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Focusing more on urban flood risk

JUSTIN BUTLER, managing director of Ambiental Technical Solutions, says there should be greater emphasis on ascertaining urban flood risk which can then be linked in with wider flood risk modelling.

Global catastrophes such as Hurricane Katrina and the Asian tsunami have highlighted the urgent need for a better understanding of flood risk. It is now thought that Katrina could eventually cost the insurance industry between $40-$60 billion in damage making it the most costly hurricane to make landfall in US history. Though Katrina's wind speeds, which reached 140mph, caused colossal damage, it was the devastation from the associated flooding which surprised people the most. Many simply weren't prepared for the scale of damage caused by the flooding in New Orleans. Furthermore, the huge cost to the insurance, reinsurance and financial communities has forced many countries, including the UK, to look long and hard at the vulnerability of their own urban centres.

THE FLOOD RISK PROBLEM.

Flood risk can come from a variety of sources including river (fluvial) flooding, tidal flooding, coastal storm surges, flash flooding, surface water runoff (pluvial flooding), overflowing sewers, groundwater and breaching/overtopping of flood defences. Indeed, many of the world's major cities, including London, Paris, Tokyo, Amsterdam and New York are at risk of flooding. In fact, on average, floods cause more damage and kill more people each year than any other natural disaster. Between 1998 and 2002 Europe suffered over 100 major flood events, killing 700 people and causing £25 billion in insured and economic losses *(source: European Environment Agency, 2006).* Experts believe that flood risk is currently increasing in many parts of the world.

CHANGE.

Climate change, increased wealth in at risk areas and continued development on floodplains are increasing not only the severity and frequency of flood events, but also the vulnerability of those people and assets at risk. It has been Suggested that a combination of heavy rainfall and storm conditions could result in up to £30 billion worth of damage across the Thames region from a major catastrophic flood event *(source: Environmental Defence, 2005).*

For insurance/reinsurance underwriting and pricing purposes, flood risk information Needs to be reliable, high detail and easily interpretable. At present,

many insurers and reinsurers have access to flood risk information for Europe and other parts of the world.

However, this information tends to be low resolution, national scale flood risk maps, which in many cases only provide an analysis of flood risk at postcode or county level. In terms of reliability, the geographic resolution which many of these models operate on tends not to lend itself to modelling flood risk in complex urban environments.

Some models do not reliably account for the standard and quality of a city's flood defences, which can greatly vary the degree of flood risk within a specific area. As a result, flood risk in urban areas, where there is the greatest concern in terms of potential insured loss, can be oversimplified and, in some cases, overestimated.

NEW DEVELOPMENTS IN FLOOD RISK MODELLING.

The changing nature of risk in the 21st century requires insurers, reinsurers and risk managers to adopt new approaches and new tools for analysing risk and worst case scenarios. New developments in topographic mapping and flood risk modelling technology can provide insurers and reinsurers with more detailed and reliable information on flood risk for improved underwriting in at risk urban areas.

In simple terms, a flood risk model would be used to determine the path and volume of water which can be expected for a given flood event at a particular location. Depending on the scope and complexity of the model, the extent, depth, velocity and duration of the flood water could also be estimated. Most flood models process information relating to a number of different factors including precipitation, rainfall runoff, river flows and channel/floodplain topography.

Where there is the provision of flood risk information on urban areas it does help if this is presented via high detail, three dimensional city models. It is possible to couple three dimensional models with mathematical algorithms to accurately capture the complexity of flood risk within the urban fabric, modelling water flow down streets and around buildings. This approach would also address the impact of varying parameters on flood flows, such as topography, surface roughness (e.g. land use) and structures (e.g. bridges).

Ideally, any facility for modelling flood risk should produce detailed information including the depth, duration and extent of flood water down to the individual building level. It should be able to examine the degree of flood risk faced by the nearby infrastructure such as access routes, roads and suppliers. This in turn would be used to realistically predict the degree of interruption a business could suffer from a flood of a given magnitude.

A good urban focused modelling strategy would have a number of benefits in terms of adding value to insurers' and reinsurers' existing investments in flood risk technology. By focusing on providing detailed data on flood risk in urban areas, where there is the highest concentration of insured exposure and in many cases the greatest level of risk, this information can be integrated and combined with insurers'/reinsurers' existing in-house or third party national-scale flood risk maps and models.

POWERFUL.

For example, for the primary insurance industry which is concerned about specific risk transaction, detailed, urban flood risk maps and risk rating information can be linked with existing underwriting systems. The powerful analytical and mapping capabilities of geographical information systems (GIS) and building-specific information can also be used to provide detailed, building/policy level flood risk information to improve the flood risk rating and premium setting process.

On the other hand, for the reinsurance and Lloyd's markets, models could be made to analyse city wide deterministic and probabilistic events, enabling carriers to examine the potential risks for a specific catastrophe (e.g. a Hurricane Katrina type event hitting Miami). This information can also be linked to the output from catastrophe models or used in conjunction with existing in-house rating methods.

It is also worth noting that new developments in aerial/satellite imagery can be used by insurers and reinsurers to better understand flood risk, both before and immediately after a flood event occurs. Post-event loss estimation systems use satellite imagery to accurately identify areas impacted by major flood events immediately after they occur. This technology can be used to rapidly and realistically determine the extent of damage caused by an event and therefore improve potential estimates of loss.

The changing nature of risk and the environment around us means that extreme flood events in many parts of the world are likely to increase in frequency and severity in years to come. The financial community can therefore expect to experience increased levels of risk (and losses) from flooding in the future.

As such, insurers and reinsurers need to better understand and manage their exposure to flood risk, especially in high value at risk urban areas.

New developments in high detail, three dimensional flood risk modelling technology can help insurers and reinsurers to better understand flood risk in these high value urban environments. This information can be used to improve flood risk rating, allowing insurers/reinsurers to underwrite more business, more accurately in previously uninsurable areas, as well as reducing the propensity for large flood claims in the future.