

## **The Review: Worldwide Reinsurance – November, 2006**

### **Taking the higher ground**

*The uncertain consequences of climate change are making it difficult for re/insurers to accurately assess future flood risks. But who is working to mitigate potential losses, and are the current models effective asks Andrew Wragg*

Modelling flood risk has become a global money-spinner, with demand for high quality, accurate output evident across the US, UK, and many parts of Europe.

Benfield's ReMetrics Natural Hazards division, which has been modelling a range of threats since 1987, not only licenses the flood software of major modelling companies such as RMS, EQECAT, and AIR, but also offers its own Geographical Analysis Project (GAP) flood models which cover the Czech Republic, Slovakia, Poland, and Austria.

Sourcing the data necessary to produce an accurate flood model is sometimes a real challenge, as ReMetrics team members Anne-Claire Serres, Adam Podlaha, and Milan Simic testify to.

"When we came to modelling flood risk in Ireland, we found that nothing was centralised," says Ms Serres.

"Collecting the data meant going to many individual organisations which can be very time-consuming.

"The post-communist countries have one advantage in that all the information can often be found on one central database so you don't have to go to various agencies:" adds Mr Podlaha.

Data precision is of major importance in flood modelling. For windstorm risk assessment, industry-recognised Catastrophe Risk Evaluating and Standardising Target Accumulations (CRESTA) zone

data can often be sufficient. But flood modelling requires a more localised analysis, and countries such as the Czech Republic have excelled in providing pinpoint coordinates to modellers, surpassing even the traditional postcode/zipcode data set.

"Historical events have helped improve the quality of data provided," says Mr Simic.

"For instance, after the 2002 floods the pressure increased on countries like the Czech Republic to provide precise x and y coordinates data, which in turn produced more and more detailed assessment of the exposure.

"But it still takes an enormous amount of research and conceptual design to bring a model to fruition." "You have to find ways to procure the necessary data, and then it can take between six months and two years before the model is ready."

## The resolution revolution

One UK-based modelling company, Ambiental, is forging ahead in the flood risk arena. Its three-dimensional representations of the UK have been produced using high resolution LIDAR technology, which only recently became commercially viable.

LIDAR data is captured using a special camera mounted on a plane that is flown over the area to be modelled.

Ambiental takes the information and removes all evidence of buildings and vegetation to create a Digital Terrain Model (DTM).

Using a combination of automated and manual processing techniques, the buildings are reintroduced into the DTM in 3D form, along with other structures such as bridges and weirs, if required.

Then, to model a potential flood, Ambiental uses its Flowroute software - technically known as 'a coupled 1D/2D flood model'.

Using hydrodynamic principles, the 1D component routes a flood wave of a given height down a river channel to identify breach points. '

Once a breach is identified, a 2D equation kicks in which routes the flow of water across the floodplain. Thanks to the quality of the LIDAR data, this routing can include the effect of buildings and other obstructions on flow paths. This confers highly detailed and accurate estimates of flood risk which include depth, duration, velocity and extent of flooding at individual building level.

Flood defences and new developments (for example, new housing projects) can also be incorporated. And architectural and engineering plans can be converted into 3D representations and added to the model.

"The LIDAR data has been available for 10 to 15 years but it has only been commercially viable for the past few years:" says Nik Bollons, Ambiental account and operations manager.

"Improvements in computer processing have made the modelling of this data more viable - it's a very data intensive process.

"Flowroute, for instance, is designed to run on a standard PC which wouldn't have been possible four or five years ago. "At the moment we are talking to insurers about the areas they are interested in; particular interest has been shown in the modelling of flood risk in London.

"It is important that we work closely with our clients in the re/insurance industry to determine their individual needs."

State-side surge

Aside from the UK, Ambiental has recently completed a flood risk model of Miami, focusing particularly on the central business district.

Floods cause more damage and economic losses in the US than any other type of natural disaster, according to the country's Federal Emergency Management Agency (FEMA). Figures released by US risk assessor, the ISO, show that in 2005, there were well over three million claims and \$53bn worth of insured properties damaged by floods - greater than the cumulative total of all claims paid by the US' National Flood Insurance Program (NFIP) between 1968 and 2004.

Like the UK's Environment Agency, FEMA assesses flood hazards, provides US residents with localised flood maps, and encourages them to participate in schemes to manage flood risk.

But the organisation has been criticised by the US Department of Homeland Security (DHS) for the quality of its topology - 70% of its 90,000 flood maps are more than 10 years old with many of the floodplains hand drawn and out of date, making them 'inaccurate and obsolete'.

FEMA received \$1.5bn for a six-year modernisation programme to update and digitise its maps.

But in a 2005 review, the DHS said that although FEMA had made progress in its mission, 'a number of significant challenges still remain'.

After being provided with high resolution topographic data by global data provider, Intcrmap Technologies, Ambiental set about producing its own model of Miami.

"The exercise was born out of a need by government and the insurance industry to better understand urban flood risk following Hurricane Katrina last year," says Mr Bollons. "What we have determined from the data we have for the area so far is that the

analysis using Flowroute seems to provide improvements in terms of granularity and detail in respect to determining levels of flood risk for the area.

"For example, the simulations using Flowroute show the identification of flow paths along streets and around large structures not seen in other examples for the area. "Furthermore, Flowroute can determine the depth, duration and extent of flooding at the individual building level - which could greatly assist risk rating of individual properties for, for example, the National Flood Insurance Program.

"We have had considerable interest in the technology from organisations in the US and this is something which we are keen to pursue in the near future."

#### The UK problem

According to the UK government's Environment Agency (EA), flooding is a £ 1 bn-a-year problem for Britain.

To substantiate this large and complex risk – and consequently, their rates - UK re/insurers have partly relied on state information as well as other varied sources of research.

But the Association of British Insurers (ABI) recently expressed dissatisfaction with the external data which had been provided to its members over recent years.

The ABI's main grouse was with the ENs'inconsistent' flood forecasts which, it said, fluctuated too frequently to allow re/insurers to set their rates assuredly, which in turn undermined public confidence in the industry.

Furthermore, the ABI lambasted the EA for its faltering distribution of Hood risk topology.

"We have been keen to share our flood risk maps among our members," says ABI climate change leader Jane Milne.

"But there have been huge licensing problems among internal government agencies, and this is standing in the way of what our customers, taxpayers and voters need to see.

"The taxpayer has already paid for this information."

In its research on flood risk, the ABI has looked at three specific factors: where the risk is located; what scenarios are of genuine concern; and how portfolios can be optimised.

In January 2006, the consortium adopted a revised Statement of Principles which deigned that flood insurance would continue to be available to customers in high risk areas, as long as adequate flood defences were installed within the next five years.

"This is a problem none of us can solve by ourselves," says Ms Milne.

"It's only by partnership that we can hope to make effective progress."

### Stemming the flow

The ABI estimates that flood risks are increasing at the rate of 2% to 4% per year, and that 10% of UK housing stock currently lies in affected areas - equivalent to approximately two million homes and 140,000 businesses, with a total asset value of around £250bn.

While much of this threat is said to be 'managed effectively': the ABI reckons there are still 570,000 homes in 'high risk' regions - more than twice the number predicted four years ago.

And unfortunately for the one and a half million people concerned, weather conditions aren't forecast to improve, with climate change beginning to deliver the portends of scientists past.

According to the UK government-commissioned report, Future Flooding, which was produced by 60 leading researchers and has been described as 'the most wide-ranging analysis of the problem of increasing flood risk that has ever been made in the UK and possibly internationally', the cost of UK river and coastal flooding could reach £20 bn per year by 2080, and the risk of flooding from rainfall might become three to six times greater.

The report claims, however, that if the UK establishes an integrated portfolio of responses, this figure could be slashed to around £2 bn.

An EA spokesperson explains: "Our message is that we must all take reasonable steps to help reduce climate change and have a tougher line against actions such as floodplain development that can exacerbate the problems associated with flood risk.

"The report has shown the most effective way to reduce flood risk is to adopt a portfolio of measures tailored to conditions in each location.

"Changes to UK weather patterns are happening now. We are recording more periods of heavy rainfall and intense storms; both can lead to flooding through increases in peak river flows, sea levels and tidal surges."

Meanwhile, Ms Milne says that while insurers are willing to adopt 'creative solutions' to address the problem of flooding, their efforts might be negated by UK planning guidelines which continue to allow more homes to be built in harm's way.

She also believes that the quality of Britain's flood defences needs to be reviewed.

"There were instances in the year 2000 where quite high standard defences failed and areas flooded; she explains.

"If we do nothing, by the end of the century we could be looking at annual damages 20 times greater than our previous estimates." ,

Driving forward

The 1953 North Sea flood, described as 'one of the most devastating natural disasters ever recorded in the UK', was a major affecter of change in UK flood insurance.

It damaged 24,000 properties, caused more than 300 British deaths (and a further 224 at sea), and forced 30,000 people to evacuate their homes. Over 1,600km of coastline was tainted and sea walls were breached, inundating 1,000 km'.

The total damage was then estimated at around £50m - equivalent to over £1 bn in modern money- not accounting for business interruption and relocation costs.

The flood reeked similar havoc on the Netherlands, but the two countries were diametrically opposed in the way the incident shaped their subsequent flood insurance mandates.

While the Netherlands abandoned private flood cover all together, it became a standard offering in UK insurers' residential and commercial policies. And according to a report by RMS, a repeat of the catastrophe in today's wealthier, more densely-populated climate would create 'one of the most expensive natural disasters for the insurance industry in the UK'.

RMS modelled the scenario and found that insured property losses would now amount to £5.5bn, split almost equally between residential buildings and contents, and industrial and commercial properties. When business interruption and additional living expenses were factored in, the figure rose by £1.5bn. But when post-1953 improvements to flood defences were accounted for, the figure fell to a maximum loss of £2 m, with extraneous factors adding an additional 20%.

"Rising sea levels and continued subsidence of the southeast corner of England, associated with land-levels after the Ice Age, act to increase the risk of storm surge flooding year-on-year, says the RMS report. "

In addition, the programme of defence upgrades and maintenance along the UK east coast remains patchy, and the potential for a catastrophic storm surge flood to the low-lying communities is ever present."

Ominous warnings indeed...but with a little prudence and using the latest technology, re/insurers can take heart that at least they did their best when the tide comes in.