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Manage increased flood-risk exposure

*New developments in three dimensional, urban flood risk modelling could help risk managers underwrite in previously 'at risk' areas, writes **Dr Justin Butler**.*

Recent flood events have highlighted the need for insurers and reinsurers in across the globe, including the UK, to better understand the potential impact and damage from catastrophic flood events, particularly in urban areas.

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. For example, many cities in Europe, including London, Paris, Amsterdam and Rome, are at risk of flooding.

The increasing levels of flood risk in many European cities is starting to make the insurance, reinsurance and financial communities look at the vulnerability of their own exposures. It has been suggested that a combination of heavy rainfall and storm conditions could result in up to £30 billion pounds worth of damage across the Thames region (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, these tend to be low resolution, national-scale flood risk maps, which in many cases can only provide an analysis of flood risk by postcode or at a county level.

In terms of reliability, the geographic resolution that many of these models operate on tends not to lend itself to modeling flood risk in complex urban environments. Some models do not reliably account for the standard and quality of the cities' 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 topographic mapping and flood risk modeling technology can provide insurers with more detailed information on flood risk for improved underwriting in 'at risk' urban areas.

The changing nature of risk in the 21st century requires insurers, reinsurers and risk managers to adopt new approaches and new tools to analyse worst-case scenarios.

Ambiental has focused on developing flood risk maps for the insurance and reinsurance community using ultra high-detail, three dimensional city models of urban environments.

These three-dimensional models, coupled with mathematical algorithms from complex systems modelling, accurately capture the complexity of flood risk within the urban fabric, modelling water flow down streets and around buildings. This detailed approach to flood risk modeling also displays the impact of varying parameters, such as surface roughness and river flow rates, upon patterns of flooding

Information produced from these models includes the depth, duration and extent of flood water down to the individual building level, providing key information for insurance underwriting and reinsurance accumulation analysis.

At Ambiental, we are concentrating on analyzing flood risk in detail, in high-risk, high-value urban areas. This 'urban focused' modeling strategy can be used to compliment and add-value to insurers' / reinsurers' existing 'in-house' or third-party flood risk models for those high-risk, high value cities where there is a particularly high concentration of risk or exposure.

Furthermore, the detail and information provided by the models is ideal for use by the insurance/reinsurance industry. By looking at flood risks to nearby infrastructures, such as roads, exposure to business interruption can also be analysed.

The developments in high resolution urban floodmapping can be used to examine flood risks down to the level of individual buildings. This information can be provided to insurers in many formats depending on user requirements.

For example, detailed, urban flood-risk maps and risk rating information can be linked with existing underwriting systems using the powerful analytical and mapping capabilities of Geographical Information Systems.

Combining building-specific information with flood hazard and risk rating data, provides insurers with detailed flood risk information for high value urban centers.

For insurers, the models can be used to analyse deterministic and hypothetical flood situations. This enables probabilistic analysis of the differing magnitude and frequency of potential flood events and their impact upon a book of business.

This information can be linked to catastrophe models or used in conjunction with existing, in-house rating methods. Further, aerial and satellite imagery can also be used to test the predictions of flood models by analyzing the extent to which predictions differ from previous and actual flood events.

At Ambiental we have recently developed a post-event loss estimation system called Floodscape™ which uses satellite imagery to identify areas impacted by major flood events after they occur, for improved loss estimation.

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 increased losses from flood risk in the future.

As such, insurers need to better understand and manage their exposure to flood risk, especially in high-value, 'high risk' urban areas. Increasingly, risk managers must start to look at the issue of flood risk in more detail. New developments in high-detail, three dimensional flood risk modelling technology can be used by insurers and reinsurers to better understand flood risk in high value urban environments, thereby potentially underwriting more business, more accurately in previously uninsurable areas.

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