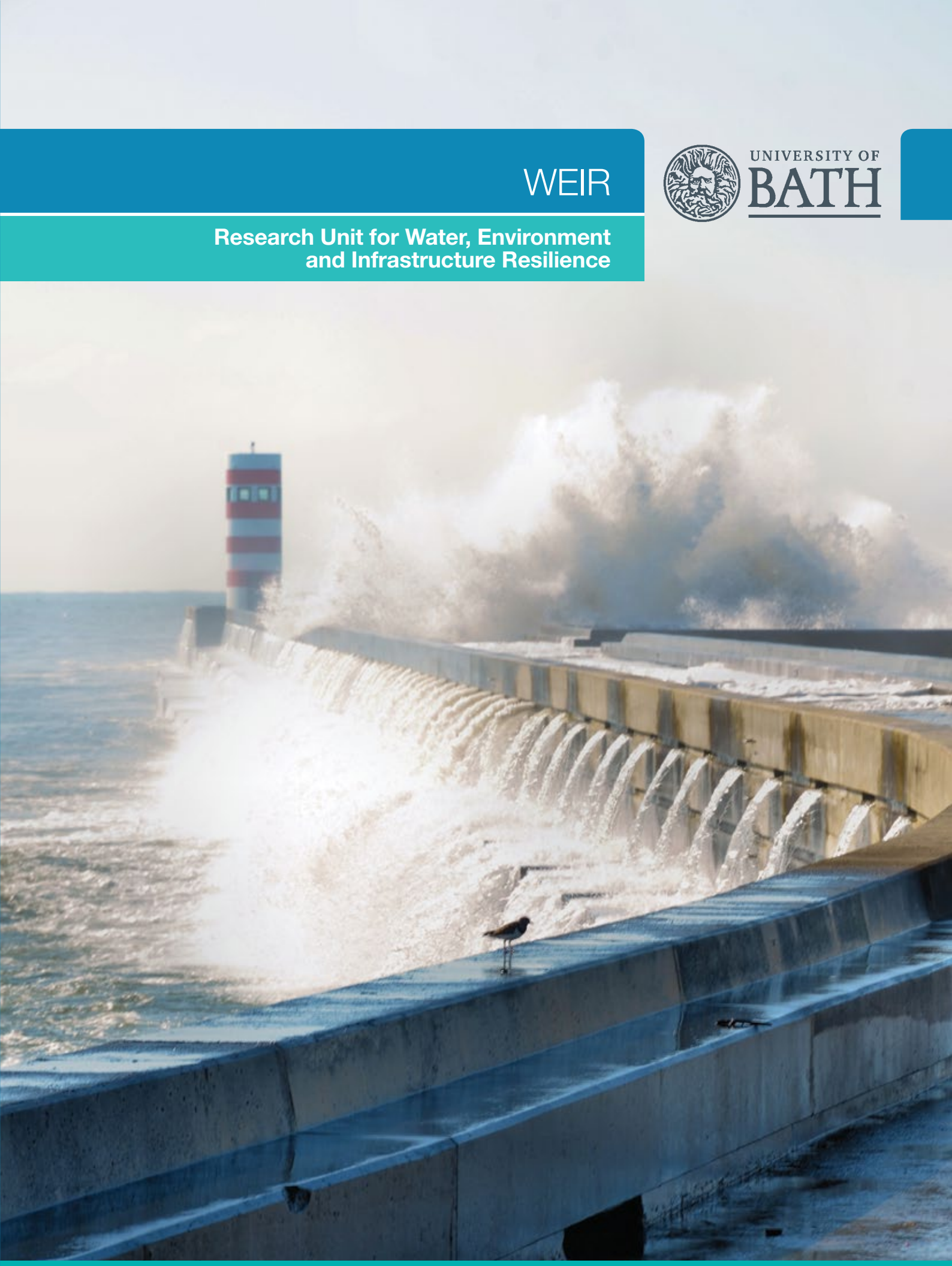
WEIR

Research Unit for Water, Environment and Infrastructure Resilience

UNIVERSITY OF BATH



www.bath.ac.uk/ace/research/weir

Research Unit for Water, Environment and Infrastructure Resilience (WEIR)

The Research Unit for Water, Environment and Infrastructure Resilience (WEIR) conducts world-class research on broad issues in the field of Civil Engineering-based water research. The challenges of climate change, water and energy shortage are the key drivers for the research undertaken in the Unit to inform and improve the adaptability and resilience of built infrastructure, help improve water security, and accelerate the progression of obtaining renewable energy from the sea and water.

WEIR members:

Dr Jun Zang
Reader, Director of WEIR

Dr Zang's research concerns the impact of extreme events on urban, coastal and offshore structures. Her research group at the University of Bath is one of the leading groups in developing and using advanced CFD tools in modelling fluid-structure interactions, urban and coastal flooding, including tsunami wave propagation and run-up, and violent wave impact on seawalls and marine renewable energy devices. She has led/participated several major national and international research projects funded by EPSRC, EU, RAE, Royal Society, GWR and industry.

Dr Christopher Blenkinsopp
Lecturer

Dr Blenkinsopp's primary research interests cover remote sensing of coastal processes, sediment transport and hydrodynamics in the surf and swash zone, wave breaking and wave energy converters. Chris has considerable expertise in field and laboratory measurements of coastal processes and has been involved in several major field and prototype-scale laboratory experiments including the ECORS project in France and the EU-funded BARDEX 1 and 2 projects at the Delta Flume in the Netherlands.

Dr Lee Bryant
Prize fellow

Dr Bryant's primary interests are biogeochemical cycling, limnological processes, and cross-media mass transfer in aquatic systems. Specifically, she focuses on oxygen, nutrient, and trace-metal dynamics and management of water quality in lakes, reservoirs, and oceans. Her primary research themes can be summarised via the following two questions: (1) What are the principal controls on biogeochemical fluxes of oxygen and other chemical species in different systems and how do resultant conditions influence ecosystem health? (2) How can this knowledge be used to optimise sustainable engineering technology?

Dr Kevin Briggs
Lecturer

Dr Brigg's research examines the influence of seasonal weather changes, extreme weather events and longer term climate change on transport infrastructure earthworks such as railway embankments and road cuttings. Field instrumentation, monitoring and modelling have been used to understand the influence of climate, vegetation and permeability on earthwork hydrology. This has been used to assess seasonal rail movement, 'shrink-swell' deformation and the ultimate stability of earthwork slopes.

Dr Thomas Kjeldsen
Senior lecturer

Dr Kjeldsen's research is focusing on mathematical and statistical modelling of hydrological and environmental systems, with particular emphasis on extreme events. He has led the development of the current UK industry standard methods for flood frequency analysis. Recent research projects include studies of the effect of urbanisation on extreme flood events, joint probability analysis of flood events based on rainfall-runoff modelling, and development of a statistical extreme value procedure for regional and non-stationary analysis of flood events.

Dr Danielle Wain
Lecturer

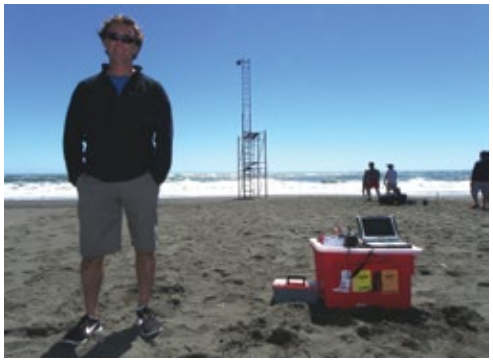
Dr Wain's expertise lies in field-based environmental fluid mechanics research in lakes and the ocean, where density stratification (usually caused by temperature or salinity) restricts the vertical mixing of nutrients, oxygen, sediments and other substances, often controlling their spatial variability. She investigates how turbulence is generated by internal waves (ranging from high frequency waves to lower frequency internal seiches and internal tides), how internal waves interact with lake boundaries and submarine canyons in the ocean, and how internal waves drive offshore mass transport.

.

Water Resources Engineering

Key Staff:
Dr Lee Bryant, Dr Thomas Kjeldsen, Dr Danielle Wain

Managing the quality and quantity of our surface water resources is an essential role of civil engineers. Changing climate and land use lead to increase in extreme flooding events and impact the use of such resources as water supplies and recreation sites. We conduct research to develop engineering tools to mitigate these impacts. Within WEIR, we have expertise in areas including reliability and risk, urban hydrology, turbulence and mixing in lakes, biophysical interactions in natural waters, aeration systems in reservoirs, and biogeochemical processes in water supply systems.



Coastal and Ocean Engineering

Key Staff:
Dr Jun Zang, Dr Chris Blenkinsopp, Dr Danielle Wain

The oceanic environment is extremely dynamic and presents major challenges to engineers involved in the design of coastal or offshore structures. Additionally coastal erosion and flooding represents a significant risk to coastal communities, infrastructure and habitat. Within WEIR we have considerable expertise in laboratory, field and numerical investigation of coastal and ocean engineering. Ongoing research covers a wide range of areas including coastal processes, wave impact on coastal and offshore structures, sediment transport, marine renewables, internal waves and non-linear wave analysis.

Natural Hazards

Key Staff:
Dr Thomas Kjeldsen, Dr Chris Blenkinsopp, Dr Jun Zang

Every year around the world, natural hazards such as floods, landslides, earthquakes and wind storms are causing trillions of dollars worth of damage. Civil engineers play an important role in both protecting society by designing prevention measures, (for example flood defences) and by designing more robust and resilient infrastructure to help mitigate the impacts of extreme events. Key research topics being pursued within WEIR aim to develop new and improved tools for engineers to better understand and predict both the magnitude and the frequency of future events, and how such events interact with both the natural and the built environment. The expertise within the group includes frequency analysis of extreme events, modelling and monitoring of coastal and marine processes, hydrological design flood modelling, and numerical modelling of urban and coastal flooding, including tsunamis.

Infrastructure Resilience

Key Staff:
Dr Kevin Briggs, Dr Jun Zang, Dr Chris Blenkinsopp

We are faced with the engineering challenge of ensuring both current and future infrastructure resilience. This includes resilience to flooding, tsunami and landslide hazards which are triggered by extreme weather events, land use change and longer term climate change. Such events can cause significant damage and disruption to road and rail networks, energy infrastructure, flood defences and the built environment. Research within WEIR aims to understand infrastructure resilience to environmental change by measuring and modelling the impact of extreme events on engineering structures. This will allow infrastructure owners and operators to target the allocation of resources for maintenance or prevention measures. The expertise within the group includes field monitoring of infrastructure earthworks, vegetation influence on near surface hydrogeology, modelling and monitoring of wave impacts on flood defences.

UNIVERSITY OF BATH

Contact

Dr Jun Zang
Director of WEIR
j.zang@bath.ac.uk
+44 (0)1225 384315

Research Unit for Water,
Environment and Infrastructure
Resilience (WEIR)
Department of Architecture & Civil Engineering
University of Bath
Claverton Down
Bath BA2 7AY

www.bath.ac.uk/ace/research/weir