

WINTER FLOODING: A THREAT TO BUSINESS?

Recent calculations by US scientists that hurricane Harvey dropped 127 billion tonnes of water over Texas in August have got me thinking about how much rain and snow could fall on the UK this winter and whether more frequent, erratic, very wet storms are now a real threat to business continuity.

Article by Matt Travis, with editorial support from Jon Herbert, Twenty6.com

Fortunately, I believe the answer is still no. Not yet at least. With good preparation, mitigation and evacuation planning, the potential for serious flood damage can almost always be minimised.

Luckily, technology is on our side too. With advanced computer modelling, it is now possible to balance the risks, costs and probabilities of flooding to a point where building flood resilience is a routine and cost-effective part of normal business planning – but with very long-term benefits.

Having said that, with recent Storm Caroline revealing the risks of melting snow on frozen ground and Storm Dylan scheduled to make landfall by Christmas, it is never too early – or too late – to get ready!

GLOBAL CHANGES V LOCAL IMPACTS

Why mention this now? There is a growing consensus that extreme weather is global warming's signature on the fundamental mechanics of world weather. The Scripps Institution of Oceanography's figures for Storm Harvey's rain-carrying supports this rather terrifying idea.

However, an increasing number of ordinary UK companies and people are also facing serious direct flood damage to infrastructure, incomes, their lives and livelihoods. The news here is surprisingly positive. In many cases, problems are quite easy to remedy. But we can't afford to be complacent.

But bad flooding often hits businesses in other indirect ways too. Valuable company brands and reputations can be compromised very quickly, particularly when trade is seasonal. One beverage manufacturer struggled for months to recover its market share after a major fire.

Statistically, the risk of flooding is much higher than fire and a more strategic problem. Highways designed to cope with 1-in-30-year floods now face 1-in-5-year events, leading to more blocked roads and long diversions. Critical power plants and water services also need protection.

Leisure and theme parks, plus garden centres and on flat, low-lying flood plain land are, particularly at risk. On dry sunny days it can be hard to imagine that a caravan park which exists to celebrate good weather could be vulnerable to vicious storm fronts gathering strength thousands of miles away.

Later on, I would like to look at mitigation and emergency evacuation measures. But before that, it might be helpful to review how some key risk factors work.

INNOVATIVE THINKING REDUCES RISKS

Businesses facing expected or unexpected flooding often have three options. Paying for the full costs of all flood damage is the first. Investing in mitigation programmes to either divert or hold back flood water is the second. However, the third is a carefully calculated but responsible route between damage a business can live with, versus damage that could potentially wipe it out.

A real-life example illustrates this. A company knows that the £100,000 cost of a 500mm-high permanent retaining wall designed to hold back all future flooding is expensive. It also recognises that it can actually live with, and recover from, 200mm of water coming in.

Probability is important here. The cost of a 300mm high wall – the difference between 500mm and 200mm – built to stand up to a lower static water head is clearly much cheaper. A 300mm flood is much more likely than a 500mm flood. Therefore, investing in a 300mm wall is a reasonable and practical decision.

However, this is where it may be important to ask whether the UK is facing a progressive or cyclic rise in extreme weather events driven at least in part by climate change. I would like to start by recapping the different types of flooding.

COMMON TYPES OF FLOODING AND DAMAGE

The UK has defined flood plains. However, over the county's relatively small geographical area, major storms can strike anywhere, particularly if discharge systems are overwhelmed by water flowing off saturated, tarmacked, concreted, or frozen ground.

Surface water flooding – A general increase in surface water run-off indicates that UK storms are becoming more intense. Although flood risk maps are available online (flood-warning-information.service.gov.uk), sudden surface water flows can inundate properties outside defined flood zones quickly.

Sewer flooding – Sewer failures may be linked to surface water flooding if sewerage systems are overloaded, blocked or damaged; the cause is often quite remote from any properties affected.

Groundwater flooding – Intense rain can elevate groundwater levels and create flooding where water tables rise above ground surface. Underground water can also damage building basements.

Coastal flooding – High tides, high sea levels caused by low-pressure storm systems, and strong onshore winds, can bring coastal flooding. Property can be damaged far inland in tidal river basins and estuaries. Rising sea levels caused by global warming are making this worse.

Reservoir and dam failures – The UK has some 5,000 dams but only a handful of large raised reservoirs. The 1955 film “The Dam Busters” is a good primer for what a major dam collapse might mean. It isn't going to happen!

CLIMATE CHANGE AND FLOOD RISK

Because of the potential damage, the Met Office now names individual storms to encourage good planning and preparation. Names for the 2017/2018 season were announced in September. Aileen, Brian and Caroline struck before Christmas. Following Dylan, Eleanor and 18 more leading up to Winifred, could be lying in wait for us.

Brian in October, which followed ex-hurricane Ophelia, hit Ireland particularly badly and was a warm Atlantic storm. Ophelia itself was the most easterly major Atlantic hurricane on record and hit the UK's North Sea coast. Caroline, veering round a North Atlantic high-pressure system, brought deep snow and a North Sea storm surge.

Caroline was forced north towards the Arctic when the jet stream was positioned unusually far south for the time of year on a latitude with Spain. New research from Pennsylvania State University (Penn State) has found that under certain conditions extreme weather patterns can be locked in place for many weeks. The jet stream then becomes stationary. This is happening more often. Further storms could follow.

DEEP OCEAN

Major atmospheric changes associated with ocean phenomena such as the Pacific Ocean's El Niño Southern Oscillation, and its La Niña counterpart, also affect our weather by interacting with the atmosphere. Both oscillate over several years with a neutral phase between them. However, the speed of oscillation seems to be increasing as the oceans warm.

El Niño, caused by warmer-than-normal surface waters, suppresses Atlantic hurricane activity by reducing the natural upwelling of cool deeper water and increasing the atmospheric stability. La Niña, the result of cooler-than-normal water, has opposite impacts in the Pacific and Atlantic.

Cutting off cold sea water that acts as a carbon sink leaves more CO₂ in the atmosphere to intensify global warming. Between them, the two

phases are responsible for perturbations now associated with not only cyclical storms and wet weather, but also droughts and bush fires around the world.

Tropical cyclones also seem to be more intense. Both hurricanes in the western hemisphere and typhoons in the east are becoming more energised. Storms like Harvey and Irma start life in the East African Highlands and move west in low-pressure “atmospheric troughs” known as “tropical easterly waves”, picking up energy from warming Atlantic water as they passed over Cape Verde to cause Caribbean devastation. Non-tropical storms like Ophelia, which gained energy over the Azores, have similar roots.

Satellite data studies show hurricanes to be forming faster than a century ago, with wind speeds 5% higher than 20 years ago, and a 4% water vapour increase in the rising warm air columns inside storms over 25 years. The destructive power of Chinese, Japanese, Korean and Philippine cyclones is reported to have grown by 50% in 40 years. Ever warmer seas are an increasing threat to densely-populated Asian coastal communities. Typhoon Haiyan killed at least 6,300 people in the Philippines in 2013. Typhoon Nina killed some 279,000 in China in 1977.

BUILDING FLOOD RESILIENCE

Fortunately, storms battering the UK cause relatively few fatalities but still have the potential to cause extensive damage and flooding. Many of the remedies are innovative but also practical.

In fair weather, it is easy to overlook these risks. Equally, it is reassuring to be able to draw a well-modelled line on the ground and then see flood waters rise to that exact point and no further months later when proper evacuation and safety procedures have been put into place and initiated.

Because of the difficulties in prediction on a small scale, floods always fool us. We can't stop them but we can build resilience. And this includes having robust site-based Flood Warning and Evacuation Plans (FWEPs) in place.

Well-designed FWEPs can include features such as sealed rooms, protected power systems and temporary or permanent flood barriers. However, they must guarantee a pre-determined and orderly evacuation that protects

people and property. They should include detailed command and communication structures, plus personnel responsibilities.

FWEPS AND FRAS

Enzygo has extensive experience in developing robust FWEPs that relate to Environment Agency, or SEPA, flood warning codes for leisure, commercial, domestic and industrial premises.

Our first consideration is what clients want to achieve in terms of flood defences versus mitigation. What are you prepared to live with? Detailed assessments follow and lead into the design of specific commercial solutions. The preferred strategy is often to let some areas flood and then get back in and start recovery immediately.

To understand what is at stake, our well-proven Flood Risk Assessment (FRA) system works to NPPF, TAN15, SPP7 and Irish Council Guidelines. We operate nationwide on residential and commercial developments and have modelled some of the most complex interactions in the UK and Europe.

Our FRAs, which include 2D numerical tidal, fluvial and pluvial flood modelling and combined flooding scenarios, are also important for planning applications of more than 1 Ha in size.

Moving onto the recovery stage, to complement FWEPs we provide Business Continuity Flood Assessments (BCFAs) with two aims. The first is to allow businesses to continue operating as usual. The second is to reduce the risk of damage and protect key infrastructure and assets.

Please get in touch if you have any questions. All discussions are confidential.

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