Environmental Managers
CML	Council of Mortgage Lenders, a UK trade association representing the interests of banks, building societies and other financial institutions involved in mortgage lending.
CoSLA	Convention of Scottish Local Authorities
crypto sporidium	This is a serious disease, which can be fatal to vulnerable age groups. The disease is spread by sheep, fox, and rat droppings in drinking or bathing water. Heavy rain washes these into watercourses and drinking water reservoirs.
CSO	Combined Sewer Overflow. Current practice for new urban wastewater collection systems normally involve the design of separate systems for wastewater (effluent) and rainfall derived storm water runoff. Historically, these systems were combined in a single pipe and most of the UK systems are combined. CSOs exist as relief valves to prevent damage to the sewers or the treatment works from certain rainfall events.
DAN	Development Advice Note. Issued by Scottish Planning Departments to advise the public and developers of what is and is not acceptable for developments. These notes can be produced in evidence at a Reporter's Inquiry so they are important.
DEFRA	Department of Environment, Food and Rural Affairs.
DEM	Digital Elevation Model showing the height of the land on a GIS.
DETR	Department of Environment, Transport and the Regions. Replaced by DEFRA/DTLR.
DFID	Department For International Development
DFT	Department For Transport
DG	Director General
DTI	Department of Trade and Industry
DTLR	Department for Transport, Local Government and the Regions - now DFT and ODPM
Dundee Tables	Tables published by the University of Dundee, based on a database of thousands of flood claims from the top 25 UK insurance companies. See Black, A and Evans, S (1999) "Flood damage in the UK: New insights for the insurance industry." University of Dundee. ISBN 0 903674 37 8. Dundee, Scotland.
E - Coli	Escherichia coli. A form of bacteria often found in manure. If washed into watercourses, it could end up in the public water supply and can be fatal to vulnerable age groups.

E & W	England and Wales
EA	Environment Agency
ECHO	European Community Humanitarian Office.
EN	English Nature
EPS	Emergency Planning Society
EPSRC	Engineering and Physical Sciences Research Council. Administers Government research grants. See also NERC.
ESSC	Environmental Systems Science Centre at the university of Reading
EU	European Union
FLAG	Flood Appraisal Group
FAQ	Frequently Asked Questions.
FASTER	Flood and STorm Event Report. A streamlined system for collecting data after a major flood or storm event. Piloted with major loss adjusters and found to increase efficiency and speed of reporting claims as well as enabling fraudulent claims to be spotted more easily. Supported in 1999 by the LPC and the ABI and by a special ABI Claims Panel working group set up to look at it, but not implemented. Subsequently recommended in the CII book on climate change in 2001.
FEH	Flood Estimation Handbook. Replaced the FSR in January 2001 as the "bible" for hydrologists and consulting engineers for the flood risk assessments etc. Published by CEH after six years work. Costs around £6k to buy.
FEMA	USA Federal Emergency Management Agency
FHRC	The Flood Hazard Research Centre at Middlesex University.
Floodplain	<p>Environment Canada defines a floodplain as "Any normally dry land area that is susceptible to being inundated by water from any natural source. This area is usually low land adjacent to a stream or lake"</p> <p><i>In Scotland, the authorities distinguish between the "functional floodplain" and floodplain generally. A functional floodplain is an area which is needed to store water in order to protect properties downstream from flooding. Any new building in the functional floodplain is discouraged, but if it is allowed in exceptional cases, compensatory new flood storage areas must be provided.</i></p> <p>The Environment Agency uses the following definition of floodplain;</p> <p>'Floodplain is defined as all land adjacent to a watercourse over which water flows in the time of flood, or would flow but for the presence of flood defences where they exist. The limits of floodplain are defined by the peak water level of an appropriate return period event on the watercourse or at the coast. On rivers, this will normally be the greater of the 1 in 100 year return period or the highest known water level. In the coastal areas the 1 in 200 year flood or the highest known flood will be used, whichever is the greater. In both instances where a flood defence exists which protects to a greater standard than those defined, then the floodplain is the area defended to the design water level.'</p>

FSA	Financial Services Authority. The Government “watchdog” for the finance industry. Responsible for protecting consumers against insurance insolvencies or sharp practice. In November 2001 it introduced a new “risk based” assessment procedure for insurers to identify those which were at greater risk of insolvency. According to information given to the author by the FSA, this could include the monitoring of exposure to flood claims, especially coastal flood.
FSR	Flood Studies Report. Published in 1975 and used by engineers to design many of our current bridges, dams and flood defences. Replaced by FEH in 2001. Research indicates that the different methodology and data used with FEH can produce rather different results from analyses using FSR, and there is concern that many structures designed using FSR may be more at risk from future flooding events than was previously realised.
Gardit	(General Aquifer, Research, Development and Investigation Team) was established in 1992, to tackle the rising groundwater problem in London (See the Rising Groundwater section in this report) For details, see: <a href="http://www.thameswateruk.co.uk/clrg/solution_frameset.html">http://www.thameswateruk.co.uk/clrg/solution_frameset.html</a>
GIS	Geographic Information Systems. A computer application in which any data with a spatial element (for example postcode) can be overlaid on maps.
Greywater	Greywater is water from sinks and washing machines, often containing detergent or cooking oil. (“whitewater” or “clearwater” is sometimes used to refer to clean water from roofs or pavements)
HR Wallingford	The Hydraulic Research centre at Wallingford, Oxfordshire. See also CEH.
IoH	Institute of Hydrology. See CEH.
IoH 130	Report 130 from the Institute of Hydrology (now called the Centre for Ecology and Hydrology). This report contains indicative flood maps for England and Wales. A supplement contains maps for Scotland. Flood hazard areas are shown for non tidal main rivers for a 100 year return period, ignoring the effects of flood defences.
IT	Information Technology.
ITE	Institute of Terrestrial Ecology
LCO	Lloyds Claims Office. This office assesses disasters and where necessary allocates catastrophe event codes to assist with identifying events for reinsurance purposes. Thus the storm in October 1987 was coded as “87J”.
LGA	Local Government Association (E&W)
LiDAR	LASER Instrument Detection and Ranging. The latest airborne instruments can provide a point density of 1 metre, a swath of 750metres and a typical height accuracy of plus or minus 15 cm. Surveys can be flown day or night and in cloudy weather. This is a very effective way to produce topographic maps with accurate height measurements.
LPC	Loss Prevention Council. At one time part owned by the ABI. Now part of the BRE.



MAHB	Major Accident Hazards Bureau (covers natural and man made hazards) See <a href="http://nedies.jrc.it">http://nedies.jrc.it</a>
MHWS	Mean High Water Spring. This is the contour shown on Ordnance survey maps. It represents the height of Ordnance Datum average high tide level during a spring tide. This is not necessarily the high tide height at the place shown.
MLURI	Macaulay Land Use Research Institute. Based in Aberdeen, this is the Scottish equivalent of the Silsoe Soil Research Institute in England. They have considerable GIS expertise and detailed land use maps.
MSP	Member of the Scottish Parliament.
NATECHS	Natural hazards triggering TECHnological disasters. See <a href="http://nedies.jrc.it">http://nedies.jrc.it</a>
NEDIES	Natural and Environmental Disaster Information Exchange System. See <a href="http://nedies.jrc.it">http://nedies.jrc.it</a>
NERC	Natural Environment Research Council. Administers Government research funding on projects related to the natural environment.
NFCDD	National Flood and Coastal Defence Database (Environment Agency). The establishment of this database is a requirement under the DEFRA High Level Targets for flood and coastal defence operating authorities.  The system is now utilised within the Agency and from March 2004, it was made available to operating authorities. At the time of writing (August 2004) the author has as yet no news of it becoming available to the public or insurers.
NHBC	National House Building Council. Funded by the building industry, inspects new houses during construction and underwrites a ten year insurance scheme for major defects in new housing.
NHBF	National House Builders Federation. Trade association for house builders.(see also SHBA)
NNR	National Nature Reserve
NPPG	National Planning Policy Guidelines (Scotland)
NPPG 7	National Planning Policy Guideline 7. Issued by the Scottish Office (now the Scottish Executive) in 1995 to give guidelines to planners about developments in flood hazard areas. Recommends the establishment of Flood Liaison and Advice Groups with insurance representation.
NRSC	National Remote Sensing Centre
ODPM	Office of the Deputy Prime Minister. See <a href="http://www.odpm.gov.uk/">http://www.odpm.gov.uk/</a> Replaces many of the functions of DTLR
OFWAT	Office of Water Services
OS	Ordnance Survey.

PAG	Project Appraisal Guidelines. Published by MAFF to provide guidance on the development of flood alleviation schemes. For example, PAG 3 relates to cost benefit appraisals of proposed schemes.
PAN	Planning Advice Note. Issued by the Scottish Executive to assist planners.
PDPF	Property Developers' Planning Forum. Set up by Homes for Scotland to give Scottish Property Developers an opportunity to discuss planning issues.
PPG	Planning Policy Guidelines. Published by DETR to guide planners on issues such as contaminated land. For example, PPG 25 relates to flooding hazards. (see also NPPG 7)
PS InSAR	Permanent Scatterer Synthetic Aperture Radar Interferometry. A revolutionary technique pioneered in the UK and Italy to measure sub millimetre movements in ground, buildings and structures. Gives early warning of subsidence, collapse, volcanic eruption or earthquake. For example, used by Thames Water to monitor reservoir embankments.
RFDC	Regional Flood Defence Committees
RMED	The median of annual maximum rainfall at a site. Used by hydrologists to assess flood hazard.
'SAFER'	Strategies and Actions/Implementations for Flood Emergency Risk Management. An EU funded project to reduce flood risk using sustainable solutions. Participants are Scotland, Ireland, Germany and Switzerland. For details of the Scottish involvement, search the web site of <a href="http://www.forestry.gov.uk">www.forestry.gov.uk</a>
SAN	Supplementary Advice Note. Another name for a DAN.
SAR	Synthetic Aperture Radar. A type of instrument used on satellites or aircraft. Can measure surface roughness or changes in topography (for example due to flooding). Can be used at night or with thick cloud cover.
SCOTS Group	Society of Chief Officers of Transportation in Scotland. Commissions research reports and has issued reports on flood related topics such as legislative framework, planning, and emergency planning.
SEERAD	Scottish Executive Environment and Rural Affairs Department
SEPA	Scottish Environment Protection Agency
SHS	Scottish Hydrological Society
SLF	Scottish Landowners Federation
SME	Small and medium sized enterprises
SNH	Scottish Natural Heritage
SNIFFER	Scottish and Northern Ireland Forum For Environmental Research
SOLACE	Society Of Local Authority Chief Executives.
SSDP	Scottish Society of Directors of Planning

SUDS	Sustainable Urban Drainage Systems. Not necessarily restricted to urban use, (and now generally called simply “Sustainable Drainage Systems”) the concept is to minimise surface water run off from a new building development to contain it to the same levels as applied before the development.
SUSTAINABLE FLOOD MANAGEMENT	“Managing the <i>natural process</i> of flooding on a <i>catchment scale</i> using <i>natural features</i> , to their maximum potential.” (source, WWF)
Swales	An area of ground, usually part of a SUDS scheme where the ground is lower to create a permeable shallow ditch for disposal of surface water. It should also have an incline so that surface water, which does not soak into the ground, can run off to soakaways. Otherwise, a swale can turn into an elongated pond during heavy rainfall.
TCPA	Town and Country Planning Association
TSUNAMI	Technology and Science in UNiversities, And Met office, for Insurance applications. In the context of this report, this refers to a consortium of major companies from the UK insurance industry, which has been funding research into various aspects of insurance and insured perils.
UCL	University College London
Water Watch	A service by CEH and others to record hydrological events such as rainfall, river flow and dam storage of water. See <a href="http://www.nerc-wallingford.ac.uk/ih/nrfa/water_watch/index.htm">http://www.nerc-wallingford.ac.uk/ih/nrfa/water_watch/index.htm</a>
WEWSA	Water Environment and Water Services (Scotland) Act 2004.  This Act transposes the European Water Framework Directive (WFD) into Scots Law. The WFD promotes a catchment wide approach to how we manage our water environment and aims to protect and improve water quality and associated habitats. Unlike the Directive, which barely mentions flooding, WEWSA has been extended after strong lobbying in Scotland to include flood management at a catchment scale, as part of river basin planning.
WFD	Water Framework Directive.
WTI	Water Training Institute. A charitable company, which organises training courses for those in the water industry. Contact <a href="mailto:mmcgowan.house@wti.co.uk">mmcgowan.house@wti.co.uk</a>
WWF	World Wide Fund for nature.

## Appendices

### Appendix 1: The Insurance Template

(© Crichton, 1998)

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 siting certain types of development in a hazardous area. The author 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 used by a number of local authorities as a guide.

#### **Category One - Strategic Sites**

Facilities which must continue to function in times of flooding, for example, emergency services, hospitals, electricity supplies, telephone exchanges, mobile telephone and broadcasting transmitters, and emergency control centres.

Such developments should not be 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.

The standards proposed by insurers are as follows;

Table 9

The Insurance Template

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

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

### Climate Change

The climate change adjustment is very important, it should take into account that in general, 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

Source: Scottish Executive Central Research Unit Report, May 2001

A "100 year event" is really another way of saying a 1% probability of flooding every year. If there are 100 developments each with a 1% probability of flood, that means that every year, there is a probability that at least one of them will flood. Insurers have to spread these losses over time, and the shorter the timescale between floods, the higher the premiums will have to be. Where the probability of flood over the next 50 years is going to rise from 1% a year to 3% a year due to climate change means that it is almost inevitable that the building will flood at some time in those 50 years. As

Section 27 of NPPG 7 points out, for the 100-year flood, there will be a 51% chance of at least one such event during the 70-year lifetime of a building.

The suggestion of a 500 year return period for bungalows and ground floor flats has caused some debate as to its reasonableness for a large development of mixed housing types. On the other hand, solutions should not be unduly costly. Few sites are completely flat, bungalows could be sited on raised ground and fitted with large skylights which can be opened for escape purposes in an emergency. If blocks of flats are being built in flood hazard areas, consider using the ground floor for parking, drying areas for clothes etc., rather than accommodation.

Sometimes individual houses have been built on "stilts" to reduce the flood vulnerability, but this is not always a good solution because owners are tempted to turn the area under the house into additional accommodation space.

Careful planning can do much, and local solutions might include:

- Raising the height of the ground floor of the building (solum), and ensuring foundations are able to cope with flooding. (This will also depend on soil conditions; sandy soil and clay are generally very vulnerable to flood)
- Designating lower lying areas of the development site as recreational areas
- Following the guidance in the Sustainable Urban Drainage Manual

Developers may well be happy to accept such relatively low cost measures as an alternative to flood defences, especially if it avoids insurance problems for their customers. After all, without insurance, the customer cannot get a mortgage, and the property will remain unsold.

It should be remembered that if the land is raised to reduce flood impacts, this will remove flood storage and additional flood storage will be needed elsewhere to compensate.

### **Caravan Sites**

Caravan and camping sites are an obvious potential problem in that the residents may not know the area and may be unaware of the flooding dangers. The owners of such sites need to be informed of the chances of flooding, the likely depth of flood, where the safe areas of the site are, and what sort of advance warning they might get. If there is a hazard, they should be advised to talk to the local authority and emergency services for advice on emergency procedures. The information on the flood risk, and what to do if a flood warning is given, should be provided to visitors on arrival or registration, and on clear fixed signs at the entrance to the site. Safe shelters should be clearly marked. This should be made a condition of the site licence if one is required.

There is a case for distinguishing between static residential caravans and seasonal touring caravans:

1. Touring caravans can be moved out of danger fairly quickly if a flood warning is given
2. Touring caravans tend not to be on such sites in the winter when the flood risk is greatest.
3. The value of property at risk tends to be much lower for touring caravans.

It is suggested therefore that for seasonal touring caravan sites, a lower standard of protection may be acceptable, provided this is kept under review each time the licence is renewed, and provided adequate warning and evacuation arrangements are in place. For mixed sites, the static caravans should be located in those areas of the site which are at the lowest risk from flood.

Try to avoid permitting touring caravan sites near rivers where there are bridges downstream; caravans can be swept away and become lodged under bridges, creating a dam, which can make flooding worse.

### **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, however, for example:

Where the site will attract the public, especially young 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,

Waste water 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.

## **Appendix 2: The Foresight Flood and Coastal Defence Project**

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(Extracts from the Foresight web site, [www.foresight.gov.uk](http://www.foresight.gov.uk))

The project will be split into two parts:

- Flood risk scenarios in the light of climate change (extrapolated to 2100), evolving land use, and socio-economic changes.
- Techniques that could be used to manage the fluvial and coastal flooding risk

### **The project is to examine:**

- Severe rainfall events (pluvial flooding)
- River based flooding (fluvial flooding)
- Sea based flooding (coastal flooding including the effects of sea level rise and storm surges)
- Interaction of rain, rivers and sea (estuarine flooding)
- The probability of events occurring at the same time (such as a sustained period of rain followed by a heavy storm) and their impacts
- Natural variations in the climate as well as atmospheric oscillations (e.g. North Atlantic Oscillation/El Nino etc.)

### **Impacts of flooding will be measured in terms of the following factors:**

- social (including health)
- economic
- environment

### **Critical assets at risk from future flooding will be investigated as a special study focusing on areas such as:**

- coastal assets (e.g. power stations/refineries)
- inland assets (e.g. transport infrastructure/emergency services)

### **Extreme Events will be considered, for example:**

- Tsunamis
- Hurricanes



- Asteroid, meteor or comet strike
- North Atlantic ocean circulation changing

**Responses to flood risk will be considered in three main areas:**

1. Hard engineering and technology (engineering and science – existing and future technology)
2. Soft engineering responses such as environmental schemes to manage flood risk, and how these link to EC Directives to protect, sustain or enhance the natural environment Europe-wide

Geomorphological engineering to repair natural systems to minimise flood risk.

**Land use**

How this impacts on flooding (e.g. urban and rural drainage) as well as controlling water at source.

**Reducing impact/damage**

- Temporary and Demountable flood defences
- Building solutions such as flood proofing houses, raising roads etc
- Using the planning system to prevent building in inappropriate areas
- Insurance and market forces
- Phased relocation and managed realignment.

**Case studies**

Small areas throughout UK will be studied to look at flood risk, potential impact and suitable responses.

Other aspects that have been identified as important for the project are:

**Communication**

- Who to communicate with (e.g. those at risk, those not at risk)
- What to communicate, how to communicate it and when (e.g. before or after a flood)
- Language used by different people (e.g. flood professionals, politicians, etc)

### **International**

There are good (and bad) flood management practices throughout the world. The project will investigate these and see if there are any lessons that could be learnt, and the project may organise or take part in an international forum or discussion group

### **Skills and research**

Skill shortages should be considered by the project and how these can be addressed.

Areas for further research should be identified.

### **The reports**

The main body of work for the project began around September 2002, and was completed in April 2004. The reports are all available on the internet and will not be considered in detail here, but they show that the flood hazard in Britain will increase significantly in the next 100 years. The project reports were announced on the 22nd April 2004, with dire warnings about the future of flood hazards in the UK (See Alert 13 on the Benfield Hazard Research Centre website, [www.benfieldhrc.org](http://www.benfieldhrc.org) )

Here is an extract from the press release:

"The project found that over the next 100 years, if current levels of expenditure and approaches to flood management remain unchanged:

- river and coastal flood risk could increase between two and 20 times;
- risk of flooding from rainfall could increase between three and six times;
- annual economic damage could increase from £1bn to between £1.5bn and £21bn by the 2080s, depending on the scenario. This compares with growth of GDP of between two and 14 times over the same period; and
- the number of people at high risk of river and coastal flooding could increase from 1.6 million today, to between 2.3 and 3.6 million by the 2080s."

Maintaining the current level of flood risk could cost between £20bn to £80bn in total over the next 80 years, but a steady increase in investment starting now could make future flood management more affordable – there would need to be an annual increase of between £10m to £30m per year for the next 80 years.

## **Appendix 3: The FASTER Form © Crichton 2001**

### **(Flood And Storm Event Report Form)**

**For quicker, but more detailed reporting on major flood and storm events.**

By David Crichton

Following a major flood or storm event, insurers and loss adjusters can have major problems in dealing with the large volume of claims that arise.

There are basically three problem areas;

The first problem is the simple logistics of dealing the volume of claims. In recent years, insurers have been pressing loss adjusters for lower rates, and this has had the effect of reducing the number of skilled loss adjusters available. This can result in a slower service to customers.

The second problem concerns so called "claims inflation". During a major event, various types of behaviour can be seen:

#### **1. Bandwagon Effect**

Where claimants are tempted to seek higher settlements after talking to other victims, and are jealous of what others obtained, or are unwilling to accept the loss adjuster's offer.

#### **2. Profiteering**

Where tradesmen inflate their usual rates due to the high demand.

#### **3. Sales pressure**

Where tradesmen have pressured victims to accept unreasonable estimates or shoddy work.

#### **4. Collusion**

Collusion between tradesman and claimant to inflate the estimates (eg to cover the excess), or between tradesman and tradesman (to "fix" the lowest estimate).

#### **5. Exaggeration**

Where many claimants have exaggerated the amount of damage or value of the losses.

#### **6. Missing salvage**

Suspicious cases where damaged contents have not been retained for inspection (perhaps they never existed, or were never owned by the claimant).

The third problem is Opportunistic Crime. Looting, mugging, assaults, and malicious damage can increase during the aftermath of a natural disaster, when the police are usually occupied elsewhere and homes may be abandoned.

## **Background**

The last ten years have seen an unprecedented increase in the number and cost of flood and storm claims in the UK. Latest expert opinion on the impacts of climate change is that extremes of precipitation will increase in the UK and many now believe that there will also be more frequent and severe storms. Adaptation will mean the need for changes in building regulations, and the insurance industry may be called on to provide data on storm and flood damage to assist with that process.

Climate change raises several important challenges for insurers;

1. Can insurers streamline claims handling systems to be able to cope with a sudden flood or storm event more quickly, providing better customer service and minimising losses?
2. Can they capture more information about the effects of such an event so that they can provide Government with the data they will need for the purposes of tougher building standards?
3. Can they improve pricing structures to make premiums reflect the risk more accurately?
4. Can they improve catastrophe models to help to assess how much reinsurance is needed how much it should cost?
5. Can insurers tighten up on fraud and claims exaggeration?

At first sight, there seems to be a conflict here, how can claims handling systems be made faster, and yet tighten up on fraud and capture more data? The "FASTER" form is an attempt to address these problems.

Usually the loss adjuster makes notes while on site, after checking on any special requirements of the insurer involved. He or she then takes the notes back to the office, and dictates a preliminary report which is then typed up and posted to the insurer. With the "FASTER" form the whole process could be made significantly quicker, with a number of other benefits. If the insurance industry were to accept this form as providing all the initial information they need and agreed to accept it in place of the traditional preliminary report, the benefits could be significant: Also, because the form has been designed to be easy to use, insurance claims clerks could use it as a checklist when on site visits for smaller claims where a loss adjuster is not involved. Similar forms have been introduced in Australia for bushfire and earthquake.

The form was first designed back in 1996, and has been through an extensive consultation and piloting phase. Academics, architects, builders as well as loss adjusters and insurance experts, have made useful and constructive comments, and the questions have been revised many times as a result. The form has been strongly recommended by the Loss Prevention Council's Natural Perils Advisory Committee and the ABI Weather Damage Working Group, as a possible standard market form, and has been extensively used in connection with the University of Dundee project to collect flood damage data.

It has been suggested that much of the information requested in the form is already provided in loss adjusters' reports. This has not been the author's experience, after reading many hundreds of such reports, trying to extract critically important information such as depth of flood, or type of contamination of the water. Even if the information does appear in the reports, it is often embedded in text, and therefore hard to extract for analysis purposes. Loss adjusters have a problem in that different insurers require different data from them; some require a great deal of detail, while many do not give any guidance as to what information they want.

#### **Benefits if the form were to become an industry standard**

##### **For the Loss Adjuster, claims clerk, or delegated authority contractor:**

1. The form provides a simple check list of information to obtain during the site visit.
  - Less chance of items being missed, saving on return visits.
  - Possible indicators of fraud are highlighted.
2. The form can be used instead of site visit notes; just fill in the boxes on a paper form or laptop computer.
  - Saves time in writing out details in longhand.
3. On return to the office, instead of dictating a preliminary report, just fax or e mail the form.
  - Eliminates time spent on producing reports following site visits; the time can be spent on giving more attention to the needs of claimants and giving faster service.
  - Eliminates costs and delays due to typing preliminary reports.

##### **Additional benefits for the Loss Adjuster,**

1. No need to check up on any special requirements of the insurer before the site visit.
  - Time saved, and less confusion over different insurers' requirements

2. Publication of the tables of average claims costs could provide guidance to adjusters for future claims; cases with claims in excess of what might be expected could be spotted more easily.
  - Helps with loss adjusters' training programmes, improves consistency, helps spot fraud.

#### **For the Insurer**

##### **Customer Service**

Much faster receipt of preliminary reports; if sent by fax or electronic mail, the completed form could be received within minutes of the site visit.

Better customer service thanks to quicker decisions on emergency repairs etc.

More likely to be able to get the repair work done by a preferred contractor - the longer the delay the more chance that the insurer will have to accept a less reliable, or more costly contractor.

##### **Setting Reserves**

Data received already formatted, ready to be processed by the insurer to establish an early indication of likely total costs.

- Quicker, more accurate reports to help with setting reserves.

##### **Reducing Fraud**

Provides more details than would be obtained from a standard preliminary report.

- Helps to spot fraudulent claims.

##### **De skilling for small claims site visits**

The form can be used by the insurer's own staff (including non claims staff) to do site visit reports on small claims.

- Potential to reduce claims handling costs and small claims fraud. This is especially important during a major event, when the need for a claims form may be waived, and loss adjusters may be used only for the biggest claims.

#### **For the Insurance Industry**

##### **ABI.**

By sending a copy of the "FASTER" form to a designated university, the details could be scanned into a computer database (after removing details which identify the insurer, loss adjuster, or claimant), and daily updates and analyses of the total likely costs and nature of the event could be made available to the ABI.

- ABI better prepared to communicate with media and emergency services.

### **Premium levels and catastrophe reinsurance**

By building up a database of various flood and storm event details, the industry can improve its understanding of the effect of such events on claims costs and can improve the accuracy of its premium levels and catastrophe models.

- Better assessment of how much catastrophe reinsurance is required.
- More accurate costings for premium levels and reinsurance.

### **Risk Management**

By identifying the main contributory factors to flood and storm costs, the industry will

- Be better placed to reduce costs through targeting risk management activities,
- Be better able if necessary to influence building techniques and standards.
- Be able to highlight potential underwriting factors such as the age or type of construction of the property.

### **Procedures**

Please note; the form is only intended for use where there has been a visit to the site of the damage, by a loss adjuster, or an employee of the insurer, or a delegated authority building contractor.

If completed by a loss adjuster or contractor, forms should be sent by fax to the relevant insurer and to the designated university as soon as possible. Alternatively, the form can be sent by electronic mail. If completed by an insurance company employee, a copy should be sent to the designated university either by fax, or posted in batches.

One Faster form should be completed for each site of damage.

When all sites have been visited, a copy of the "Event Form" should be completed for all insurers involved.

### **Event Form; General Issues**

This supplementary sheet is intended to be used to give the loss adjuster's or claims handler's general impressions about aspects of the event which could have implications for the claims costs. In the aftermath of a major event, there are many factors which can operate to increase the claims costs, and this would have obvious effects on catastrophe modelling. Keeping this as a separate form, applying to all the sites visited, not only saves duplication, it will hopefully encourage a franker, more forthright disclosure of some of the more sensitive and difficult aspects of the claims.

## Instructions for Completion of Forms

A guide to completion, and what the questions are for...

### Header

The form is intended to be used in place of the adjuster's site notes and preliminary report.

By completing the form on site, and faxing it to the insurer and to the university immediately after the visit, not only can a great deal of time be saved which can be more effectively used out on site, but also the industry can get a much earlier picture of the extent of the losses. Note that there is space to show the name of the individual who completed the form, and the date of the visit. There is also space for a rubber stamp showing the adjuster's name and address. Just above this is a space for "File Ref. No", to be used for the loss adjuster's file reference number, or, if the form is completed by an insurance company employee, the claim number or policy number.

### Part One. General Information

This is information relevant to different types of natural perils claims.

- 1.1 If the premises does not have a postcode, e.g. a church, item of plant, electric substation etc., then give the nearest postcode available and write "next to" above the postcode field.

To avoid any possibility of Data Protection Act problems, the University which will be analysing the data will be subject to a confidentiality agreement and will not be capturing the house number; that information is purely for the benefit of the insurer dealing with the claim.

- 1.2 This is intended to assess proximity of adjoining property as this can affect wind gusts and flood velocity and contamination. It could be a potential future underwriting factor. Topography also affects the local maximum gust speed; the figures from the nearest weather station may not be appropriate to the local situation. The question is also relevant to flood.
- 1.3 This shows three very broad industry groupings, plus residential, motor trade, and unoccupied. Anything outside these may have unusual features and so it needs to be specified, in case it affects the validity of including the data.

It is tempting to ask for more detailed information about occupation, e.g. asking for the Standard Industrial Classification, but the main purpose of the form is to be able to produce mean loss ratios. The more variables the more complex this task will be. Occupation reveals something about the contents, (this is why motor trade merits a special mention - see the comments on question 3.5) while there is another question about the type of building (2.2). There is also, of course, an unoccupancy option.



## **Part Two: Information about the property**

Note that non conventional properties are excluded from the scope of this part of the form, but it still requests information about losses. Individual insurers may wish to revisit such claims asking for specific information.

- 2.1. Only a limited menu here, - this reflects an expectation of the factors to be shown in the mean loss ratio tables.
- 2.2. This is to get a general idea of the building stock type. By having two "dimensions" it is potentially possible to identify 25 different types of building from only two ticks. A further tick in the next question raises this to 100 potential types. In practice, mean loss tables will tend to group types with similar results, but to do this requires a fairly detailed set of data.
- 2.3. These are the bands currently used in the Middlesex University flood mean loss tables. Using these bands will aid comparison.
- 2.4. Even a very old flood event will be of interest for flood risk mapping purposes. Recent storm damage will also be of interest, from the point of view of whether repairs were satisfactory.

## **Part Three: Flood and Freeze**

- 3.1. Flood and freeze have been combined in this part, because freeze damage to burst pipes could result in similar damage to flood. However flood is also associated with contaminated water, impacts etc. so questions 3.2, 3.3, 3.4, and 3.5 are not relevant to freeze and can be skipped in such cases. Separate surveys have already identified information about precautions people take to prevent freeze damage, so there are no questions about this in the form, however, there is an unoccupancy question which would be relevant (1.3)

The aim of this section is to collect information about water damage claims. Not all such claims will be covered under the flood or burst pipes sections of the policy - please ensure that you are aware of the limits of such covers in the relevant policy.

- 3.2. The source of the flood is useful for identifying the event and mapping its extent. Roof failure is a common cause of flooding when there is a long spell of torrential rain; gutters and down pipes may be blocked, tiles may be broken, flashings may not cope with the volume etc. Also roof failure may be the result of storm damage and in a wet storm, there can be significant water damage inside the building. Rising groundwater is not usually regarded as "flood" and is normally excluded from cover. However, in certain circumstances, e.g. where the event is sudden and is related to flood conditions, then it may be decided to indemnify. For example, seepage under an earth flood defence due to pressure of water from a river or the sea. A burst water main is not a natural catastrophe, but what is important is data on

water damage for mean loss ratios. For that purpose, it is valid to include such an event.

- 3.3 Contamination and impact are important factors influencing the amount of damage.
- 3.4 Studies in the UK show that flood warnings can have a major effect on reducing average flood losses. A two hour warning can reduce average losses by as much as 50% for a 0.3m flood in residential property (43% in a shop). However, a four hour warning only increases the saving to 55% (47% in a shop). [Cole, G and Penning-Rowse E C, 1981 in "Flood Studies Report; five years on" pp143-151].

Long warnings are unusual in the UK, due to the relatively small scale of river catchments and coastlines and it is clear that the first two hours are critical.

In the USA, it is possible to have quite long warnings: a Mississippi flood can take more than two days to reach New Orleans for example. However, there is some evidence from the USA that a warning of more than eight hours has little more effect than a warning of less than eight hours. It is not known whether the same applies in the UK. Finding out how the warning was given is a bonus; it would be very useful to the insurance industry and the authorities to discover the most effective source of warnings because this could potentially help make future warnings more effective, something which is in everyone's interest.

If the policyholder takes action as a result of a warning, this will affect the loss and therefore the costs will have to be treated differently when collecting data for the mean loss ratios.

If no action is taken, the reasons should be explored, hence the reference to Question 5.5.

- 3.5 The type of action taken will influence the extent to which the individual loss is mitigated. Another factor will be the occupation, which is an indicator of the type of contents in the premises. A good example of this is motor trade, where high value vehicles could be moved quickly at short notice, thus having a major effect on costs and a reduction in subsequent oil contamination for surrounding property.

The action taken may not be very effective, and it is vital to know whether it is or not for the input into the mean loss ratios data.

- 3.6 The longer the inundation, the greater the damage for a given depth. This is because capillary action and humidity will attack property above the level of the water. So pumping out the water and installing industrial dehumidifiers quickly is very important. Any calculations of mean loss ratios will be very much influenced by the duration of the inundation, and the effects of these

secondary forces. For coastal floods, there could be the added complication of successive tides topping up the water level.

- 3.7 Depth is still the single most important factor, and will be the basis for all the flood mean loss ratio tables. There has been some debate about the use of bandings rather than asking for a depth figure and developing a "smooth curve". In practice, following studies of hundreds of loss adjusters' reports, it is clear that there is already a form of banding being used in that loss adjusters tend to give depth estimates in round numbers - after all they are usually estimates anyway.

#### **Part Four: Windstorm**

- 1.1 Roof damage is one of the commonest results of a storm. In the October 1987 storm, 63% of damage was to roofs. Note that for flat roofs the form does not ask for any construction details, because damage to a flat roof usually seems to be due to the lack of adequate ties holding it to the structure.
- Sarking boards are an important element; they are generally used below slates or tiles in Scotland, but are much less common elsewhere. Indications are that sarking has a major effect in making the roof more storm resistant.
- 4.2 A number of experts expressed concern that unsupported gable walls would be very vulnerable in areas where storms are not traditionally very common.
- 4.3 There are a lot of different factors in this list, many of which have been derived from an Aberdeen University study (Loss Prevention Council, Paper LPR 8: 1998 ISBN 0 902167 49-9) which has examined the causes of windstorm damage. The factors shown here are the most common causes according to this study. While this will not help with the mean loss ratios, it is an excellent opportunity to create a very much larger database of such information, which can be used for a number of purposes, for example targeting areas for surveyors to check out, or providing information to those who set building and construction standards. This question can also give an indicator of a potential problem due to lack of maintenance, hence the cross-reference to question 5.5.
- The question of lack of maintenance or the general condition of the property is an important one, and merits its own question later on (question 4.7)
- 4.4 Just as depth of flood is the major factor in flood mean loss ratios, so maximum gust speed is a major factor in windstorm. Unfortunately, gusts are very localised, and depend on local topography and surface friction (see question 1.2). In most cases therefore, the loss adjuster will have to rely on the mean windspeed from the nearest weather station. Note that conversion ratios are given for a number of different units of measurement, because the nearest weather station may not always be a Met Office one; it could be a WeatherNet station or perhaps a university, coastguard, marina, airfield, or private

individual. The important point is that the station should be the closest one to the site, regardless of who operates it, provided they are qualified and the anemometer and recording equipment are to Met. Office standards.

- 4.5 Duration and whether the storm was "wet" are clearly important factors.
- 4.6 If the property is the only one in the area to suffer damage, this might indicate lower standards of maintenance, or suspicious circumstances, hence the reference to question 5.5.
- 4.7 Leading on from 4.6, there is a specific question about the condition of the property. In the case of severe storm damage, this may be hard to assess without closer examination, so again there is reference to question 5.5.

#### **Part Five: Costs**

These are self-explanatory. Note that the form asks for information before deductibles, excesses or average: this is because the information is for use in mean loss tables, not to calculate the cost for a particular insured. Although average is to be ignored, there is still a question about an appropriate sum insured, because this gives a good measure of the size of the property: different sizes/values of property may have different mixes of claims components.

The form asks for actual sums insured as well; this is for a possible future analysis of whether particular categories of policyholders have a tendency to underinsure. For example are those living in flood plains less likely to underinsure?

Note that for domestic contents costs should be on a "new for old" basis, not indemnity; this obviously would have an effect on claims costs.

This is the only part of the form that asks about outbuildings. These can be particularly vulnerable to storm damage, and may feature in many such claims.

For the purposes of producing mean loss tables, the estimates should assume that a preferred contractor will be used for the repairs, although in practice this may not be possible in a major event. This is catered for in question 5.5, which should help to produce some form of consensus about an appropriate claims inflation loading to the mean loss tables where a catastrophic event occurs.

Question 5.5 also gives the loss adjuster the chance to flag up any suspicious claims. In such cases a phone call to the adjuster is more appropriate than asking for comments in writing.

The FASTER FORM

Page 1 of 4

Form completed by (name or initials); \_\_\_\_\_  
 Adjuster/contractor file reference; \_\_\_\_\_

Event date; (dd/mm/yy):            \_\_/\_\_/\_\_

Please fax/post/email a copy of the completed form to:-

1. Insurer (Policy No \_\_\_\_\_) AND

2. Geography Dept, University of Dundee, DD1 4HN

Fax 01382 344434

From (Company  
 Name and  
 Address)

**PART ONE: GENERAL INFORMATION about affected premises**

Floors affected

1.1 Postcode\*; \_\_\_\_\_ House No\* \_\_\_\_\_  Basement  Ground   
 Other

(\* the University of Dundee is registered under the Data Protection Act to hold this information.)

1.2 Location (please tick all that apply)  
 Built up area  Industrial estate  Suburb  Rural area  
 On a hill crest  Near a cliff edge  Near the coast

Near a river

1.3 Nature of occupation by policyholder (please tick all that apply)  
 Residential  Industrial  Retail  Office  Motor trade

Unoccupied  Other

**PART TWO: INFORMATION ABOUT THE PROPERTY**

non conventional , (e.g. caravam, boat, site cabin etc.) – in such cases go to Part Five.  
 Otherwise,

**2.1 Walls** (please tick any of the following which apply)

External  Brick  Stone  Concrete  Cladding  Other

Internal  As for External  Plaster board  Lath / plaster  Other

Comments on any external / internal materials likely to be particularly vulnerable

**2.2 Height and type of building** (tick the predominant one from each column)

- |   |  |
|---|--|
| <p>Height</p> <p><input type="checkbox"/> Mixed heights</p> <p><input type="checkbox"/> Single storey (not counting attic)</p> <p><input type="checkbox"/> Single storey, lofty</p> <p><input type="checkbox"/> Two storeys (excl. attic)</p> | <p>Type</p> <p><input type="checkbox"/> Residential type (even if business use)</p> <p><input type="checkbox"/> Purpose built retail type</p> <p><input type="checkbox"/> Purpose built office type building</p> <p><input type="checkbox"/> Industrial/agricultural shed type</p> |
|---|--|

**2.3 Date of Construction** (approximate) -tick the box for the oldest substantial part of the building

- Pre 1918  1918 to 1938  1939 to 1970  1971 to 1989  post 1990

Comments – for example, is a significant part of the building of more recent construction?

or is the building a listed heritage building?

**2.4 History of previous damage from flood, storm or freeze** (if any)

Year Flood Storm Freeze Brief details (continue on a separate sheet if necessary)

- |       |                          |                          |                          |       |
|-------|--------------------------|--------------------------|--------------------------|-------|
| ..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | ..... |
| ..... | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | ..... |

.....    .....

**PART THREE: FLOOD AND FREEZE** (If no flood or freeze damage, go to Part Four.)

Please tick  all that apply.

**3.1 Type of Claim**

- Burst water pipe or tank due to freeze (if this is the sole cause go to question 3.6)
- Freshwater Flood from rainfall, snowmelt, blocked drains, burst water main, etc.
- Saltwater Flood due to coastal storm surge/ failure or overtopping of sea defences etc.

**3.2 Immediate source or cause of flood:** (please tick  all that apply)

- Sea/Tidal Estuary     Stream/River/Lake/Loch (insert name)
- Roof failure                       Failure of sea/river defences at
- Rising groundwater     Blocked drains or culverts outside the building
- Burst water main             Backup into toilets or bath etc. inside the building

How far away was the nearest source?  metres

**3.3 Factors contributing to damage:** (please tick  all that apply)

1. Contamination:-     Salt     Silt     Oil/Chemicals     Sewage
2. Any impact damage caused by rapid flows of water and floating debris?     yes     no

**3.4 Warning received:**                      Hours - If none, insert zero and go to question 3.6.

1. Source of warning;                       telephone     TV/radio     neighbour     other
2. Any action taken?                       yes     no    (if "no", go to question 3.6, see also 5.5)

**3.5 Action taken by occupier or others to reduce damage:** (please tick  all that apply)

Type of action	Action taken?	Effective?
movement of portable items/ vehicles	<input type="checkbox"/> yes <input type="checkbox"/> no	<input type="checkbox"/> yes <input type="checkbox"/> no
use of sandbags, flood screens etc	<input type="checkbox"/> yes <input type="checkbox"/> no	<input type="checkbox"/> yes <input type="checkbox"/> no

other – please give details

**3.6 Internal inundation / humidity damage**

1. Duration:  Days  Hours Were pumps used?  yes  no

2. Any damage from  condensation?  capillary action?  humidity?

3. What proportion of total damage costs is likely to be due to increased humidity ?  
 %

4. Were/are dehumidifier machines available?  yes  no

5. Were the waters topped up by successive tides?  yes  no

Other comments:

**3.7 Maximum depth of water:** (Please use metric measures)

centimetres		Conversion to
External ground level	<input style="width: 60px; height: 30px;" type="text"/>	multiply inches by 2.54
Internal ground floor level	<input style="width: 60px; height: 30px;" type="text"/>	multiply feet by 30.48
Internal basement level	<input style="width: 60px; height: 30px;" type="text"/>	e.g. 4" =10 cm, 6' = 182cm Show the maximum depth based on marks on walls

Additional comments:

**PART FOUR: WINDSTORM** (If no windstorm damage, go to part five.)

Please tick  all that apply.

**4.1 Roof construction.** If no roof damage go to 4.2

Pitch  Steep  Medium  Shallow  Flat (if flat, go to 4.2)

Structure  Timber rafters and trusses  Steel rafters and trusses  Sarking boards

Cladding  Slates/tiles  Felted timber  Sheeting



**4.2 Wall, chimney, door or window damage** (If none, go to 4.3)

- Gable wall    Chimney    Other wall of building    Door/windows

**4.3 Factors contributing to the storm damage.**

Please tick  all that apply

- Inadequate ties between wall / roof and structure
- Normal ageing/wear and tear
- Premature ageing indicating inappropriate materials/design/construction
- Fatigue/corrosion etc. indicating lack of maintenance (see 5.5)
- Aggravation of previous unrepaired damage
- Building under construction/repair- inadequately supported
- Falling trees/branches (delete as appropriate)
- Falling chimney(s)/aerials/satellite dish (delete as appropriate)
- Other flying debris causing impact damage. Type?
- Failure of the roof cladding fixings
- Failure of the wall cladding fixings
- Local failure of the cladding - insert cause if known
- Partial roof or wall failure creating a dominant opening
- Other (please state)

**4.4 Maximum Windspeeds at nearest weather station** (if known) Conversion to mph

- |                                   |       |                               |
|-----------------------------------|-------|-------------------------------|
| 1. maximum mean windspeed         | Mph   | multiply knots by 1.15        |
| 2. maximum gust speed             | Mph   | multiply metres/second by 2.2 |
| 3. distance from weather station? | Miles | multiply Km/hour by 0.6       |

**4.5 Other details of the windstorm**

Duration:  less than 2 hours  2 to 6 hours  over 6 hours

Was the storm accompanied by heavy rain, hail, or snow?  yes  no

**4.6 Isolated incidents** Was there similar damage to other property in the vicinity?

Yes, extensive  Limited  Virtually none (see 5.5)

**4.7 If possible, assess general condition of the property before the storm**

In good repair  Signs of neglect  In poor condition (see 5.5)

Additional comments:
----------------------

**PART FIVE: COSTS** - Damage or loss estimates, before average

Please ignore the effect of any deductibles or excesses when completing this section. Please insert an approximate figure for each item affected, assuming that any repairs will be done by a preferred contractor (but see questions 5.4 and 5.5).

**5.1 BUILDINGS**, Domestic, Commercial and Industrial

**Reinstatement costs before average**

 (Please comment on  
 any unusual features)

Foundations

£\_\_\_\_\_

Building walls

£\_\_\_\_\_

Roof, chimneys, aerials

£\_\_\_\_\_

Doors, stairs, windows

£\_\_\_\_\_

Fixtures and fittings

£\_\_\_\_\_

Outbuildings

£\_\_\_\_\_

Alternative accommodation

£\_\_\_\_\_

Clean up/dry out

£\_\_\_\_\_

Debris removal

£\_\_\_\_\_

Landfill tax

£\_\_\_\_\_

TOTAL (before excesses)

£\_\_\_\_\_

Excess (if known)

£\_\_\_\_\_

Total buildings sum insured for this property...

£\_\_\_\_\_

If this is too low, what would be a reasonable sum insured?

£\_\_\_\_\_

**5.2 CONTENTS**, Domestic and commercial, excluding stock etc., (see 5.3)

Replacement costs before average ("new for old" basis) (Please comment on any unusual features)

Carpets, curtains, etc.	£_____
Furniture	£_____
TV, VCR, stereo, etc.	£_____
White goods	£_____
Clothing and personal effects	£_____
Alternative accommodation	£_____
Clean up/dry out	£_____
TOTAL (before excesses)	£_____
	Excess (if known)
	£_____
Total contents sum insured for this property	£_____
If this is too low, what would be a reasonable sum insured	£_____

**5.3 STOCK IN TRADE, PLANT AND MACHINERY**, Commercial and industrial.

Total claim cost before average £\_\_\_\_\_

Total sum insured for these items £\_\_\_\_\_

If this is too low, what would be a reasonable sum insured? £\_\_\_\_\_

**5.4 CLAIMS INFLATION** (due to high demand for contractors, materials etc.)

Please comment; e.g., the likelihood of having to use a non preferred contractor and the possible effect of this on costs.

**5.5 GENERAL COMMENTS** Are further enquiries needed before you can be satisfied that the claim may proceed?

yes  no (if "yes", a contact phone number would be appreciated.)

Other comments:

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## EVENT FORM

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PLEASE COMPLETE THIS FORM ONLY AFTER YOU HAVE CARRIED OUT ENOUGH SITE VISITS TO HAVE AN OVERALL IMPRESSION ABOUT THE TYPE OF CLAIMS ARISING IN THIS EVENT. IT SHOULD NOT APPLY TO ONE PARTICULAR SITE OR CLAIMANT.

Form completed by (name or initials);.....

(Name and address rubber stamp)

Details based on site visits on (dates);.....

Event date (dd/mm/yy): \_\_ / \_\_ / \_\_

Please fax/post a copy of the completed form to:-

1. Any Insurers/other Principals who instructed you
  2. Geography Dept, University of Dundee, DD1 4HN
- Fax Number 01382 344434

## GENERAL ISSUES

This form does not necessarily relate to any specific claim; it is for recording general issues which may increase overall claims costs beyond what has been shown in the individual forms. After a number of site visits, if you have formed some general impressions which would be helpful to the insurer and to the researchers, please record them below.

---

### 1. Bandwagon Effect

Where claimants are tempted to seek higher settlements after talking to other victims, and are jealous of what others obtained, or are unwilling to accept your figures.

### 2. Profiteering

Where tradesmen inflate their usual rates due to the high demand.

### 3. Sales pressure

Where tradesmen have pressured victims to accept unreasonable estimates or shoddy work.

---

#### 4. Collusion

Suspicious that there is collusion between tradesman and claimant to inflate the estimates (eg to cover the excess), or between tradesman and tradesman (to "fix" the lowest estimate)

#### 5. Exaggeration

Where many claimants have exaggerated the amount of damage or the value of the losses.

#### 6. Missing salvage

If there are suspicious cases where damaged contents have not been retained for inspection (perhaps they never existed, or were never owned by the claimant)

#### 7. Opportunistic Crime

Looting, mugging, assaults, and malicious damage can increase during the aftermath of a natural disaster.

#### 8. General comments

Thank you very much for completing this form

## **Appendix 4: Advice for those in flooded areas.**

### **General Points**

You will want to try to salvage property as soon as possible, especially items of sentimental value such as photographs or jewellery, but please do not put yourself at risk. When a building has been flooded, there are all sorts of dangers that you may not be fully aware of, and we would strongly advise you to read these notes before you do anything else.

### **Health and safety**

1. Sewage back up can bring in contaminated water, don't eat food which has come into contact with any flood water, -even tinned or packaged food could still be contaminated.
2. Boil all drinking water
3. Watch out for fire hazards like broken gas pipes, wet electrical circuits and oil, petrol or chemicals carried on the water
4. Don't enter the building if the flood waters reached above ceiling level; the structure may be unsafe. Also check for cracks in foundations. If you see any, wait for specialist advice before entering the building.
5. If flood waters are still rising, make sure that everyone is out of the building; people have often become trapped in rooms when the water has risen to ceiling level and they have drowned. Please check if the neighbours are OK, especially if they are elderly or infirm.
6. Don't allow children to play in the flood water, it often will contain sewage or worse. Beware of rats or other vermin, they can spread disease.
7. Remember flood defence embankments can give way very quickly. If the waters are rising, get to higher ground.

Flooding of your home is a very traumatic experience; your insurer will help you sort out the property damage, but don't underestimate the effects on your own health. Don't over exert yourself trying to move furniture or cleaning away mud or sludge. Your policy will normally cover clean up costs anyway, and specialist cleaning contractors will be able to do the job more safely and effectively. After a flood, you will need to make arrangement to dispose of used sandbags safely. Children may be tempted to play with the sand inside them, but this will be contaminated by polluted floodwaters, and could pose a health risk.

### **The Samaritans**

You, and your family and neighbours, are bound to feel emotionally upset, especially if you have lost items of sentimental value; don't be afraid to talk to others about how you

feel. The Samaritans are specially trained to help people cope with distress and will be able to listen sympathetically to anyone who wants to talk. In the event of a major flood, they may have teams on site.

### **Alternative Accommodation**

If you are not able to live on the premises any more, your insurer or loss adjuster should be able to help you to make alternative arrangements quickly. If you make your own arrangements, it is important that your insurer knows where to contact you.

Telephones may not work, plan a way to communicate with the rest of your family if separated.

### **Loss or Damage to Property**

1. If you have a cellar, do not pump it out all at once; remove about a third a day, otherwise the weight of the wet soil outside may cause the walls to collapse
2. If you must enter the building, turn off the gas, electricity and water supplies first, watch out for falling plaster, or weakened floors.
3. Emergency Repairs: By all means have emergency repairs made as necessary to protect remaining property, but
  - a. don't be rushed or pressured into signing repair contracts with a tradesman at the door; deal with reputable contractors, if in doubt, contact your insurer or loss adjuster.
  - b. keep receipts for insurers,
  - c. take photographs of the damage, including tide marks on walls, and
  - d. keep notes of such things as the depth of flood, how long the flood waters were there, what contamination there was, what property you were able to move etc.
4. If you need to throw things out, and the loss adjuster has not yet examined them, keep samples or photographs. If you have a garden it is better to leave things in the garden until the loss adjuster has examined them. Alternatively, leave them on the pavement outside your house.
5. If you run a business and want to make a business interruption claim, keep detailed records of any business activity before and after the flood and extra expenses during the interruption period. Include expenses that continue such as advertising contracts. Keep current copies away from the business premises so they are not destroyed by water, humidity or fire.
6. Humidity can damage property even if it was out of reach of the water. Try to move valuable papers, electronic equipment, and other property into a dry building if



possible. The sooner you can get de-humidifying machines working the better, but it can take a very long time to dry out the property completely. Ask your insurer if they can provide industrial de humidifiers and if not, whether they will cover the cost of renting them.

7. If your car engine has been under water, don't attempt to start it as this could cause more damage to the engine; seek professional help. If the carpets have been soaked, it's best to remove them for drying out as otherwise rust can form underneath them.

### **Insurance**

If you are insured:

- reasonable temporary repairs will be paid by insurers, but make sure to keep receipts
- household buildings and contents policies include flood cover for domestic residences
- policies for commercial or industrial premises do not always include flood cover
- damage to your car will be covered if you have a comprehensive motor policy
- the costs of reasonable alternative accommodation will usually be met up to the limits stated in your policy if your home becomes uninhabitable

Don't hesitate to telephone your insurer's emergency helpline number if you have any problems; most insurers operate an emergency number 24 hours a day.

Being Prepared...

You may read in the press that the flood was a "one in a hundred year event" or something like that. This does not mean that you won't be flooded for another 100 years; you could just as easily be flooded again next month or next week. (In fact if the ground is still waterlogged, you are more likely to be flooded again.) It makes sense to give some thought to what you should do to be prepared, just in case...

Warnings

In England and Wales, make sure that you are included in the Environment Agency's flood warning scheme. This will enable the Agency to send you a warning message by telephone.

But remember, sometimes a flood can happen with little or no warning; some planning now could save lives in the future.

Supplies

Sandbags, shovels, plywood, polythene sheets, hammer and nails, torches, batteries, battery operated radio, first aid kit, wellingtons, emergency food and water, (including food which does not need cooking or refrigeration and which is not damaged by water), cash and credit cards.

#### Information

Know how to turn off gas, electricity and water. Plan an evacuation route, plan where to go and what to take, plan a way to communicate with the rest of your family if separated.

Plan alternative local accommodation if possible, for example with friends or relatives.

#### Businesses

Businesses should consider making arrangements for alternative facilities in the event of a flood; this could be made on a reciprocal basis; e.g. you could offer your facilities to another business if they have a fire etc.

#### Help

Keep a note of your insurer's helpline number and your policy number handy. Don't hesitate to call your insurer's helpline right away, the sooner you call them, the sooner they can help you. You don't have to wait until office hours, most insurers' helplines are available 24 hours a day, every day.

## Appendix 5: Resilient Reinstatement

Many of the techniques described in this appendix should only be carried out by specialist contractors with the correct skills and equipment. For a list of such contractors, contact the British Damage Management Association (BDMA) on [info@bdma.org.uk](mailto:info@bdma.org.uk) or visit their web site [www.bdma.org.uk](http://www.bdma.org.uk).

Most of the information in this appendix relates to flood resistant design and construction, but in some cases, local flood defences which protect only one or two houses might be considered. For more information about these, an excellent paper by P. Bowker of HR Wallingford was published in the September 2002 issue of *Municipal Engineer*<sup>206</sup>.

### Flood Damage to Dwellings

Current research indicates that climate change will bring increasingly wet weather with more severe extremes in the winter. If a property is flooded it should ideally be reinstated in such a way that future floods will cause less damage. Some suggestions are shown below.

Building materials can be affected in different ways by a flood, but repair is more a function of the type of materials than the duration of flood;

plasterboard and chipboard will always have to be replaced even if the immersion time is small. Consider alternative materials if possible.

timber can be dried out to an acceptable moisture content, provided it does not warp

masonry can usually be dried out although the finish may be different

There are two basic types of materials used in a house

materials which although vulnerable, are easy to replace, (e.g. drylining/plasterboard) or

more robust materials which suffer little damage, but may take a long time to dry out and require skilled labour to replace (e.g. plastered masonry).

### Effect of flood on different materials

#### 1. Masonry and concrete

No serious effect, but takes a long time to dry out.

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<sup>206</sup> Bowker, R., HR Wallingford, (2002) "Making properties more resistant to floods." *Municipal Engineer*, 151, pp 197-205

Lightweight concrete may expand on wetting and shrink on drying, causing cracks.

Wet masonry, especially in foundations and external walls, will be vulnerable to freeze damage.

Foundations built on sand or gravel can be weakened by flood waters, check them carefully.

### **Resilient Reinstatement**

If walls have to be rebuilt, ensure that adequate ventilation and drainage is provided. With cavity walls, holes may be needed to help drainage (see also comments on insulation). Ensure that a proprietary waterproofing solution is applied to the external walls.

## **2. Timber**

Swells and may distort. This could cause serious damage to the rest of the building. Timber based panelling may suffer permanent weakness if wet for a long time.

Chipboard, even if to the BS for flooring, will expand and may need to be replaced.

### **Resilient Reinstatement**

Ensure that waterproofed chipboard (or preferably marine plywood or solid timber) is used.

## **3. Rendering**

Cement based rendering should not suffer but may be hard to clean and will be at risk of frost damage for several weeks.

## **4. Cladding**

Tiles, GRP and plastic should be only slightly affected. Timber siding may distort and need to be replaced.

## **5. Metals**

Metal sheeting will have accelerated corrosion, even aluminium - especially after a sea water flood. Also wall ties, nails and fixings, and metal window frames.

### **Resilient Reinstatement**

Ensure that stainless steel fixings are used in vulnerable areas.

## **6. Insulation**

Quilt insulation below suspended floors is likely to compact and not recover following wetting and will need to be replaced; preferably by rigid slabs.

Reflective foil sheets will hold water and should be perforated with holes.

Mineral fibre and expanded polystyrene panels in cavity walls should self drain without problems. However, blown in cavity insulation could have problems; polystyrene beads can be washed out, urea formaldehyde can be crushed and low-density mineral and glass fibre insulation can be displaced, creating voids.

### **Resilient Reinstatement**

Ensure that replacement insulation is not vulnerable to soaking or movement. Rigid slabs are ideal, or if polystyrene beads are used, ensure that they are used in conjunction with waterproof adhesive.

## **7. Floors**

Suspended floors are likely to be less affected by shallow floods than solid floors, simply because the floor level tends to be about 200 mm higher than solid floors.

Joists built into walls are more vulnerable than joists supported on hangers.

Access will be needed below all solid floors to ensure that sewage and silt can be removed.

Floor surfaces of boarding on top of insulation are likely to float during a flood and usually have to be replaced.

In the last ten years, building regulations have raised the insulation standards for new buildings, and this has led to the practice of insulating floors to meet the new standards. A typical method is the so-called “floating floor” where polystyrene insulation is laid on the floor and then covered with either chipboard or cement. Flood water can become trapped in this insulation layer, and has to be removed. Where the insulation is covered in cement this can either be done by digging up the floor, which is expensive, or by using high pressure suction pumps combined with high pressure injection of dry air until the humidity of the exhaust air reaches a satisfactory level. This can take up to three weeks and is obviously a job for a specialist contractor<sup>207</sup>.

### **Resilient Reinstatement**

Ensure that waterproofed chipboard (or preferably solid timber) is used, ensure adequate access is available to voids under floors and if possible that these voids have drainage holes, which can be cleaned. Consider fitting a sump pump under the floor to help keep flood waters low next time.

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<sup>207</sup> British Damage Management Association, 2002.

If replacing the floor in the ground floor of a property, if the ceilings are high enough, serious consideration should be given to raising the height of the floor above the flood level.

## **8. External Walls**

A wall with a clear cavity will dry out more effectively than a solid wall. A wall with cavity insulation may take a lot longer to dry out.

Some insulation materials can have a capillary action, which draws floodwater up to the upper floors.

Check for ventilation holes in the outside skin; these will speed the removal of water from the cavity.

### **Resilient Reinstatement**

When a wall has fully dried out, treat it with a proprietary waterproofing solution.

If a property is so badly damaged that the walls need to be rebuilt, consider raising the floor height and the damp proof course above the danger level, and ensure that foundations are adequate to avoid water scour.

## **9. Internal Walls**

Stud partition walls will need replacement of the plasterboard sheets, the studs should be allowed to fully dry out first, if warped they will need to be replaced.

Solid partition walls will be less affected, though drying out will take longer

Panel partitions (e.g. two sheets of plasterboard with a honeycomb centre) will need to be replaced.

### **Resilient Reinstatement**

Consider laying the boards horizontally, so that next time only the lower sheets will need to be replaced.

If a suspended timber floor is also being replaced, the internal walls should rest on masonry under the floor structure. If the walls rest on the floor, and the floor has to be replaced again next time, then the walls will also have to be replaced.

## **10. Doors and windows**

External solid timber doors are unlikely to be affected, though some distortion may occur. Stripping the paint off the doors will help them to dry out more quickly. Remove them from their hinges and lay them flat while drying to reduce warping.

Hollow core doors will need replaced.

Windows will be only slightly affected, although metal windows could corrode from salt water and double glazed units may be damaged if water reaches the edges. If water enters a sealed double glazed unit the unit will have to be replaced.

Hollow UPVC window or doorframes could fill up with water containing contaminants which might be difficult to remove.

#### **Resilient Reinstatement**

If new woodwork is to be installed, specify a micro porous paint finish, or for hardwood, use an external micro porous protective stain rather than a varnish. This protects the wood from water, but if the wood does become wet, it allows the water to escape and the wood to dry out, avoiding blistering, peeling or warping.

### **11. Skirtings and door facings**

These will almost always have to be removed if only to investigate the underlying materials and allow drying out. They are difficult to remove without damage and it should be assumed they will need to be replaced.

### **12. Floor finishes**

Sheet and tile finishes can be affected by damp; adhesives will deteriorate. Blistering may occur for several months. Ceramic tiles are usually resistant to wet conditions, but if they are on a solid base, they may have to be removed to allow drying out.

#### **Resilient Reinstatement**

Most laminated floor finishes will need to be replaced after flooding. Water-resistant laminates are expensive (over £15 a square metre) but may be worth considering if the insurer approves.

### **13. Drains**

Floodwater can enter the building through the drainage systems. External storm water drains will be silted up and gullies will need emptying.

#### **Resilient Reinstatement**

Consider installing non-return valves, but these will need regular maintenance and may not be suitable for multi tenure properties.

### **14. Central Heating Systems**

Pipe work is unlikely to be damaged unless the water contains salts. Pipe work insulation could become saturated. Electric storage radiators will need replacement.

Warm air ducts can fill with water and will need to be drained and cleaned. Oil tanks in the garden could float away, allowing oil to escape and contaminate property.

### **Resilient Reinstatement**

Consider moving heating appliances and the central heating boiler to less vulnerable positions. Ensure that oil tanks are well secured.

### **15. Gas supplies**

Water may get into pipes, e.g. through pilot lights. Pipes may have to be purged.

In some areas, the gas supplier may insist on replacement of all copper piping if it has been immersed in seawater.

### **Resilient Reinstatement**

If replacing pipework, re route it at a higher level.

### **16. Electricity**

For safety, the affected wiring and sockets should be replaced. Initially, ensure that there is no risk of fire from flooded wiring.

### **Resilient Reinstatement**

Ideally new sockets should be at least 450mm above floor level to reduce the risk of damage from future floods. Wiring should be routed through the ceiling and loft wherever possible.

### **17. Telephone, TV aerial and similar wiring**

These are usually in conduits. Water in conduits can cause problems and can take a long time to drain. Before reinstating, seek advice from the supplier concerned.

### **18. Sanitary and kitchen fittings**

Sanitary ware is usually unaffected.

Kitchen units will distort and need replacing. Units resting on plastic legs may survive a shallow flood. Gas cookers are less vulnerable than electric, but oven insulation may deteriorate regardless of whether it is gas or electric.

### **Resilient Reinstatement**

New kitchen cabinets should be the type which sits on plastic legs rather than those where the chipboard sits on the floor. Gable ends and plinths may still have to be replaced after a flood and should be installed in such a way that they can be easily removed. This will also assist drying out.



### Temporary flood defences for individual properties

There are a number of products available which can give temporary protection against flooding. One of the most comprehensive systems is the "Neptune" system produced by Floodskirt Ltd. A copy of their recent press release is reproduced below, as it shows the issues which need to be addressed when considering the installation of a private flood defence for an individual property.

#### PRESS RELEASE

The Neptune Flood Defence System, as manufactured by Floodskirt Ltd, recently passed a second severe real life test, witnessed by the National Press and TV when Yalding was flooded by a breach of the River Beult.



On Monday 30 December 2002, a flood warning triggered the owner, Duncan Hewett, of Riverside Cottage, to swiftly deploy the system's skirt around the external walls. Unfortunately, in doing so, he damaged one of the zips but was able to execute an emergency temporary repair with back up advice from the manufacturers.

The test commenced when the river rose to a height of over 760mm (2'6) above the surrounding ground level completely flooding the area around the property for some 30 hours.

The rubber skirt came into immediate use as the waters rose as did the system's non-return valves preventing back flow up the drains. The next danger, hydrostatic pressure/rising ground water, would have flooded the cottage from the inside. However, the system's sump pump, located inside the garage, activated and is still running to remove thousands of gallons of water that would potentially enter the property from under the foundations all the time the river level is higher than the ground floor.

Rising ground water is a very real problem and will enter a building through the face of external walls below ground level and via service ducts. Whilst concrete foundations are impervious, walls are not and underground tanking is as essential as protection above ground. The Neptune Flood Defence System covers this situation by protecting below ground walls with a torch on bituminous membrane. No other system offers protection like Neptune.

Due to the damaged zip, sump pumps located behind the skirt were put under extra pressure but still coped with the situation and the property was not flooded thus saving insurers a potential claim of over £70,000 and the owners the heartache of again having to leave their home for some 12 months for remedial works.

Whilst the system is not cheap, it is far cheaper than flooding!

## Appendix 6: The “Crichton Formula”: A new “Insurance Guarantee”?

(The following is based on a proposal presented by the author to the Australian Government and Insurance Industry at a conference in Canberra in 2001. During the conference a number of options were considered and the favoured option was close to the author’s proposal. It was subsequently published in 2002 by the Water Research Foundation of Australia in a book of the proceedings titled “Residential Flood Insurance”, edited by Dr David Smith and Prof. John Handmer. The author has adapted it as a possible way forward for the British market.)

The following is based on the assumption that Britain is prepared to make private sector flood insurance work without any cost implications for government. However, there is a case for saying that for those on old age pension, income support or other form of benefit, government should make a contribution by increasing such benefits to pay for insurance premiums.

Also grants could be given for individual flood protection and resilience measures.

This would be much more cost effective for the government than finding money to pay compensation to people after the event, and much more equitable than the present situation where 50% of such people cannot afford any insurance at all.

For a useful discussion on different types of flood insurance systems see the recent Focus Report published by Swiss Re<sup>208</sup>.

### The Crichton Formula

**It should be noted that while this includes obligations on the part of local and national government, unlike the ABI “Statement” it does not in itself involve any increase in taxpayer funded expenditure.**

Note the restrictions on the flood excess: it is inequitable to have a flat sum excess of, say £10,000, which could cause great difficulty for low-income families. In any case, the traditional purpose of an excess was to encourage the policyholder to act to avoid or mitigate losses, and there is little that can be done to avoid flooding. However, if the policyholder is fit and healthy and receives enough warning it may be possible to move contents to a safer place. If this is done it is only fair to reduce the excess in such cases, or in any case where the policyholder is physically unable to move property.

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<sup>208</sup> Menzinger, I., and Brauner, C., (Swiss Re), 2002. “Floods are insurable” Swiss Re Focus Report, Zurich, 2002.

## **PART ONE – INSURERS’ OBLIGATIONS**

### **1. General**

- 1.1 All insurers which provide property loss or damage cover under household and small business package policies (buildings and contents, including alternative accommodation and business interruption) will include cover for water damage caused by flood, storm or burst pipes, for all such policies. Those insurers will guarantee not to refuse cover on the grounds of flood risk for areas within the boundaries of those local authorities which accept the obligations outlined in Part Two of this formula.
- 1.2 For those local authority areas, the flood excess will not exceed 10% of the sum insured, but there will be no premium limit. Cover will not be refused on the grounds of flood risk unless:
- The property owner has refused the offer of a flood alleviation scheme
  - The property has suffered flood damage three or more times in the previous five years and no additional flood protection measures have been put in place since that time.
- 1.3 For those local authority areas, insurers agree not to seek to recover flood claims costs from the local authority unless there is evidence of gross negligence on the part of the Council, or failure to ensure that all watercourses within the Council boundaries are properly maintained.

### **2. For buildings insurance:**

- 2.1 In the event of a flood claim, the maximum amount payable will not exceed the market value of the property immediately prior to the flood. (This is to cater for properties sold cheaply due to a history of flooding in the area.)
- 2.2 In order to avoid blight, insurers will maintain cover on existing property after it is sold, subject always to the terms of this formula.
- 2.3 In the event of a flood claim, if the insurer considers future flood claims to be inevitable, it can reserve the right to:
- pay the market value or outstanding mortgage (whichever is greater) for the property in return for the title deeds. The insurer is then free to demolish or otherwise dispose of the property. OR
  - cancel the policy unless the policyholder agrees to install flood protection measures to the satisfaction of the insurer at his or her own expense.

- 2.4 The insurer reserves the right to reinstate flood-damaged property in such a way that it will be less vulnerable to future flood events. If betterment is involved the policyholder will be liable for any additional cost (in Scotland this would not apply where resilient reinstatement is a legal requirement). However the insurer will provide a low interest loan for this additional cost in return for a long-term agreement covering the repayment period. During the repayment period, the insurer will undertake to continue to invite renewal of the insurance at a premium rate not exceeding 20% more than the rate for the previous year, and will continue to invite renewal on this basis even if the property is sold. If the policyholder is not prepared to pay the additional cost of betterment, the insurer is released from any obligation to renew the policy.

### **3 For contents insurance**

- 3.1 Any flood excess will be waived or reduced as appropriate if the policyholder can demonstrate that reasonable precautions were taken to move contents to a place of safety or otherwise reduce the loss, taking into account all the circumstances, including, but not limited to:
- Risks to the health of the policyholder or the policyholder's dependants
  - The policyholder's state of health or fitness
  - The amount of warning given
  - Ability to readily access a place of safety.

### **4. Insurers shall be released from any obligations where:**

- the property is within a dam break inundation area or managed retreat or realignment area
- the policyholder is deemed by the ABI to be unsuitable for insurance, for example due to criminal activities
- the flood hazard is greater than 75 years for properties constructed or granted planning consent prior to 2003
- the flood hazard is greater than the 100 year return period for properties granted planning consent after 2003
- the flood hazard is greater than the insurance template for properties granted planning consent after 2006
- the flood hazard is greater than the insurance template for any properties after 2010

- the property has been identified in an ABI advisory notice as having an unacceptably high level of flood risk, for example where the EA have advised against the development
- the local authority withdraws or is deemed by the ABI to have withdrawn from the obligations outlined in part two of this formula.

## **PART TWO – LOCAL GOVERNMENT OBLIGATIONS**

This formula will only apply to properties within the boundary of those local authorities that have agreed to:

1. Hold at least four meetings a year of Flood Liaison and Advice Groups including representatives from the relevant environment agency, River Basin Management Board, Water Company or Authority and the insurance industry. All decisions relating to strategies for floodplain management including flood defences, planning, drainage impact assessments, flood risk assessments, and significant developments where flood hazard is a possibility, to be referred to the flood appraisal group.
2. Adopt a presumption in their planning strategies against development for cases where the flood hazard exceeds the insurance template
3. Make available to the insurance industry timely and detailed information about any proposed new residential development which breaches the insurance template so that the ABI can issue an advisory notice to insurers
4. Use its building control powers to require properties in flood hazard areas to be constructed to resilient flood and windstorm standards as laid down by the ABI in conjunction with CML, RICS, and NHBC.
5. Consult with adjoining local authorities as necessary
6. Adequately maintain watercourses and culverts using funding from a “planning gain” levy on developers, and publish biennial reports on actions taken
7. Seek SUDS solutions to drainage of surface water, and agree to adopt and maintain above ground SUDS installations, again funded by a “planning gain” levy on developers.

## **PART THREE – NATIONAL GOVERNMENT OBLIGATIONS**

### **National Government to agree to**

1. Incorporate flood hazards and give statutory status to Flood Liaison and Advice Groups in legislation prepared under the Water Framework Directive
2. Introduce regulations to enable local authorities to ring fence any planning gain levies to be used for maintenance of watercourses or SUDS schemes

3. Introduce legislation to require resilient reinstatement following flood or storm damage in consultation with the insurance industry and CILA
4. Temporarily relax FSA requirements on insurance companies' exposure management in local authority areas which have accepted the formula
5. Make dams subject to COMAH Regulations
6. Apply a levy on insurers to fund the introduction of the FASTER system for the collection of insurance company data on flood and storm claims and publication of analyses of these data. Require insurers to co-operate in the submission of such data, subject to confidentiality safeguards to protect personal information and insurers' competitive position.

## Appendix 7: Insurability Issues for flood: a global view.

### How Insurance Works

For a risk to be insurable, there are a number of requirements. The Mnemonic “BASIC MUD”<sup>209</sup> sums these up:

- B Big enough “book” of business, i.e. a large enough collection of risks for a statistical spread
- A Adverse selection minimised through good knowledge of each risk.
- S Sustainable over a number of years for various future scenarios so the risks can be spread over time and reserves built up. Because liability claims can take a number of years to settle, it is possible for casualty insurance to be appear to be profitable in the short term, or as long as the account is growing. If it is not priced properly, however, as soon as the account starts to reduce in size, current income is no longer enough to cover increases in costs of old claims.
- I Information readily available from reliable sources about hazard, vulnerability, exposure and claims triggers. Legislation under the Aarhus Convention will make such information more easily obtainable in the future as the Convention requires disclosure of environmental information to the public.
- C Consistent with existing insurance practices, systems, customs and law.
- M Moral and political hazard low and manageable. For example the country must comply fully with the Harare Declaration, which establishes standards for human and property rights and democratic systems.
- U Uncertainty about the potential loss.

At least one of the following must be uncertain:

- Will it occur? (for example, property or casualty insurance)
  - When will it occur? (for example life insurance) - or
  - How much will it cost? (for example “after the event” insurance);
- D Demand for insurance must exist (or have potential to be created) and must be effective, i.e. there must be enough customers prepared to pay the price that insurers need to charge for providing sustainable insurance.

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<sup>209</sup> Crichton, D., 2002 Residential Flood Insurance: Lessons from Europe. In Smith, D I, and Handmer, J., (eds) Residential Flood Insurance, 41-58, and 293-295. Water Research Foundation of Australia, Canberra



### **Adverse Selection and “Cherrypicking”**

Where the customer knows more about his risk than the insurer, or where the insurer, through ignorance, incompetence, regulation, or market forces has failed to recognise the extent of the risk with adequate premium levels, the customer can select against the insurer. With flood insurance, only the customer in the flood risk areas will want to insure for flood, for example.

The corollary of adverse selection is often called ‘cherrypicking’. This is where an insurance company decides to only provide insurance for the most profitable, relatively claims free types of risks. Some insurers, for example, will only offer motor insurance to mature drivers with family cars and a good claims record.

While some larger insurers will use the term “cherrypicking” in a derogatory sense, it is a perfectly valid strategy in a free market, especially for smaller insurers trying to build up a profitable account. It is a less viable strategy for the large insurer trying to maintain a large book of business, and in such cases appropriate pricing strategies are not enough, the insurer will need to offer assistance and incentives to policyholders to manage and reduce their risks wherever possible. In particular, for flood and storm hazards, resilient reinstatement is important.

### **The Vicious Circle**

Commodity business such as household and motor insurance is largely price driven and based on statistical analyses. Commercial business such as property or casualty (fire or liability) cover for factories and offices is written on a more individual basis. For either type of business, accurate underwriting is necessary to avoid the vicious circle. The circle works like this:

1. Premiums are too low for the risks insured
2. Losses are incurred
3. Across the board increases in premium are applied.
4. “Good” risks, for example householders who are careful and have a low propensity to claim, or businesses which are well managed, will find cheaper premiums elsewhere, (or will chose not to insure at all) and will cancel their policies.
5. Because the increases have been inadequate for bad risks, more of these will be attracted, or retained, so a higher proportion of the book will be “bad” risks.
6. Losses are incurred
7. Further across the board increases in premium are applied – return to step 4.

The cycle continues until all the good business has gone.

### **The Virtuous Circle**

1. Premiums are too low for the risks insured
2. Losses are incurred
3. Across the board increases in premium are rejected; instead, highly selective rating increases are applied, and risk management advice is given to policyholders to help them reduce their risks.
4. “Good” risks, for example householders who are careful and have a low propensity to claim, or businesses that are well managed, will be encouraged to stay.
5. “Bad” risks will find cheaper premiums elsewhere and will cancel their policies. Alternatively the underwriter will introduce risk management measures and policy conditions to improve the bad risks.
6. A higher proportion of the book will be “good” risks.
7. Profits are made
8. Further very selective increases in premium are applied, together with discounts for good risks, for example a no claims bonus – return to step 4.

The cycle continues until all the “bad” business has gone, or has been improved.

### **Case study**

Due to a statistical error, one major insurer charged much lower rates than the rest of the market for a particular type of risk. The underwriters were aware that their rates were out of line with the market and did not fully trust the picture being given by the statistics. Therefore, while they continued with the low rates, rather than accept all business coming their way (as some senior managers wanted), they became very selective about which risks they accepted. For years the insurer attracted good risks from other insurers until when the error was finally spotted, it was no longer a problem because the claims experience had improved so much that the low rates were now justified and the book was making a healthy profit.

### **Moral Hazard**

Moral hazard is a very real problem for insurers. For example, there are those who do not disclose all material facts when proposing for insurance, and there are those who understate their sums insured or who exaggerate the amount of a claim. (A public opinion survey commissioned in 2001 by the Royal & Sun Alliance found that in the UK some 60% of people said they would be prepared to exaggerate a claim after a flood.)

The main types of “claims inflation” or fraud encountered after a flood event have been listed in Appendix Three, but are given in more detail below:

- Bandwagon Effect - Where claimants are tempted to seek higher settlements after talking to other victims, and are jealous of what others obtained, or are unwilling to accept the loss adjuster's figures.
- Profiteering - Where tradesmen inflate their usual rates due to the high demand, or carry out work which is not strictly necessary. Flood claims are particularly prone to this. For example, tradesmen may replace floors, doors and windows despite the fact that they could have been cleaned, dried out and re used. Often these new materials are actually more vulnerable to future flood damage.
- Sales pressure - Where tradesmen have pressured victims who are desperate for repairs to accept unreasonable estimates or shoddy work, rather than wait.
- Collusion - Suspicions that there is collusion between the tradesman and claimant to inflate the estimates (e.g. to cover the excess), or between tradesman and tradesman (to "fix" the lowest estimate).
- Exaggeration - Where claimants have exaggerated the amount of damage or the value of the losses. Again this may be done to cover the excess, and the bigger the excess, the more likely it is that claimants will exaggerate the amount of the damage.
- Wrong proximate cause - claiming that the cause was an event that is covered, when the real cause is excluded by the policy. For example, there is anecdotal evidence from loss adjusters in Canada that they are often under pressure to show that flood damage was due to sewage backup, which is covered under a household policy, rather than from other types of flood, which are not covered.
- Missing salvage - Suspicions can be aroused in cases where damaged contents have not been retained for inspection (perhaps they never existed, or were never owned by the claimant).
- Opportunistic Crime - Looting, mugging, assaults, and malicious damage can increase during the aftermath of a natural disaster.
- Selective salvage - It is often alleged by insurers that if a policyholder receives warning of a flood, they will not only move valuables out of harm's way, they will also move some property, such as older electronic equipment, into the path of the flood so that the insurer will replace them with new equipment. Unlike the other sources of fraud listed above, however, the author has not been able to find any evidence of this actually happening, and would welcome comments.

Moral hazard is of course a problem irrespective of whether the insurance is provided by a private insurer or by the government. Indeed it may be more of a problem if a government provides it. An extreme example was the floods in Sarno, Italy, in 1998. A

leading Mafia expert<sup>210</sup> has told the author that almost all the government compensation, (the equivalent of 150 million Euros) ended up in Mafia hands.

So long as the moral hazard is low and manageable there should not be a problem for private insurance, although it might be a problem for public insurance. In the USA, where there is a federal compensation scheme, private insurers are often sub-contracted to administer claims payments because they have good systems for counteracting fraudulent claims. Similarly, in other countries, most private insurers have sophisticated methods and data for minimising moral hazard.

Certainly there are some countries where the moral or political hazard is so high that insurers would be reluctant to become involved. For example Goma, hit by the recent Nyiragongo volcanic eruption. Would it be wise for an insurer to offer cover for a city which has an economy founded on aid, smuggling, and arms dealing, with no warning or evacuation system in place? Economic and political stability, plus compliance with the Harare Declaration are crucial.

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<sup>210</sup> Caporale, Prof. R., St John's University, New York (2001). Personal Communication

## Appendix 8: Private Flood Insurance Solutions around the World

From studying two comparisons of a sample of countries around the world<sup>211</sup> it seems clear to this writer, that there are really only two types of private flood insurance for residential properties, the 'option' system and the 'bundle' system.

### The Option System

Under this system, insurers agree to extend their policy to include flood on payment of an additional premium. This system can be found in Belgium, Germany and Italy for example, but the take up rate is very low.

There are a number of problems with optional cover. Apart from the problems of defining what "a flood" means so it can be excluded, the biggest problem is adverse selection. Insurers tend to select against customers by only making the cover available in areas they consider to be safe, while customers select against insurers by only buying it in areas they deem to be risky. The result is that cover when it is available at all, is expensive, and has very low market penetration. From the point of view of the BASIC MUD rules (see Appendix 7), it is unlikely to be sustainable, because of adverse selection and because a big enough "book" of business cannot be achieved. In countries where the government will step in to compensate flood victims, this further reduces the effective demand for insurance.

### The Bundle System

In this system, cover for flood is only available if it is 'bundled' with other perils, such as storm, theft, earthquake, etc. This system is used in Britain, Israel, Portugal, and Spain, for example.

With the bundle system, insurers have the freedom to charge differential rates, but excessive rate increases can be mitigated because the risk is not only spread over time, but across perils, and across rating areas. People living in areas safe from flood still have to buy flood cover, if they want to get earthquake cover, for example, and vice versa.

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<sup>211</sup> Schoubroeck, C. (1999) *'Flood Insurance Systems in Selected European Countries'*. Published in Proceedings of the Euro Conference on Global Change and Catastrophe Risk Management, Laxenburg, Austria. and

Swiss Re, 1998 'Floods – an insurable risk? A Market Survey.' Swiss Reinsurance

Company, Zurich, Switzerland.

This system is characterised by much higher market penetration, around 95% in Britain and Israel. This is probably a reflection of the extent of property ownership by individuals and the requirements of mortgage lenders, rather than any particular desire to have comprehensive cover.

Because everyone is paying for flood insurance whether they think they need it or not, this reduces the opportunities for adverse selection by customers. From insurers' experience in Britain, it can be argued that everyone needs flood cover even if they are not near the coast or a river, simply because of surface water run off where the drains are too antiquated to cope with the volumes of water from a heavy rainstorm.

It has been argued that insurers need not fear adverse selection with regard to flood hazards, because these are widely known. After all, in most countries, flood maps are in the public domain and readily available to insurers and the public alike. However, as has been shown earlier in this report, lack of government investment in flood mapping, means that flood maps of England and Wales only appeared in the public domain in 1998 (2000 for Scotland), and are very limited in scope.

Concerns about possible adverse selection have caused a number of major insurers in the UK to each invest substantial sums in better flood maps for their own use. These maps are better than the UK government or its agencies have been able to afford so far. Such research has been expensive, and the insurers who have paid for it jealously guard the information. It may come as some surprise to those outside the UK that so many private insurers have made this investment. The investment has been justified because of a lack of good quality public domain data and because of the high penetration of cover, which has enabled the costs to be spread over a large number of policies. The bundle system means that every policy has the potential to produce flood claims, and insurers have to know what their total exposure is likely to be.

The adverse selection argument is nevertheless valid in the case of people who have actually been flooded, and therefore know they are at risk. Indeed in 2001, some UK insurers started to apply large flood excesses, up to £5,000, and heavy premium loadings for properties where flood claims have been made.

Insurers' main cause to fear adverse selection is where, in effect, one insurer is selecting against another. This is happening in connection with block business schemes arranged by mortgage lenders. In such cases, adverse selection is becoming a real problem even for bundled policies.

In the UK there is a practice amongst finance houses that lend money to those wishing to buy a house, to insist that the house be comprehensively insured in order to protect their collateral. These finance houses will usually arrange block policies with a preferred insurer who then has to accept any property his principal decides to lend money on. Recent consumer pressure has forced mortgage lenders to allow customers to opt out of the block policy and arrange their own insurance. Some insurers are actively "cherry-picking" from this client base by encouraging selected borrowers to move their insurance to them. They only offer this encouragement of course, where

the borrowers live in a safe area, and ultimately there could be a vicious circle situation for the finance house.

Analysing the same sources as in the previous section the writer has concluded that, apart from the USA, which has a rather different system, there are three categories of state involvement in compensation for flood victims, and these are outlined below. First, however a general point needs to be made; there seem to be very few examples of a country deciding to arrange for reinsurance cover from foreign reinsurers, all the costs are kept within the boundaries of the country. This could be dangerous if there is a major catastrophe or series of catastrophes because the country may find itself in financial difficulties or at the very least find it difficult to attract capital investment in the future.

Reinsurance offers a very cost-effective way to spread the risks across the economies of other countries so that if one country is hit by disaster, other countries automatically step in with support.

**No state compensation for citizens (although there may be grants for infrastructure). Argentina, Germany, Israel, Japan, Portugal, UK**

This causes severe problems for those where private insurance is not available or is not affordable. Such people are often the hardest hit when a flood strikes, and the resulting stress and other health consequences could be serious. Even if insurance is available, the mental trauma of losing items of sentimental value can have a direct economic impact which has never been properly measured, and which can recur whenever there is the threat of another flood. Often the only long-term solution is relocation to a safer area.

The author is not aware of any research into the psychological damage caused by floods, but it is clear that there is a need for trained counsellors to be on hand to help people to talk through their problems and despair. In the UK, this service is provided by a voluntary organisation called "The Samaritans", part of Befrienders International, and the value of their services is often underestimated. Women in Muslim communities can be particularly hard hit, as they are left in the desolated home while the men go out to work.

As stated before, flood insurance penetration in the UK overall runs at around 95%, but this figure is misleading. In the case of people in lower socio economic groups, the penetration drops to around 30%. These are precisely the groups most likely to be flooded, because they live in housing built on cheap land, which is often floodplain. However, flooding is now becoming so widespread and frequent, and building land in such short supply, that wealthier people are beginning to suffer, and rightly or wrongly, they have a much more powerful voice. In the UK floods of 2000, a number of television celebrities and senior legal figures saw their homes being inundated, and this raised the profile of the subject in the media. (It also resulted in the legal profession looking around for someone to sue, with some success.)

A government commitment not to compensate the victims of a flood or other natural disaster raises many important economic and moral questions, perhaps worthy of exploration elsewhere. From an insurance point of view it has certainly done no harm to the demand for insurance, and in turn the presence of a strong insurance industry has helped to mitigate public protest at the lack of government compensation.

#### **Procedures to provide compensation in hardship cases. Australia, Canada, and China**

This is a pragmatic solution, but not necessarily the best. The State may not be well geared up to assess how much compensation to pay or to administer it efficiently, whereas insurers have the systems in place to pay out fair levels of compensation. Also some citizens might regard such compensation as 'charity' and be too proud to accept it.

#### **Compensation only by decree after the event. Belgium, France, Italy, Spain, USA.**

This can be dependent on the whim of a politician who could be influenced by many other issues, not all entirely objective. The main effect is that while such a scheme can be very expensive for the State, the citizen is never sure in advance if he will be protected, and may be reluctant to invest in his property if he thinks it may be flooded.

In the USA, for example, government disaster aid has only been given for 50 percent of recent flood events<sup>212</sup>. (There is some indirect government compensation for businesses in the USA in that flood losses are tax deductible.)

#### **The USA System**

The system in the USA is unique and has not been copied by other countries. A National Flood Insurance Program (NFIP) was set up in 1968, and is the only Federal insurance scheme for natural disasters in the USA. NFIP just provides basic cover, and additional cover is available from private insurers. It only applies to eligible communities where the flood risk has been assessed and a program for loss mitigation has been established. Such loss mitigation programs generally involve expensive structural defences, and recent research has suggested that some of these can actually increase the risk of flooding<sup>213</sup>.

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<sup>212</sup> Swiss Re, 1998 'Floods – an insurable risk? A Market Survey.' Swiss Reinsurance Company, Zurich, Switzerland.

<sup>213</sup> Criss, R.E., & Shock, E.I., (2001) 'Flood enhancement through flood control' *Geology*: v29, no 10, pp. 875-878



Premium levels are high, and before the 1993 Mississippi floods, penetration in flood hazard areas was only 15-20%. This increased by about 50% after the floods. Cover cannot be refused, so adverse selection is a big problem. Properties with recurring flood losses represent only 2% of the NFIP policies, but accounted for 40% of the losses between 1978 and 1995. Poor risks are subsidised by the Federal Emergency Management Agency (FEMA) and the NFIP is currently heavily in debt to FEMA. No reinsurance is purchased on the international markets to spread the costs outside the USA economy (Swiss Re, 1998).

The NFIP uses private insurers to settle claims on their behalf because of their claims handling expertise, but there is anecdotal evidence that because the private insurers recover their costs from the NFIP, the claims costs are higher than they would be under a private insurance scheme.

To sum up, the USA system is subject to considerable adverse selection, it encourages people to live in flood hazard areas, and it undermines the private insurance market, which does not have the benefit of being subsidised by the taxpayer.

On the other hand, the potential flood losses in the USA are now so severe due to the numbers living in the danger zone and the growing hazards from climate change that it is doubtful if any private insurer would be prepared to consider the risk.

The USA does not seem to satisfy the BASIC MUD guidelines, since the exposure is so high and take up for public insurance is so low, despite multi million dollar subsidies from the Federal Government.