

Minimising Flood Risk



A new visualisation tool is helping CH2M to work with UK Government agencies to quantify the benefits of investing in non-structural flood risk defences to protect homeowners and industry.

The Department for the Environment, Food and Rural Affairs (Defra) considers flooding to be the UK's greatest climate change risk, affecting up to 3.6 million people by the middle of the 21st century. The economic impact is significant, with the flooding of December 2015 in the North of England estimated to have cost £5.8bn, with an additional £2.75bn needed to re-build damaged infrastructure and flood defences (Daily Telegraph December 2015). In March 2016, the UK Government announced an additional £700 million of spending on flood defences bringing its total commitment to £3bn by 2021. This funding will be used to improve physical flood defences but also non-structural approaches such as flood warning systems and new approaches to land management. However, there is a need to critically evaluate which non-structural measures are the most cost effective, and how investment in these measures affect the performance of physical flood defences.

What the IDC did

Initially the team focussed on developing a more rigorous approach to quantifying the return of investment in non-structural flood defences as these cannot be assessed

in the same way as physical flood defences using standard cost benefit analysis. This approach evolved to use systems thinking to consider the wider flood risk management system and the interrelationships between "soft" and "hard" measures within the overall flood defence system. The team investigated systems dynamics models and used CH2M's proprietary Flood Modeller software, which is the most utilised flood software package in the UK to develop new tools and models to estimate system benefits.

The project delivered a number of outputs including new, cutting edge, internet platform based R&D tools for flood visualisation, which has helped secure new work and deepened CH2M's client relationships. A commercial report for Defra and the Environment Agency assessing the benefits of non-structural approaches over traditional structural approaches has been used to influence flood defence investment decisions.

The Impact

The outputs of the project have helped to maintain CH2M's position as a leading provider of cutting edge solutions for water and flood risk management:

- The approach to this project, including the development and thought processes, have been applied to areas beyond flood management, for example developing a water resource scenario viewer which provides a graphical, user friendly, physical representation of the water system to support decision making for 17 million customers in the South East UK.
- The Research Engineer has been an ambassador for the application of systems thinking and approaches, thereby promoting their use and delivering impact throughout the company.
- The business benefits of systems thinking to CH2M have been well received and the Research Engineer has been recruited to further develop the tools and identify new application areas.
- The methodology developed by the Research Engineer has been adopted for other successful bids, including a £1M application to the Newton Fund for research in China on earthquakes and landslides.
- CH2M have a much closer relationship with the University of Bristol and are partners in the University's prestigious Water Informatics Science and Engineering (WISE) Centre for Doctoral Training to further investigate flood resilience.

- The underlying academic approaches which were developed through this research underpin over £5 million of proposals for future funding to apply risk methodologies in developing countries.

The Future

The project has embedded into the company a systems thinking approach to problems and tool development which CH2M can apply to a variety of problems across a wide range of industry sectors.

The visualisation tools produced by this research are constantly being improved and updated to make them more attractive to clients and deliver new outcomes. It is hoped this research will transfer cutting edge thinking to regions of the world where flooding can devastate entire regions and cost thousands of lives.

Related publications

Keep it simple: user-focussed flood risk visualisation, 2014, Joseph Clarke, Jon Wicks, Luke Lovell, Dawei Han and John P. Davis, ICE Water Management, Volume 167, Issue 5, 01 May 2014, DOI: 10.1680/cien.13.00016

