

# Swansea University

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Swansea University  
Prifysgol Abertawe

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## Outline

Swansea University, founded in 1920, is located in South Wales, UK. Being home to 16,000 students and 2500 staff, Swansea is one of the leading research Universities in the UK and provides an excellent environment for research excellence, with research that is world-leading, globally collaborative and internationally recognised. Swansea uses its research strength, collaboration with industry and global reach, to drive economic growth, foster prosperity and to contribute to health, safety and well-being of communities. Located in a beautiful coastal city, Swansea University provides an ambient atmosphere for excellent teaching, learning and research. The current vice Chancellor of the University is Prof. Richard Davies.

The University constitutes of seven academic colleges: Engineering; Art and Humanities; Human and Health Science; Law; Medicine; Management; and Science. Among the colleges, the College of Engineering and the College of Science are in the forefront of research on the natural environment. Rated as one of the top 10 engineering colleges in the UK from the last Research Excellence Framework in 2014, 94% of research carried out at the College of Engineering is ranked as world-leading or internationally excellent. The college hosts three strategic technology centres and conduct research under three primary themes: aerospace and manufacturing; energy and environment; and health and sport. The College of Science hosts five departments, bioscience; computer science; geography; mathematics; and physics. The current research at the college of science spreads across eight research centres covering a wide range of themes from global environmental modelling, glaciology, ecosystem dynamics, human and physical geography; and nano-health. Both colleges have strong links with the practicing engineering and science communities and work in partnership with the UK and Welsh Government; national and international industries and companies; service providers; business communities and governmental and non-governmental organisations responsible for health and well-being of communities.

## Natural hazard research achievement

Swansea University is a successful research led University in the UK. In the Research Excellence Framework (REF) in 2014, which is the system for assessing the quality of research in higher education institutions in the UK, Swansea was ranked 26<sup>th</sup> place among all UK Universities where 90% of the University's research impact was rated as internationally excellent. College of engineering of Swansea University who hosts research on the natural environment and hazards was ranked in the 10<sup>th</sup> place among all engineering colleges in the UK with 94 % of engineering research outputs were rated as world leading or internationally excellent.

Renowned for being the home to the establishment of finite element method by Prof. Zienkiewicz, the college of engineering of Swansea University is historically known as a centre of excellence for finite element applications in structural mechanics, computational fluid dynamics and geomechanics. The college established the Energy and Environment Research Group in 2012 with the aim of expanding the strategic engineering research in the areas of coastal and estuarine processes and modelling, flood risk modelling and management, hydrometeorology, hydroinformatics, climate change and adaptation and hydroclimatic modelling. Within the short span of three years of its existence, the group today hosts three full-time academics, five post-doctoral researchers and eight PhD students and has become a leading research group in the UK.

The group currently holds substantial research grants from the Research Councils UK (RCUK), the British Council and industry. Also, the group has a history of involvement natural disaster research where the member are investigators and partners of RCUK funded Flood Risk Management Research Consortium (FRMRC), Flood and Coastal Erosion Risk Management Network (FCERM\_Net), Ensemble prediction of inundation risk and uncertainty arising from scour (EPIRUS) project, Multi event modelling of risk and recovery from floods (FloodMEMORY) project and EU funded FLOODSite and THESIUS projects.

The research outputs of these projects are continuously being fed to the development of future strategies for flood risk research, developing and implementing flood risk mitigation policies, planning and management of flooding and flood risk, developing resilience to flood risk, planning and managing field measurement campaigns, planning and designing flood defences and increasing the ability and accuracy of flood forecasting. The research group maintains very close links with the Environmental Agency UK, Natural Resources Wales, local councils, industry, consulting engineers and general public and continuously work towards improving flood risk management and mitigation.

## **Research Challenge**

Natural hazards claim thousands of lives every year, and cause damage worth hundreds of billions of pounds. Hurricane Katrina cost the US government an estimated \$105bn, while the Fukushima disaster cost around \$309bn. Closer to home, more than five million UK citizens live in properties thought to be at risk of flooding, putting assets worth some £200bn at risk. The world is becoming ever more susceptible to natural disasters. The number of major disasters resulting from natural hazards has risen dramatically since the 1970s, and is still increasing. Global losses from natural disasters in 2011 were the highest in recent history.

Coastal and river flooding from storms, hurricanes or typhoons have been recognised as one of the most frequent natural hazard affecting millions of people worldwide. Recognising the need for mitigation of flood hazard, the Energy and Environment research group based in the College of Engineering of Swansea University focuses their research on storm induced coastal erosion and flooding and inland flooding.

With ever increasing frequency of flood disasters, population and economic growth in urban centres and poor utilisation of natural resources have led disaster mitigation and prevention extremely difficult and challenging. The Swansea research team has identified a number of key research challenges in flood risk research:

- Improve the assessment and quantification of uncertainty and risks of natural hazards by developing new probabilistic methods and demonstrating their applicability to enhance the uptake of natural hazards science
- Need to enhance the understanding of the physical processes behind flooding and flood inundation, and also their effects and implications on flood prediction and mitigation.
- Need to understand and ability to predict risks from high impact multiple flood events, particularly as they increase in severity and frequency. In that, it is essential to understand the 'memory' effect of the disaster receptor system (both physical and societal), which will help us to understand the impacts of past hazards on future hazards.
- Reducing computation times and accuracy of real time flood forecasting
- Need for interdisciplinary research on flood risk that combines meteorology, science, engineering, social sciences and economics to improve flood forecasting and to address complexity of flood hazards and disaster mitigation
- Improve the historic flood hazard database which will be extremely helpful for accurate prediction of future flood risk.
- Need to understand the factors that make people and their assets more vulnerable to floods
- Need for a dynamic risk assessment framework to understand changing risks
- Need to increase community resilience and build flood-prone infrastructure and buildings

## **Disaster research**

- Improved national and international collaborations among natural disaster researchers
- Establish working groups for different research areas
- Measure progress of research and development
- Advances in modelling and real time forecasting
- Improved community resilience to withstand and recover from natural disasters
- Improved multi-disciplinary approach for natural disaster risk and uncertainty, taking a 'whole system' approach
- Improved long term post-disaster measurement programmes which will be extremely helpful to improve the capacity to model and forecast natural disasters
- Activities and methodologies for strengthening community resilience
- Communicating with and educating communities about risks of natural disasters
- Open platform for disaster mitigation research outputs