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Institution of Civil Engineers

ICE Wales briefing sheet
Flooding: Engineering resilience

Heavy flooding has occurred in Wales every year since 1998. The floods of 2007 were particularly severe.

Whereas most of the UK is flat, with relatively low river and drainage velocities, the Welsh landscape is the opposite. Steep sided valleys exacerbate flooding, with rivers and drainage systems often running a steep course at higher speeds, leading to flood waters rising dangerously fast.

Building on valley sides and the use of impermeable materials like concrete has exacerbated these problems.

Recommendations

- Build extra capacity into infrastructure
- Address the engineering capacity and skills shortage
- Keep the public informed and engaged
- Build flood resilience measures into new developments

Civil engineers have a vital role to play in delivering flood resilience measures in Wales. The solutions to the problems are identified and the technology is available but we need to ensure that we have sufficient skills, capacity and funding, and that engineers work in partnership with hydrologists and environmentalists to effectively protect Wales against flooding.

Critical infrastructure

The floods of 2007 exposed the vulnerability of the UK's critical infrastructure to flood risk. As highlighted by Sir Michael Pitt, when compared with the highly co-ordinated approach to the threat of terrorism on critical infrastructure, the approach to mitigating natural risks is often 'uncoordinated and reactive'.

The floods of 2007 had a devastating effect on many areas of the UK's infrastructure, with electricity sub-stations shut down leaving thousands without power, arterial roads closed, water and waste treatment plants affected, schools damaged, and Network Rail estimating repair costs at £32 million.

The onus should be on utility companies to take responsibility for ensuring that they continue to deliver a service, rather than on merely meeting minimum standards of flood defence at individual facilities. Utilities and other infrastructure organisations must be able to provide an adequate minimum level of vital water, power and transport services during emergencies.

ICE believes there is a strong case for building back into infrastructure some of the spare capacity lost in recent years. In practice too many pieces of infrastructure may have been allowed to become 'critical'.

Capacity and skills

The industry is facing a shortage of flood defence engineers, drainage engineers and municipal engineers in general. Reasons such as an ageing workforce and difficulties recruiting students into engineering until fairly recently indicate that the current shortage of engineering skills will continue across the sector. When the increasing demand in the flood risk management sector and other utilities in general is taken into consideration, it is clear there are likely to be severe challenges in delivering major flood defence engineering schemes and non-structural flood resilience measures.

Photo: Environment Agency Wales

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The public sector has particular difficulty in recruiting and retaining flood risk management experts. Local authorities and the Environment Agency may not be able to offer the remuneration to secure the numbers of staff required. Local authorities and the Environment Agency particularly may also lack the capacity to procure outsourced expertise and services necessary for an expanding programme of activity. Local authorities also lack capacity in planning and development control, meaning that it is difficult for them to fully implement Technical Advice Note 15.

Managing public expectation

The expectation from some businesses and members of the public that total protection from all flood risk is achievable must be managed. Even with the higher levels of investment that we are recommending, construction and maintenance of comprehensive flood defences will be unaffordable in the context of climate change. Communities should expect to be more exposed to flooding in the future. It is vital, therefore, that steps are taken to improve flood resilience of communities in general.

As expectations become more realistic, individuals may be encouraged to become more self-reliant and take some precautions of their own to protect their homes and businesses against flooding.

Effective public engagement is essential to managing expectation and encouraging self-reliance. The Environment Agency is attempting this; making more information available to the public, such as flood risk maps and undertaking public flood risk information and awareness campaigns. In Wales the Environment Agency flood maps show areas of high, medium and low risk. Public awareness of flood risk in the region is undeniably growing.

Flood risk management at the heart of urban design

Technical Advice Note 15 is intended to ensure that measures to manage flood risk are built into new developments. Local planning authorities in Wales ensure that the consequences of flooding are managed acceptably.

The Welsh Assembly Government and Environment Agency Wales are working together with the Association of British Insurers to find ways of building resilience into the built environment when repairs are made.

Engineers are central to delivering flood resilience measures. Traditional structural defences alone are no longer the most effective or economic methods of dealing with flooding in Wales. A range of responses are needed with all agencies working together to provide community solutions.

Large regulating "ponds", such as those found in Malaysia and Thailand, might be an interesting integration to new Valleys developments. These areas have much in common with the Welsh Valleys in respect of the times and concentration of flooding events.

Planning regulations should require Valleys' developers to provide wide drainage channels, typically at two metres, with shallow slopes, creating massive storage capacity before discharging storm flows into rivers.

This would satisfy the need to require and enforce greater use of sustainable drainage systems in Wales.

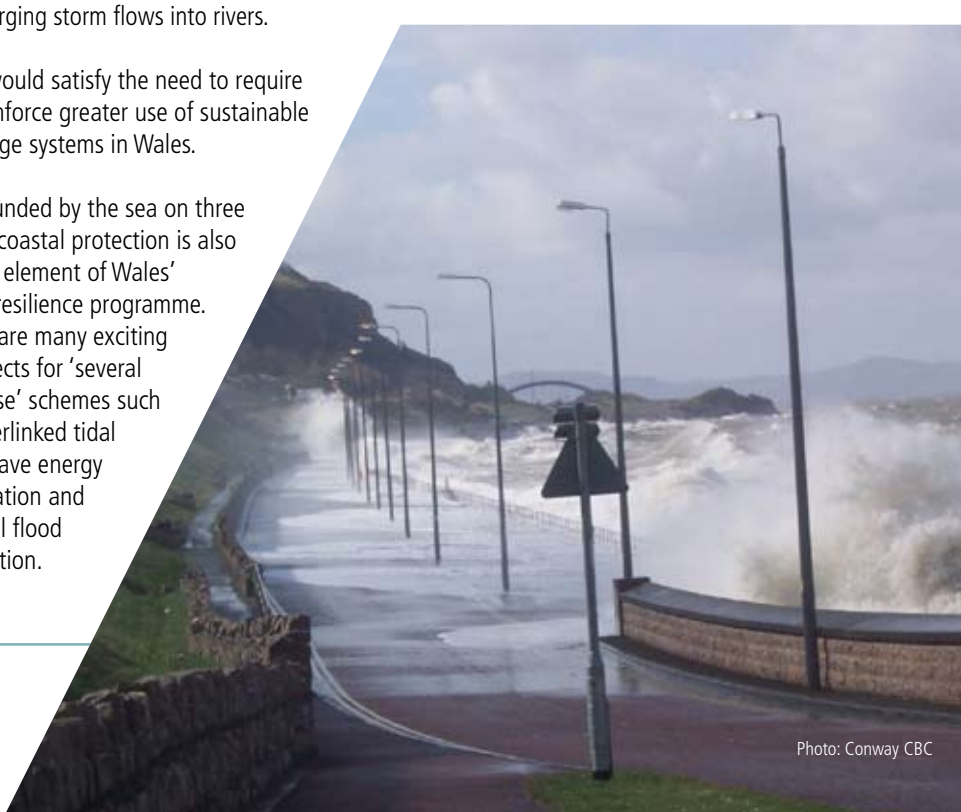
Surrounded by the sea on three sides, coastal protection is also a vital element of Wales' flood resilience programme. There are many exciting prospects for 'several purpose' schemes such as interlinked tidal and wave energy generation and coastal flood protection.

Most of the North Wales coast could benefit from civil engineering works that would provide renewable energy and flood protection, not least the areas around Towyn - ravaged by inundation by the sea in 1990, from which it has barely recovered.

ICE Wales calls for an early government backed demonstration project to finally prove the technology and recommends a tidal energy storage and release scheme between Rhyl and Colwyn Bay, coupled with a government backed research, development and demonstration project.

We cannot stop flooding but we can prepare for it. Emergency response and critical infrastructure need attention and need to be made more resilient. The floods of 2007 highlight the need to continue the preparedness.

We need all authorities, agencies and bodies to continue to work together.



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