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### Dealing with flooding: the new business risk for the 21<sup>st</sup> century

*Hurricane Katrina and a number of major flood events since 2000 have highlighted the growing issue of flood risk in the 21<sup>st</sup> century. With experts predicting flood risk to increase in many parts of the world, risk managers will increasingly need to understand the changing nature of this threat says Dr. Justin Butler, Managing Director of Ambiental Technical Solutions.*

Many businesses are at risk from river, coastal or sewer flooding. Indeed, many industrial and manufacturing businesses tend to be located in the flood-prone areas close to rivers and coastal plains. In addition, numerous commercial properties are located in towns and cities at risk of flooding (including major international centres such as London, Tokyo, Paris and New York). In the UK, approximately 130,000 businesses are at risk of flooding and according to the UK Environment Agency, you are more likely to be flooded than burnt down (Environment Agency, 2006).

Many businesses take the view that 'if they have flooded before, they are unlikely to flood in the future'. This is a dangerous assumption. Experts predict climate change will increase the intensity and frequency of flood events in the future, and urban development continues to alter the nature of flood risk on the ground. Businesses and risk managers will increasingly need to address questions such as:

- **Where** is flooding likely and to what extent?
- **What** assets do I have that are vulnerable to a flood, and how well protected are they?
- **How** will a flood of a given type affect my business; what will it do and how much will it cost?

New developments in computational flood modelling and flood risk analysis can provide risk managers with the information they require to address the questions above. Indeed, companies like Ambiental are pioneering a new end-to-end flood risk management approach to deal with the effect of flooding on businesses.

### **Where is at risk of flooding and to what extent?**

The first stage is to identify where is at risk of flooding and the extent of this risk. This stage generally involves the use of, or more likely the output from, a computational flood risk model. In simple terms, a flood risk model is used to determine the path and volume of water that can be expected for a given flood event.

A key component of this process is hydraulic modelling. Hydraulic modelling involves the simulation of water flow within a river channel, over a floodplain, or along a coastline. Hydraulic modelling often involves two key components: a digital elevation model (DEM) representing floodplain topography and some form of mathematical procedure to simulate the flow of water across the floodplain surface.

There are numerous different types of flood model available on the market, operating at different spatial scales and processing information including some or all of the following: precipitation, rainfall-runoff, river flows, and channel/floodplain topography. In recent years, new developments in ultra-high detail flood risk modelling techniques have increased the reliability and accuracy of determining where is at risk of flooding and the level of this risk. For example, Flowroute™, developed by Ambiental in collaboration with Cambridge University, uses high-detail three-dimensional representations of the environment to accurately route water down streets and round buildings. More importantly, whichever model (or model output) is used by the risk manager, expertise is needed to understand the strengths and limitations of the model and the information it provides.

## **What assets do I have that are vulnerable to a flood, and how well protected are they?**

Once the areas at risk of flooding have been identified, analysis is undertaken to determine which business assets are vulnerable to a flood and if they are protected? This process involves 'geocoding' information supplied by a business to create a geographic coordinate of the building or asset. Using the address data provided by a business - as well as Geographic Information Systems (GIS) and new developments in satellite and aerial photography processing - precise geographical coordinates can be determined for single or multiple sites. This geographical information - along with details about the type of building, construction type, number of stories and much more - is combined with the flood risk information provided from the previous stage to determine which assets are at risk of flooding and how vulnerable they are.

Information as to which assets are at risk and to what extent can then be used to determine appropriate business responses and risk mitigation strategies. For example, for a large multinational commercial manufacturing business with 10 sites in the UK, the analysis may reveal three sites at risk of flooding, with two sites at high risk. The risk manager may choose to absorb the risk for the single (medium/low risk) site within the existing insurance cover and/or initiate some low cost risk mitigation strategies - such as registering with a local flood warning system.

## **How will a flood of a given type affect my business, what will it do and how much will it cost?**

However, for the two high-risk sites identified above, the risk manager needs to know precisely how a flood could affect the site, how this will impact the business, how much it will cost and what can be done to mitigate the risk. The most reliable and accurate method to answer these questions is to conduct a detailed Flood Risk Assessment (FRA) for each site.

This process includes detailed topographic surveying of the site and surrounding area, an examination of the flood record, and, if required, detailed

computational flood modelling. Information provided from this assessment includes the identification of specific flow paths, analysis of surface water run-off and calculations of the capacity / extent of the existing drainage network.

This site-specific detailed analysis can be used by the risk manager to determine specific risk mitigation and business strategies. For example, the FRA provides recommendations for improved management of surface water, potential relocation/raising of infrastructure and incorporation of flood resilience into the building design. Information from the FRA can also be used to inform transportation and evacuation plans in the event of a flood, as well as business continuity planning.

Flooding is a growing concern to consumers and businesses. Risk managers need to be aware that simply because a business has not flooded before, does not mean it will not flood in the future. Only via the employment of an end-to-end flood risk management approach - incorporating detailed computational flood risk modelling and Flood Risk Assessments – will risk managers and businesses be able to deal with the growing issue of flood risk in the 21<sup>st</sup> Century.

*Dr Justin Butler is Managing Director of Ambiental Technical Solutions ([www.ambiental.co.uk](http://www.ambiental.co.uk)), a company that is pioneering new technology to help insurers, reinsurers, risk managers and brokers tackle the risks of environmental catastrophes.*