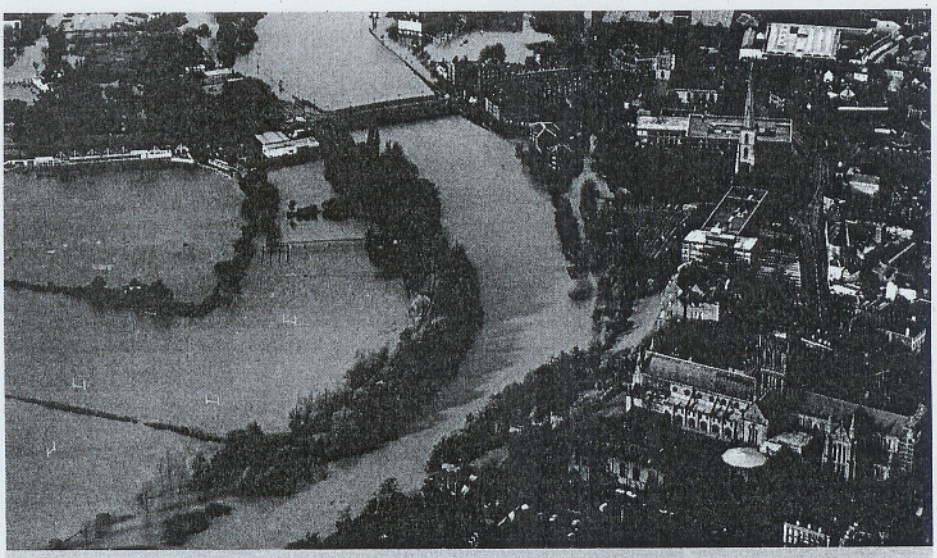
INDUSTRY OPINION: FLOODING SPECIAL

Understanding models helps insurers

Over the next two pages, JUSTIN BUTLER, the managing director of the flood risk-mapping consultant Ambiental, reviews some of the key issues relating to flood risk and its insurability



Changes to the UK's flood-risk classification system could mean an increase in the number of properties considered to be at high risk

On December 7, 2006, the Department of Communities and Local Government (DCLG), formerly the Office of the Deputy Prime Minister, published Planning Policy Statement 25 (PPS 25). PPS 25 follows on from and strengthens the principles set out in Planning Policy Guidance 25 (PPG 25), which argued that flood risk should be taken into account at all stages of the planning process.

One change between PPG 25 and PPS 25 that may affect the UK insurance industry is the potential change to the Environment Agency's (EA) national flood-risk classifications. These classifications provide an indication of the extent of flooding that could be expected from a one-in-100-year river flood event or a one-in-200-year tidal event (or whichever is the more likely at a given location).

Direct impact on insurance

Many UK domestic insurers use these classifications to identify areas at risk of flooding and underwrite/price the flood risk component of a policy accordingly. As such, any change to these classifications could have a direct impact on both underwriting and reinsurance accumulation analysis.

Under PPS 25, for planning purposes, the existing classification for Flood Zone 3 (High Risk) is to be subdivided into Flood Zone 3a (High Probability: eg, one-in-100-year river flood event or one-in-200-year tidal event) and Flood Zone 3b (Functional Floodplain: eg, one-in-20-year or greater event).

At present, it is difficult to determine what effect these changes in the planning sector may have upon the insurance industry. For example, one of the biggest questions being raised is whether there will be an increase in the number of properties classified as being at high risk of flooding.

As flood risk continues to increase in importance in the UK, to remain competitive, insurers will need to develop a better understanding of how flood models work, what their limitations are and how changes in the assumptions behind the modelling can influence the definition of flood risk on the ground.

At the strategic level, PPS 25 requires local planning authorities and county councils to identify land potentially at risk of flooding to determine the location and suitability for future development. These so-called strategic flood risk assessments (SFRAs) have encouraged the development and implementation of new techniques to map and model flood risk for large geographical areas rapidly and accurately. While initially designed for development purposes, these new modelling techniques can also be used by the insurance industry to better understand flood risk and improve underwriting performance.

At the micro level, PPS 25 is likely to increase the need for flood-risk information for individual properties. Under PPS 25, all planning applications for new developments in areas identified as being at some risk of flooding by the EA should be accompanied by a flood risk assessment (FRA).

Many forms of FRA

FRAs come in many forms, from a short desk-top study for a single residential property to a full risk assessment for multiple commercial facilities. In general, an FRA includes information relating to previous flood events and the condition of flood defences, as well as an assessment of surface water and sewer flooding.

Depending on the individual client's requirements, the FRA report can also provide recommendations for mitigation measures, including the flood-proofing of structures on site, as well as highlighting potential evacuation routes in the event of a flood. Similar to fire risk assessments, information from the FRA can be used by an insurer to better understand the flood risk to a specific property or business and can more accurately underwrite the risk accordingly. For example, a commercial property underwriter can use the FRA to better understand the estimated maximum loss for a high-value, high-risk commercial property.

Aid business-continuity plan

The information can also be used in business-continuity planning to help businesses reduce potential losses and recover more quickly following a flood event.

Recent changes in government legislation relating to development and flood risk could potentially affect the insurance industry in a number of ways, but perhaps most importantly, the improved availability of flood-risk information in response to strengthening legislation provides an opportunity for the insurance industry to utilise new tools to more accurately assess flood risk in the future.

How these changes will actually impact the primary insurance and reinsurance industry remains to be seen. To maintain a competitive advantage and to adapt to the role climate change and flood risk is playing in shaping the political and economic landscape, insurers must keep a careful eye on changing government policies and emerging technologies if they are to manage the growing threat of flood risk in the UK.

Socio-economic factors increase floodplain risk

The Intergovernmental Panel on Climate Change published its fourth assessment on the scientific background and potential impacts of climate change on February 2, 2007.

The report underlined the message from previous reports, which indicated that one of the most likely impacts of future climate change will be increased levels of flood risk in many parts of the world.

However, even without the potential impacts of climate change, rising levels of affluence and urbanisation are likely to result in more property and assets being located on floodplains. As such, businesses and insurers will increasingly need to adopt new flood-modelling technologies that can account for future development in the floodplain as well as the likely impacts of climate change.

Flooding kills more people and causes more damage per year than any other type of natural catastrophe. According to Munich Re, floods accounted for 31% of all natural cat events in 2006.

Value of assets at risk rising

The number of people and value of assets at risk of flooding are increasing. Low-lying areas by rivers and in coastal regions have historically attracted human settlement for a variety of reasons including access to fertile land and transport. Indeed, many major international cities are located next to rivers or within the coastal floodplain (for example, New York, London and Tokyo). Increasing levels of urbanisation and affluence, as well as the tendency to locate high-value assets next to water, mean that the number and value of properties in the floodplain that are at risk of flooding is on the rise.

In addition, it is not just the risk of flooding to a new development itself that can be problematic. Construction projects in the floodplain are often accompanied by loss of vegetation and reduction in natural flood storage, thereby potentially increasing the risk of flooding in other areas. It is important for insurers to understand that, irrespective of the potential impacts of climate change, the number and value of properties and assets at risk of flooding are set to increase in the future.

Account for future impacts

From a modelling perspective, flood and other natural disaster models need to be flexible and detailed enough to account for the future impacts of climate change, as well as assessing the uncertainties associated with any predictions. Insurers and reinsurers must be able to examine different climate scenarios to inform their underwriting strategies accordingly. As such, insurance-focused flood models will need to include climate change predictions over a variety of temporal scales and should incorporate alternative climate scenarios.

Unlike windstorm and earthquake models, small topographic details and the presence of buildings can have a significant impact on patterns of flood risk. Congested urban environments produce highly complex patterns of flooding. As such, urban flood models need to operate at an appropriate spatial scale that accounts for the impacts of buildings, natural features and flood defences. Models also need to be flexible enough to account for the impact of future development and their effect on patterns of flood risk in years to come.

Climate-change scenarios

We have recently completed an analysis of the impact of different climate-change scenarios upon levels of flood risk in the Canary Wharf/Docklands area of London to improve the accuracy of our loss estimates that were originally based on lower detail catastrophe-modelling approaches.

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Knowledge key to flood-risk survival

Hurricane Katrina made landfall in south-east Louisiana on August 29, 2005. By August 31, 80% of the city of New Orleans was flooded with some parts of the city recording water depths in excess of 6.1 m. In total, 1,464 people were killed and hundreds of thousands evacuated from the city and outlying districts.

Katrina woke the insurance industry up to the devastating losses which can occur from catastrophic urban flooding. As a result, insurers and reinsurers need to closely examine what happened in New Orleans to better understand their exposure to catastrophic flood losses in other major cities at risk of flooding (such as London, New York, Miami, Tokyo).

Storm surge

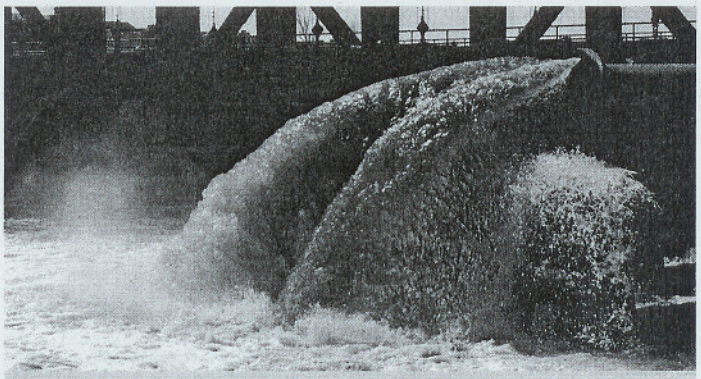
Although the storm surge from Katrina was significant and caused damage to many of the city's sea defences, it was the levee failure which caused most of the flooding in the city. Levees are natural or artificial raised embankments designed to increase the level of flood protection along a channel and thereby prevent flooding to the surrounding area. The levees in New Orleans were originally designed to protect the city from the seasonal flooding of Lake Pontchartrain and the Mississippi River.

The levees were strengthened after hurricane Betty in 1965. Engineering assessment of the levees post-Katrina indicated that, in some locations, the volume of water in the channel had caused the underlying ground surrounding the embankment to shift, thereby resulting in sections of the levee collapsing and floodwater inundating the city.

The failure of the levees in New Orleans highlights two important points in relation to flood defences. First, the design of flood-protection measures is based on engineering and modelling analysis capabilities undertaken at a specific point in time.

The historical data and models available at that point in time may not fully reflect all potential future flood scenarios (ie, the levees and flood defences in New Orleans were only upgraded to protect the city against a category three hurricane such as Betty, not a slow-moving, precipitation-heavy event like Katrina).

Second, defences can and do fail, either through poor engineering design or human error. As such, defences should not be solely relied upon to provide absolute flood protection for an area. There is evidence to suggest that New Orleans, like other cities around the world, placed too much emphasis on the protection that hard flood defences offered and not on softer measures such as restricting development in the floodplain or testing evacuation procedures.



Water pours into Lake Pontchartrain this month as flood protection work continues in New Orleans

Perhaps one of the most devastating components of the flooding from hurricane Katrina was the rapid onset and extent of the floodwaters.

Catastrophic urban floods of the nature experienced in New Orleans are often characterised by a rapid inundation of flood water over large geographic areas (the 1953 flood event which seriously impacted the Thames estuary is another example). There are a number of reasons why. Excessive development in cities tends to artificially constrain the natural flow of water within a channel, thus creating a build-up of water during, for example, a storm surge, which then rapidly propagates over the urban landscape once a defence failure occurs. Housing and businesses are often located in the natural floodplain where flood waters tend to remain for extended periods of time, thereby providing a greater potential for standing water, contamination and interruption to business activities.

Modelled scenarios

Ambiental has recently analysed a series of catastrophic 'Katrina-like' flood events for the city of London. Using our flood risk-modelling platform, we modelled a number of scenarios informed by what happened in New Orleans.

One was where the Thames Barrier was assumed to be operational (ie, was raised) and another where the barrier failed to operate. Results for the barrier failure scenario showed that significant flooding would occur in many parts of central London, including the Isle of Dogs, whereas some areas, surprisingly, would remain unaffected.

Finally, we used detailed, building level flood-risk information for each scenario combined with exposure information relating for high-value commercial properties (eg, 1 Canada Square, Canary Wharf) and transport links (eg, the Docklands Light Railway) so as to determine the effect floodwaters could be expected to have on gaining access. This information was then used to rate individual buildings and postcodes in terms of the likelihood and severity of business interruption.

Insurers, reinsurers and risk managers need to learn lessons from what happened in New Orleans and, using new flood risk-modelling tools and assessment techniques, apply these lessons to other major cities around the world which are at risk of flooding. Only via access to more detailed, reliable and accurate flood-risk information will the industry be able to cope with another Katrina-style flood event ... when it occurs.

Tools of the trade that can cut the losses

In the UK, the average claim for interruption to business activities from a flood event has increased by 60% in the last four years from £21,000 ($41,000) to £35,000 (*Axa, 2006*). As climate change is likely to increase levels of flood risk in many parts of the world, insurers are likely to see increasing flood claims attributed to business interruption (BI).

The quantification of BI is complex and difficult to assess. Any assessment of BI losses from a flood event involves understanding not only how a flood affects the site itself, but also how flooding affects the surrounding area, infrastructure, roads and communication systems.

Risk assessment

This complexity presents a significant problem for insurers and reinsurers, as well as businesses that are seeking to accurately price and underwrite commercial risks. Nonetheless, there are a number of flood risk-assessment techniques which can help risk managers to better understand commercial flood risk and in particular BI losses.

The first stage in understanding how flooding could impact upon a business is to identify which sites are at risk of flooding and to what extent. This involves undertaking a strategic flood risk assessment (SFRA) for a commercial client. The SFRA provides a general overview of relative levels of flood risk at the site(s) and can be used first to determine which sites require further assessment and, second, help to provide initial estimates of BI losses.

For example, for a small business on a single site, the SFRA may involve examining historical flood records to determine if the site has flooded before, or contacting national flood-mapping organisations, such as the Environment Agency (EA) in the UK, to find out about the level of flood risk.

On the other hand, for a large multinational business with a number of sites located around the world, the SFRA may require the use of geographical information systems and remote sensing technologies (ie, satellite imagery) to help determine which sites are at risk of flooding and to what extent.

The second stage in this process is to assess the potential impact different sources of flood risk could have on those sites identified as being at risk by the SFRA. This is known as a phase one flood risk assessment (FRA). Information from the FRA can be used to build up a more detailed picture of the link between BI losses and the damage caused to physical assets during a flood event.

Physical impact

The FRA can be used to identify the potential physical impact to the site from tidal, fluvial (river), surface water, ground water and sewer flooding. Further, where appropriate, potential flow paths can be identified and an assessment of the speed of onset of the floodwaters as well as potential depth of water and duration can also be provided.

Finally, using the information from the SFRA and FRA reports, a detailed quantitative and qualitative assessment of likely BI losses from a flood event can be made. This is known as a business impact assessment (BIA). The BIA involves working closely with the client, insurer and broker to better understand the business operations, key processes and insurance protection.

This information is combined with the information from the SFRA and FRA to help determine risk ratings and the likely effects that a flood could have on the business, how long the site will be inaccessible and the likely estimates of financial loss. Further recommendations for measures which could act to reduce the risk of flooding to the site and therefore reduce potential BI losses, including raising ground-floor levels, contingency planning, building flood defences/flood barriers, are also provided.

At Ambiental we have considerable experience in undertaking FRAs and BIAs for property developers, investors and industrial facilities. For example, we work on a regular basis with national and international bodies such as the EA and are able to acquire and process flood-risk information rapidly and cost effectively for single or multiple sites. We also have close links with remote-sensing data providers, such as Intermap Technologies and the European Space Agency, to collect and process flood and topographic data virtually anywhere in the world.

We also work closely with international insurance brokers and primary insurers to help them to better understand and manage both residential and commercial flood risks.

Given the rising levels of flood risk in many parts of the world, and the increasing number of high-value, high-risk commercial and industrial sites located within and in close proximity to floodplains (ie, near rivers and the coast) losses from physical damage and BI are likely to play an increased role in future flood claims.

Tools and techniques

There are now a number of tools and techniques with varying levels of sophistication and cost which are available to insurers and risk managers. These can be used effectively to better understand the impact flooding can have up on commercial risks and the likely losses from BI.

By supporting the decision-making process, these techniques and the information they provide can help insurers, reinsurers and commercial risk managers to better understand and reduce the potential losses associated with flood risk.

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