LEADING THE WAY ON WATER

Research Outlook 2021-2026

Leading the way on water

“Innovation is central to our mission. We are here to tackle the world’s most complex water-related challenges by creating next-generation tools and technology. As an independent not-for-profit organisation we have no shareholders; we reinvest our profits from our science and engineering work into world-leading research and state-of-the-art facilities.

We pride ourselves on sharing our vision and insight with our partners and we collaborate with public, private, not-for-profit and academic organisations across the globe.

This five-year research outlook explains our mission and vision, as well as the ambitious approach that keeps us at the leading edge of all that we do.”

Dr Bruce Tomlinson
Chief Executive

Our mission

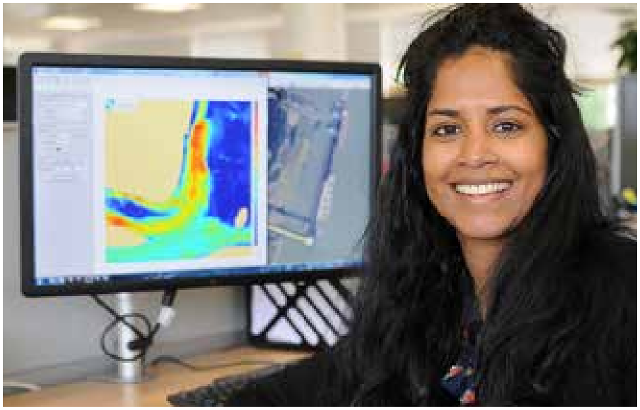
At the core of HR Wallingford's existence is the drive to build knowledge and innovate wherever water interacts with people, infrastructure and the environment.

Over the past 70 years, our research, in collaboration with worldwide partners, has led to breakthrough technology used to provide solutions to the planet's most pressing problems.

We aim to attract the brightest and the best in their fields. Our exceptional people push the boundaries of conventional thinking and harness the power of new technologies. They have helped to protect vulnerable communities, create resilience and improve lives.

Success in research, innovation, partnering, dissemination and training is vital to maintain our international reputation. Our everyday work in science and engineering also gives us an authentic perspective that keeps the research focussed on the working needs of our partners and stakeholders.


Fast
Flow
Facility



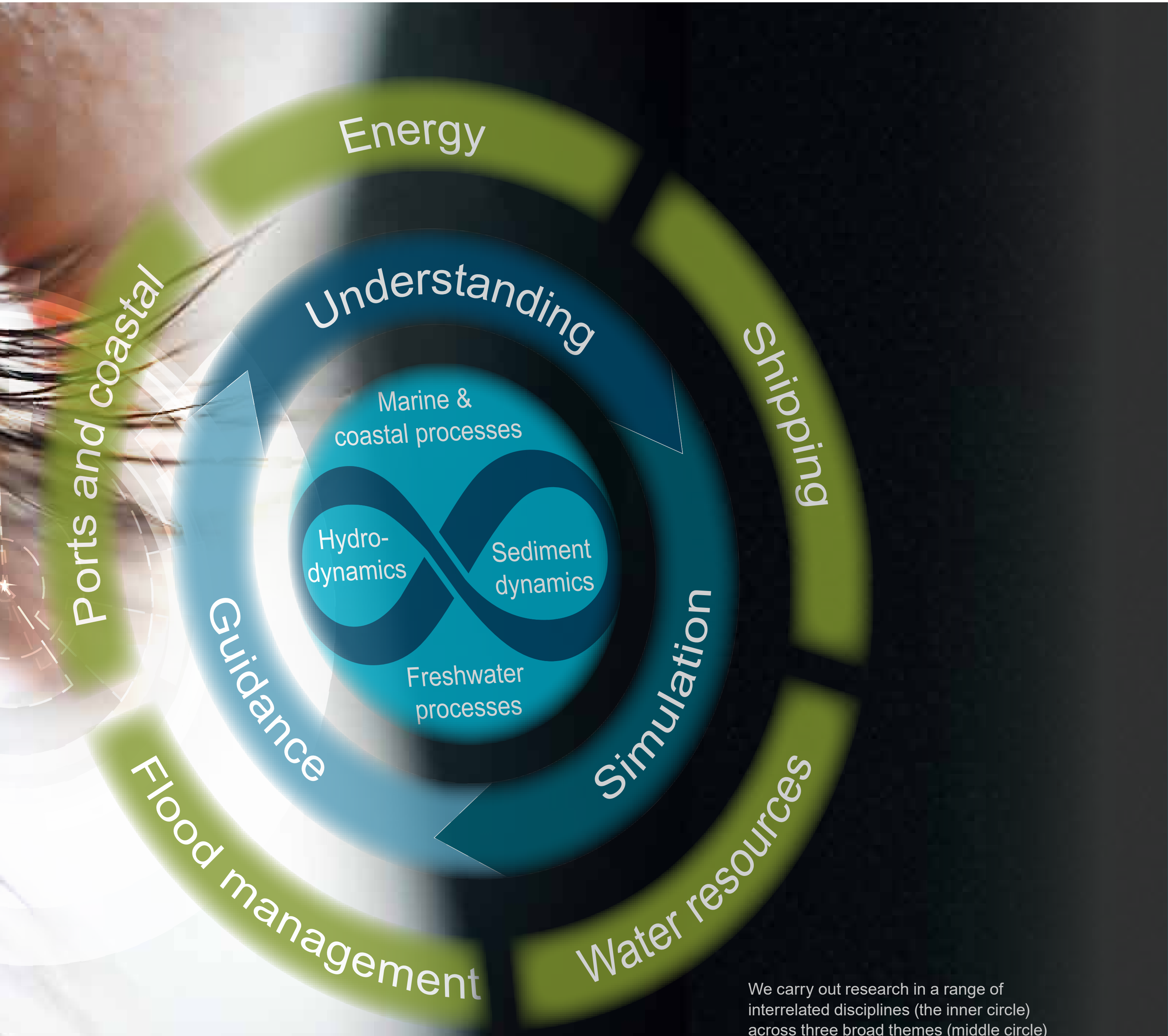
Our research vision

Our vision is to extend and consolidate knowledge and innovation wherever water links to infrastructure, energy, health, food and connects to the rest of the natural environment.

As an Independent Research Organisation, we aim to advance the sustainable management of the water environment and the well-being of our fragile planet, whilst improving all aspects of our expertise.

Through our research we aspire to:

- extend our understanding of data processing and modelling capabilities for physical processes in the water environment and their implications for engineering design and risk management issues;
- help solve key global challenges such as sustainable development, climate change adaptation, the water-food-energy nexus, human health and welfare, protection from natural disasters (flooding, erosion, impacts of storms, cyclones and tsunamis);
- support the sustainable and safe harnessing and delivery of natural resources.



We carry out research in a range of interrelated disciplines (the inner circle) across three broad themes (middle circle) and to support a number of different sectors (outer circle).

Commissioning and funding

Our research, funded by partners and our own profits, is commissioned by external bodies and through our own internal research calls.

We liaise with a wide range of organisations regarding research opportunities and respond to research calls from a variety of funding partners around the world. As an Independent Research Organisation listed by UK Research and Innovation (UKRI), HR Wallingford is eligible for funding from all of UKRI's seven Research Councils.

For most projects, funding bodies expect us to participate as a research partner, but where appropriate, it is sometimes possible for our input to be considered as a subcontracted service to a research project.

Where an area of research is of particular relevance to us, we may contribute internal funds towards its successful delivery, if permitted by the funder. All parties benefit as we support the core delivery of the research and we contribute funding towards a larger project that we could not otherwise deliver on our own.

Every year we carefully select a number of internally funded projects, based on their relevance to our focus areas, described later in this document. Some projects involve only our own staff, while for others we collaborate with an external organisation. In either case we fund all the activity. Typically, projects last one to two years, but longer-term projects such as PhDs are also funded by this scheme.

By working with academic institutions, we are able to offer PhD and Masters research programmes for our staff, as well as hosting visiting researchers and professors. This creates an exciting, inspiring working environment. We also work with other universities in the UK and around the world contributing to funding and supervision of PhD students.

Collaboration in delivery

In delivering our research programme, our aims are to provide reliable, timely and effective information and solutions that underpin decision-making for our partners. This includes offering scientifically robust opinion, evidence and advice in a way that can be clearly understood and acted upon.

Collaboration is important to us, and we work closely with partners and other researchers, with our high calibre staff taking on roles from contributing researchers to Principal Investigators. We use real and virtual environments to collaborate on research with colleagues and collaborators, and we promote staff exchange.

We believe in fostering international co-operation, and are committed to growing science and innovation capacity beyond the UK. As part of this strategy, we will increase our engagement with research institutions in emerging economies and foster collaborations through international frameworks. In particular, we will:

- engage in new partnerships with industry and research institutes worldwide to promote international collaborations, develop national and international centres of excellence, share knowledge and ideas, and build capacity.
- collaborate with partners worldwide engaging in innovative field measurement campaigns of waves, flows and sediment movements.
- facilitate periods of placement for national and international researchers in our headquarters in Wallingford and as part of sabbaticals and knowledge transfer.
- support the wider development of open source numerical models through code development, scientific committees and hosting of user and developer sites.
- aim to broaden networking between communities of experts working in different fields of applications.

The global water context

Water is vital to the health, security, cultural and economic well-being of our society, and to the sustenance of all life on Earth. HR Wallingford plays a key role in advancing the understanding of the freshwater and marine environments and how they can be better managed, preserved and improved for future generations, as well as supporting the design of infrastructure.

The demand for water and energy is rising continually because of population growth and rapidly expanding economies. Projections suggest that by 2050 the world's population will reach over 10 billion with GDP tripling. Global water demand is expected to increase by 30 per cent, with water resources becoming scarcer, leaving over 40 per cent of the world's population in severely water stressed conditions. Access to clean water and sanitation remains a major problem across low income countries.

At the same time, global energy demand is expected to be nearly double that of today, and, despite the demand for renewable energy in a decarbonising economy, 75 per cent of this energy may still be supplied by fossil fuels. This would lead to an increase in greenhouse gas emissions, an acceleration of climate change and an exacerbation of global biodiversity loss.

In the face of these challenges, there is a long-standing commitment at the national and international level to seek pathways that lead to sustainable development, incorporating concepts such as robustness, resilience and reversibility, and with a focus on working with nature.

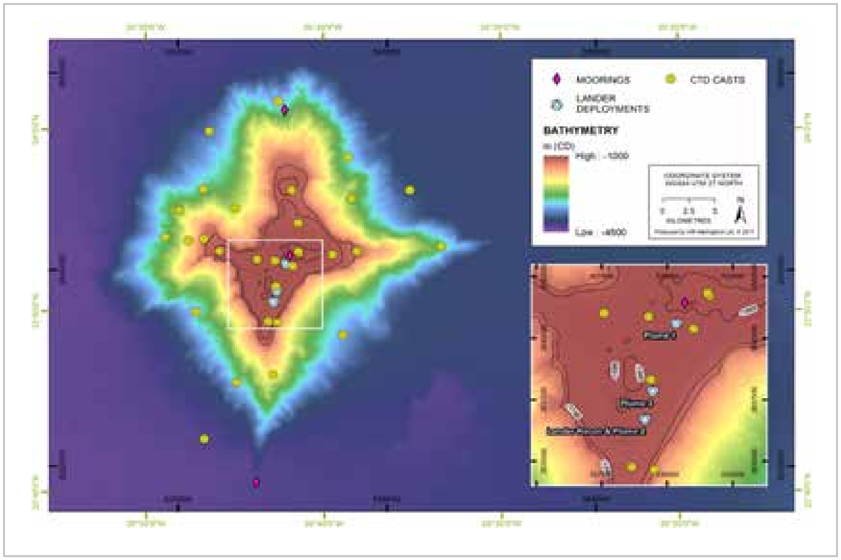
Research impact

From fundamental understanding of microscopic sedimentary processes to application of remote observation techniques across vast regions of the world, we tackle complex water-related challenges at all scales.

Working to deliver results where ever water interacts with people, infrastructure and the environment, our research supports national government policies and strategies and provides practical solutions to global issues. We deliver rigorous, cutting edge science, and have international reputation for research excellence. Working in collaboration with global partners, and with support from a broad range of national and international funding agencies, we deliver knowledge that helps to build resilience, protect communities and sustain habitats.

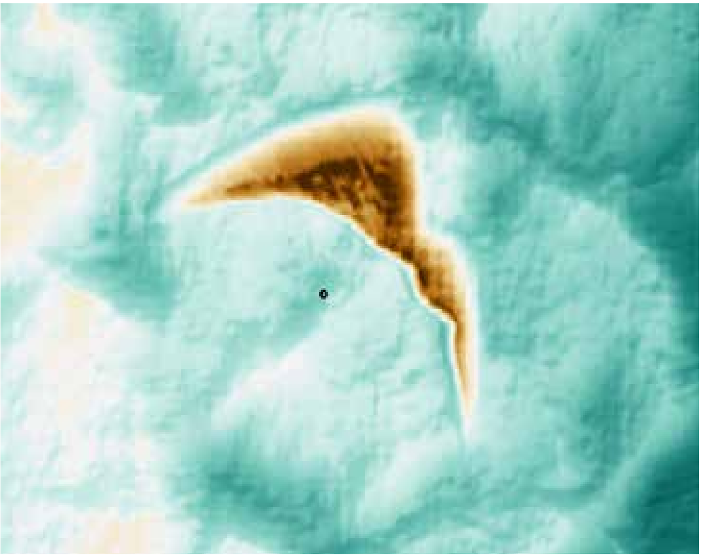
Community preparedness. In India we are using satellite data to predict in near real-time the impact severe floods will have on communities, infrastructure and agriculture.

Working with nature. Using agent-based models, we investigate how marine wildlife interacts with tidal power and marine energy devices, and how often collisions happen. This builds on our previous work showing how fish and marine mammals react to underwater noise caused by human activity in the sea.



Illuminating deep ocean environments. Working with the UK's National Oceanography Centre, we are exploring the potential impact of deep sea mining for e-tech elements on the ecosystems around tropical sea mounts.

Preparing for the impact of climate change.
For almost a decade, we've supported the UK government's assessment of the risk associated with climate change. Our work underpins policy and guidance.



A secure foundation.
As part of a unique 11-year project to track the course of a marine barchan dune across an offshore wind farm, we showed that the dunes pose little threat to the operation of wind turbines.

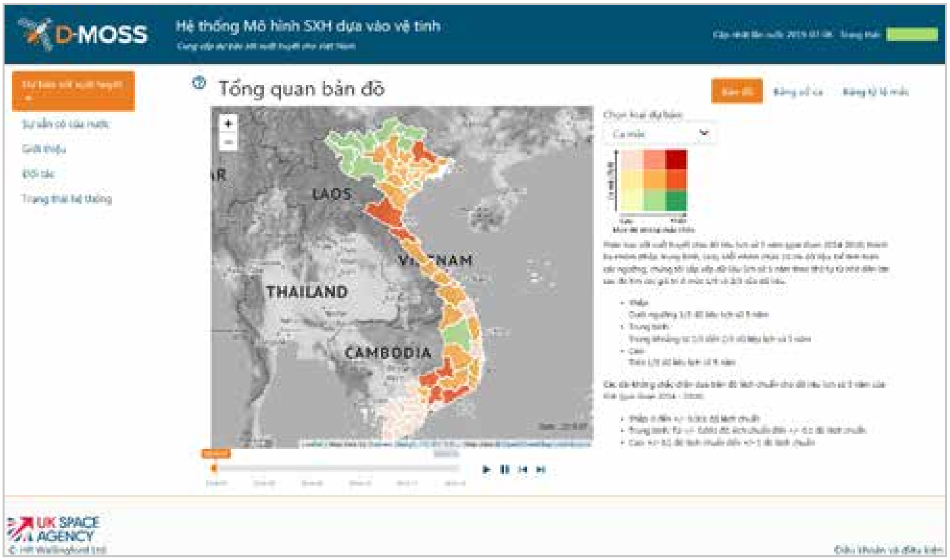
Integrating climate resilience. With climate change expected to increase the severity of extreme weather in the Caribbean, as part of a Caribbean Development Bank funded project we've been helping stakeholders in the region improve the reslience of their water supply systems.

Improving resilience to tsunami. Understanding of the forces exerted by tsunami waves on sea walls and coastal buildings has leapt forward through research conducted by UCL and HR Wallingford using our unique tsunami simulator. Ultimately, the research will lead to improved design guidance for buildings and sea defences in tsunami prone areas.

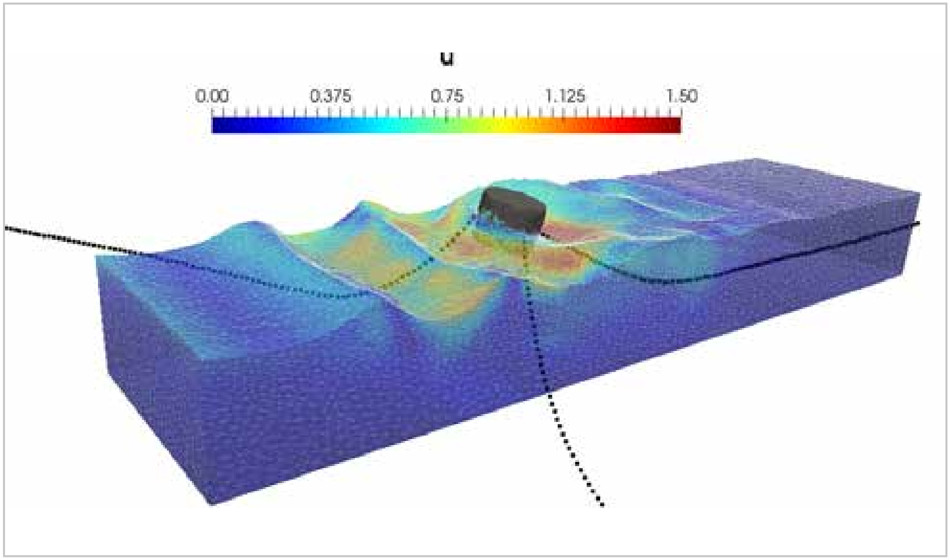
Preparing for extreme floods. In Malaysia we are working with the government to deliver a national flood forecasting and warning system. And in Bulgaria, with World Bank support, we are developing flood hazard and risk maps.

Water security in a changing climate. In Yemen, ground water levels have severely dropped over the past few decades. We are assessing the associated risks to communities to allow effective management strategies to be put in place.

Resilient infrastructure. DAMSAT uses remote sensing data to monitor tailings and water supply dams so action can be taken to avoid dam failures and to protect downstream communities.



Protecting people from mosquito-borne disease. Our multi-award winning D-MOSS system, supported by the UK Space Agency, forecasts dengue fever outbreaks upto six months in advance, giving authorities the time needed to take action and protect vulnerable communities from the impact of this disease.



Helping to develop clean energy solutions. Working with the Coastal and Hydraulics Laboratory (CHL) in the US, we developed a CFD toolkit to optimise the design of floating offshore renewable energy devices. Used at an early stage of the project it can reduce costs, and ultimately help to reduce the cost of the energy produced.

Award winninng advances. Our solutions are recognised across the industry; our work on evolution of methods for coastal defences was awarded the prestigious Halcrow Prize by the Institution of Civil Engineers.

The challenges that drive us

In the context of the United Nations' Sustainable Development Goals, population growth and climate change, we have identified three main groups of broad water-related global challenges that are driving our research.

Address the water-food-energy nexus in terms of both security and affordability

- Adequacy of natural surface, groundwater and desalinated water resources in the face of climate-related drought including for human, agriculture and industry consumption and use
- Provision of secure, clean, safe, efficient and sustainable energy generation, including reducing carbon emissions and ensuring access and reliability of low-carbon energy devices and systems
- Sustainable agriculture, fisheries and forestry

Ensure that water-related systems benefit the health and welfare of humanity and the planet

- Forecasting and managing the consequences of extreme weather and climate change on ecosystems
- Protecting people, property and infrastructure and transport systems from natural and man-made disasters (e.g. cyclones, tsunamis, flooding)
- Understanding and managing the impact of natural and engineered water systems on health and wellbeing
- Understanding and managing the increasing impacts of plastics on ecology and human health

Manage the harnessing and delivery of resources associated with oceans and freshwaters, while delivering environmental net gain

- Securing and protecting ocean resources, supporting shipping, energy supply, a sustainable growing blue economy, and increasing use of marine areas for renewable energy (from wind, waves, and currents), for fisheries and aquaculture, and resource mining
- Safe and environmentally sensitive water-borne transportation
- Effective industrial use and recycling of abstracted water

Addressing the challenges

The need to tackle these global challenges is central to the agendas of organisations including: the UN; international development agencies and banks; national and regional organisations and governments; UK Government departments and agencies; sector-specific organisations; public and private companies; non-governmental organisations; and stakeholders in the water, marine, energy and resource development sectors.

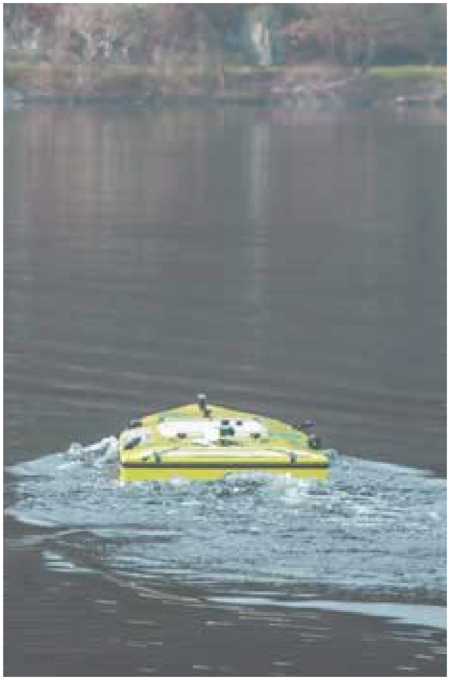
We address major scientific and engineering questions, helping to:

- understand complex natural, engineered and human systems, from global to local scales, by bringing together the best of the physical, biological and social sciences;
- make best use of modelling systems to simulate and predict the evolution and behaviour of systems;
- develop tools and guidance to help end-users how to understand and manage global challenges at a local and regional level. This includes assessing and managing their related uncertainties through adaptive pathways.

Moving industry forward

Industry has a huge part to play in addressing these issues, and commercial requirements help find efficient ways to deliver environmental services. We are committed to providing high quality research to address the needs of the energy, transport, construction and water management sectors and to find sustainable solutions for industry when interacting with the marine environment.

Our research focus



Bridging the gap between reactive models and the changing world

Data

Information and guidance

These global challenges drive our research focus. To understand and predict the evolution of the complex natural, engineered and human systems, we use a combination of data, physical and numerical modelling with design and management tools and techniques. We pride ourselves on making our work accessible and useable; we develop the tools and software needed to understand and enable better management of the water-related aspects of our work.

Numerical and scientific computing

Scaled physical modelling

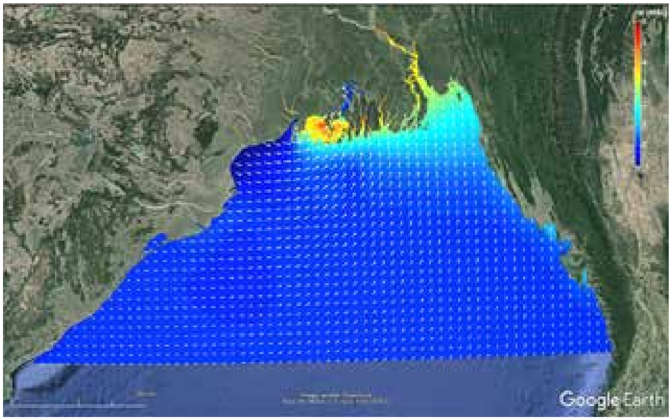
Software development

Bridging the gap between reactive models and the changing world

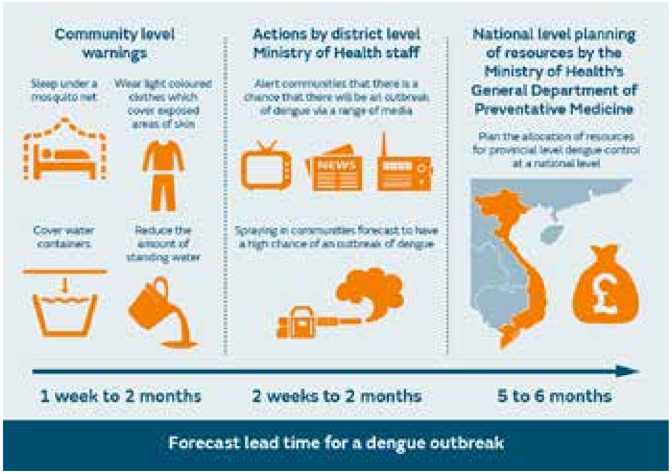
By using electronic components with sensory and augmented reality technologies, it is possible to link the physical environment and the virtual world of numerical modelling and computer-based reporting. With advancing (software and hardware) computing techniques we can work with bigger data sets and more complex simulations, as well as new methods to visualise and interpret the results. We are therefore examining new approaches to how information is made accessible, providing improved forecasts to promptly and effectively inform operational, monitoring and emergency procedures, and enable better forward planning and real time control. At the same time, we aim to enable and inspire greater interaction with larger data sets and richer information.

Building on recent advances in earth observation, geophysical investigation, real-time monitoring, machine learning, smart materials, augmented reality, wearable user interfaces, and data visualisation, our research will further explore, develop and exploit both the hardware and software components of information systems.

Similarly, we aim to acquire live sensory and image data from the physical world, assimilate them into responsive numerical models, and project computer-generated information onto real objects. This will allow us to acquire and assimilate live sensory and image data, and observations from the physical world and laboratory experiments (adjusted for scale effects) into adaptive and responsive numerical models and databases enabling better forward planning.



▲ The rapid response of our team helped DFID prepare for the impact of cyclone Amphan in the Bay of Bengal during 2020. Now, working with the FCDO, our goal is to deliver this service globally, protecting communities from tropical storms wherever they may occur.



▲ D-MOSS forecasts, driven by Earth Observation technology, allow local stakeholders to plan and execute dengue fever prevention and control activities.

Data

We recognise the fundamental value of marine and freshwater field data, which are now increasingly collected using revolutionary autonomous survey systems. In addition, physical measurements gathered under controlled conditions in our hydraulic laboratories reduce complexity and aid understanding. We promote relevant interplay between observations and models, and will continue developing models that have built-in data assimilation systems, including making use of new data sources.

To support data acquisition and analysis from models, instruments, remote sensing, databases and media, we will continue to:

- explore, develop, adopt and exploit emerging reliable, economical, real-time and autonomous survey systems for data acquisition. In particular, we will continue to contribute to the design, development, supply and use of advanced measuring instruments and unmanned vehicles.
- make greater use of big data – high resolution data is being rapidly and accurately collected over space and time via smart, embedded and remote sensing.
- support improved analysis of data via conventional physical process models and by artificial intelligence.

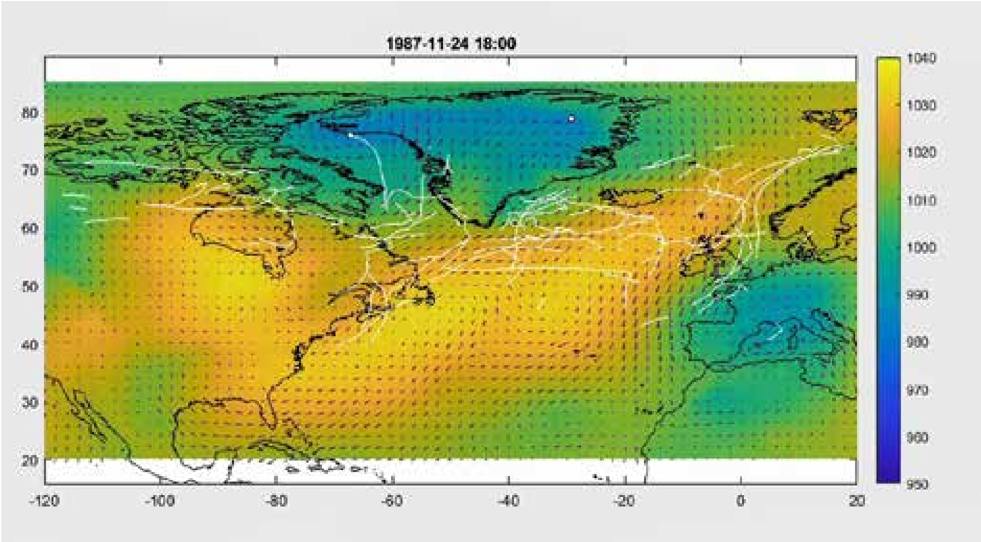
Central to this area of work are data security, scalability, traceability, trust and quality assurance in information generation, as are streamlining and facilitating data access, data mining, visualisation, manipulation, inter-comparison and re-use. Our research needs to take account of the huge size of data volume, rapidly changing data types such as social media, the plethora of structures, formats and encodings and veracity.

Image © Zac Nash

Image © Glen Peek Dwr Cymru Welsh Water

Information and guidance

We have a long and proud tradition of supporting the creation of accessible guidance documents for professionals, acting in the role of 'research translators' to enable end-users to make best use of the latest information. Advances in technology are giving us new opportunities to deliver smart and interactive documents, manuals and apps.



▲ Working in collaboration with the US Army Corps of Engineers, we are analysing historical meteorological data to identify the parameters of extra tropical storms.

Numerical modelling and scientific computing

A key to our success is our capability in state-of-the-art computational modelling and we continue to build on these cost-effective, yet reliable, techniques. Numerical modelling tools, often in combination with physical modelling, have allowed us to develop increasingly sophisticated and accurate simulations and predictions of key multiscale and multi-physics processes (e.g. in flow-wave-sediment-soil-structure interaction), focusing on interactions and transitions between processes.

We are expanding the types of models we use to make them higher definition (both advanced physics particle-driven and Eulerian), with the possibility of coupling to 'reduced order' methods and/or statistical emulators. To facilitate these advances we continue to develop our in-house high performance computing capability so that we can respond to the needs of society and industry.

Simulating behaviour and evolution of complex systems

Our modelling of complex systems continues to inform, advise and facilitate debate on: impact assessment in connected physical, biological and social systems; potential adaptations to environmental, social and economic change; and decision-making that recognises gross uncertainty and seeks no-regrets courses of action.

Modelling and predicting the evolution of complex system dynamics requires methods and tools capable of data assimilation, parameter estimation, uncertainty quantification and multi-physics, and multi-scale, system optimisation. We are using stochastic methods to create large ensembles of predictions for which hundreds of thousands of simulations are assembled to feed iterative optimisation procedures, restricting the predictive models to fast, but simplified, models.

Equally, adjoint modelling, which adapts every input parameter to best fit the predictive solution to every target value with only a small sample of simulations, provides us access to computer intensive predictive modelling suites.

Global and regional responsive modelling

Increased scalability of modelling systems translates into an unprecedented capacity for us to predict the evolution of complex multi-scale phenomena, providing a consistent level of accuracy over a cascade of spatial and temporal scales.

One of our primary aims is the development of modelling platforms capable of generating synthesised information and predictions concerning key system properties, linked and supported by assimilation of data from space-borne, aerial (e.g. LIDAR) and *in situ* observations. This facilitates detailed whole Earth and large region modelling strategies for the oceans, land surface water and groundwater. This leads to corresponding integrated response modelling for port operations, and the management of coastal change, flooding and drought. Our characterisation of extreme weather events has improved our forecasts and risk assessments of engineering strategies for projects.

We have successfully developed and applied sophisticated hydraulic system risk analysis models (e.g. for flooding) that operate at national, regional and local scales. These approaches are well-suited for long-term investment planning and appraisal. Of particular interest to us is modelling complex low probability-high consequence (LP-HC) natural or man-made hazards. Recent events have highlighted the need to extend the traditional view of extreme events to provide a richer, dynamic understanding of the temporal and spatial variability of hazards, vulnerabilities and risk.

In the longer term, we will need methods to incorporate the dynamic risk arising from compound hazards, and the combination of climate, societal and economic damages. The research will improve simulation of complex systems by extending traditional hydrodynamic and statistic modelling, rapid appraisal methods and use of agent-based modelling of human components of the risk system.

Through collaboration with other researchers and research organisations who specialise in natural hazards and risks, our understanding and modelling of compound hazards will also support the commitment of many countries to disaster risk reduction measures (DRR) following the UNDRR Sendai principle of ‘build back better’.

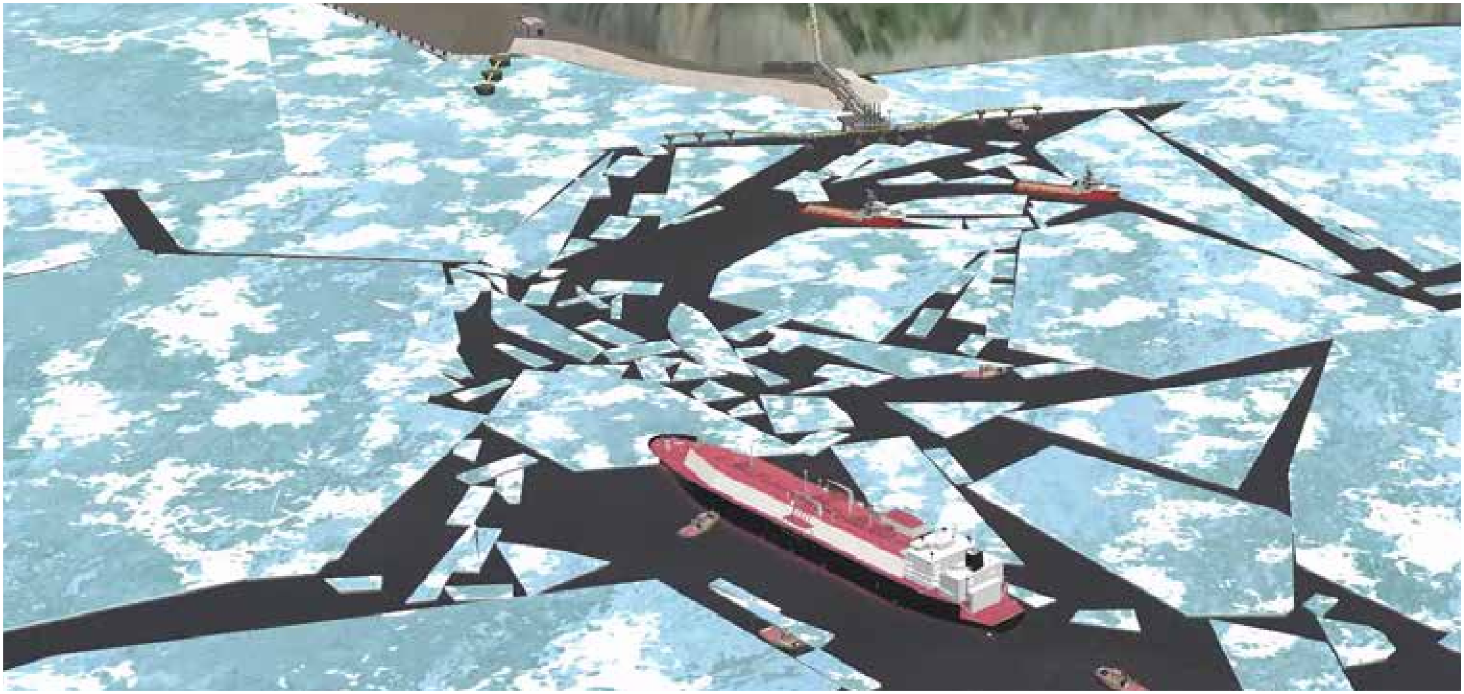
Agent-based models of emergent behaviour

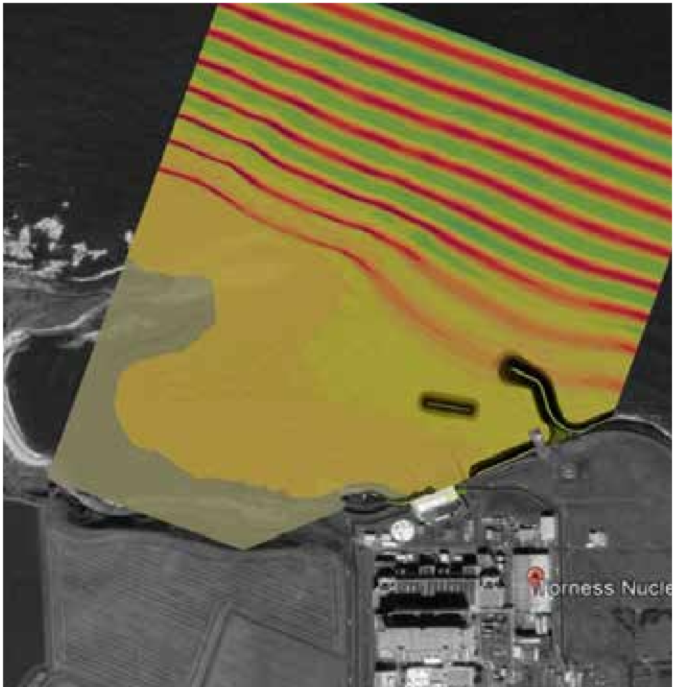
We are increasingly using agent-based models to explore social and ecological interactions, and behavioural change, with a view to making significant contributions to the development of new policies.

This approach enables the integration of the best available ecological and social science into our physics-based predictive evolution models. The approach can tackle a wide range of issues including the management of water resources, waterborne diseases, flood risks, evacuation and emergency response planning and the management of ecological impacts.

Our research will continue to improve the representation of agent-based processes, with particular emphasis on the effects on the dynamics of the system as a whole, and the behaviour of the agents (defined as individuals or groups of given characteristics and capable of behavioural responses) when stressed or stimulated by changes in external factors. Such ‘emergent behaviour’ modelling of individual/group behaviour (e.g. such as the response of aquatic species or humans to stimuli such as noise or warnings) provides a powerful tool for informing the adaptive management of complex dynamic systems.

As structures and infrastructure are built in new and challenging environments, with stringent environmental and financial requirements, we need to create advanced tools and methods to enable the development of optimal, performance-based design solutions. Our research must develop performance-based criteria for multivariate probabilistic engineering design, going beyond present design codes and standards.





Scaled physical modelling

We have the most modern and extensive suite of physical modelling facilities anywhere in the world.

Our state-of-the-art physical modelling facilities are housed in three purpose-built halls, covering 14,400 m^2, and include:

- wave basins, both separate and linked units capable of extension to 2,400 m^2;
- wave-current or current only basins with uni- or bidirectional current discharges;
- Fast Flow Facility for investigations into how waves, currents and sediments interact with structures;
- wave flumes equipped with wave absorbing paddles to compensate for wave reflections;
- volumetric flow flume with certified volumetric measurement capability;
- hydraulic structure and river floodplain modelling area;
- specialist facilities for tsunami simulation, flood protection product testing and aircraft ditching studies.

We use our labs for:

- consistent, reliable and impartial assessments of the performance of marine, coastal, hydraulic and flood protection structures;
- accurate, robust and rigorous modelling of complex multi-physics, multiphase phenomena operating at a range of spatial and temporal scales, the evaluation of which is beyond the capability of numerical models;
- validation data for new or improved numerical models and empirical relationship for the impact of structures on fluids, the response of structures and the interactions of water and sediment.

The Fast Flow Facility

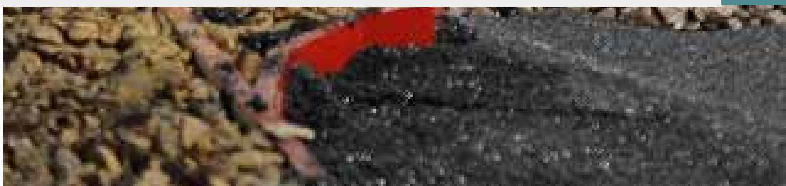
A significant part of our research in physical modelling relates to sediment transport, scour and the mitigation of scour around physical assets. We achieve this in our Fast Flow Facility, one of the largest marine test facilities in the world. The unique dual-channel, race track shaped flume offers waves, fast tidal currents and sediment capabilities.

Understanding the complex way waves, currents and sediments interact with structures is vital to the successful delivery of projects in the marine environment, and the Fast Flow Facility allows us to do this at a larger scale and in greater detail than ever before.

We can study sediment transport, scour and morphology for a wide range of subsea, coastal, estuarine and fluvial engineering projects, as well as the combined impact of waves and currents on structures in a completely controllable, measurable environment. It's also home to the world's most accurate tsunami generator which is used to estimate impact forces on structures and the volumes of water which will overtop flood defences.

Erosion testing

Our new sediment erosion testing platform (SedCore) complements the Fast Flow Facility, and affords us a unique opportunity to gather insights on: the erodibility of natural sediment cores and samples; the evolution of scour around fluvial and marine structures in space and time; the dynamics of mixed sediment transport in nonsteady or non-uniform flow conditions; and nearshore transport of sediment in the coastal environment.




HR Wallingford
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Performance of built assets

Our research contributes to optimising the safe, sustainable and efficient performance of built assets for industrial process and power plants, under frequent and extreme conditions. We assist by advancing the understanding of such features as:

- the interaction of currents and waves with structures, including marine intakes and outfalls, pumping stations, pipelines, foundations and renewable marine energy devices;
- multiphase flows in intakes, pumps, risers and pipes;
- hydrodynamics of complex hydraulic structures, such as dam spillways, tunnels, and drop-shafts.

Scaling methods

We are actively contributing to advance knowledge, share understanding and promote the development and uptake of improved scaling methods for physical modelling. The areas we cover include the dynamics of mixed sediments, multiphase flows in porous media, vortex dynamics, impact pressures and overtopping discharges. The combined and complementary use of small and large scale physical modelling facilities, computational models and field data provide us with a unique combination of reliable tools and effective methods to assess and account for the effect of scaling in modelling. This, in turn, translates into increased understanding and risk reduction for our partners.

As weather conditions become more extreme, water deepens, and currents intensify, physical model testing needs to remain accurate. We continue to build on our tradition of innovation, to develop new equipment (hardware and software) for use in laboratories across the world, and, where appropriate, construct new facilities on our campus. We will further advance in-house developed technologies and instrumentation to provide even more flexible, fast and accurate control and measuring systems.

We ensure that we always operate at the leading-edge of technological development by:

- upgrading our wavemakers to the very latest technology available.
- developing new, world-leading measurement capabilities.
- constructing new test facilities, reviewing the facilities in our portfolio, and responding to market trends.

Developing tools and guidance for end-users

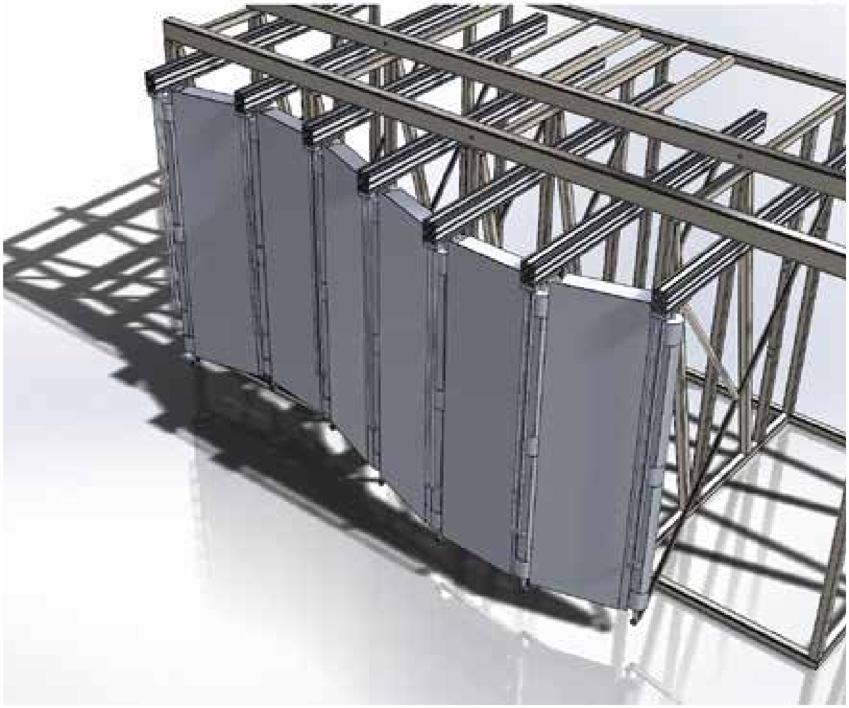
As scientists and engineers we understand that there is uncertainty in predicting long-term climate conditions, but public expectation can be very different. Non-specialists may expect climate to change slowly and gradually, and not be aware of the need to plan also for extreme events, as they are not common experiences. We therefore need to help non-specialists visualise and interpret possible future scenarios, especially as public engagement is now required in many decisions about publicly funded planning, infrastructure development and management.

Our integrated modelling is designed to help demonstrate alternative future scenarios and options (for example, for water and land management, for regulation and for climate and socio-economic scenarios) to the public and stakeholders.

We will continue to research the development of:

- Web-based social media tools to support participatory modelling and stakeholder engagement in decision-making.
- Adaptive decision pathways that take account of concepts such as robustness, resilience and reversibility in order to address uncertainties in climate and economic development and to avoid being locked into inflexible mitigation strategies.

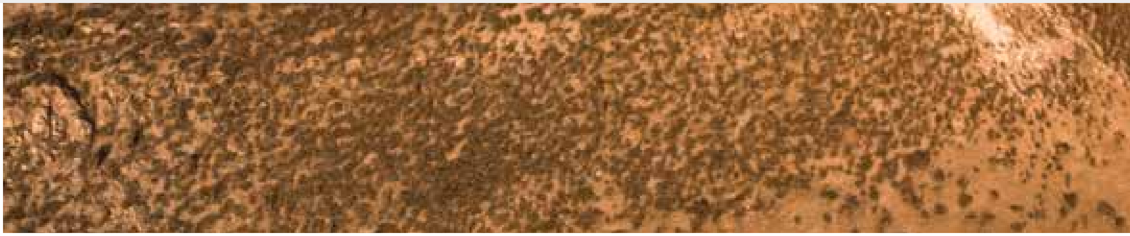
We aim to develop measures of uncertainty and variability that are scientifically sound, and credible and understandable for both professional and nonprofessional audiences. How we communicate concepts to our audiences is key, and our tone of voice and use of visualisation technologies will be all-important.



Software development

In our research, we often partner with user communities to co-produce software solutions to help meet specific water and environmental challenges, while keeping within standardised modelling frameworks, system architectures and system deployments. This includes:

- Developing open-source, freely available community models that can be accessed and co-developed by a range of stakeholders worldwide, for example we play an active role in the continuing development and management of the TELEMAC-MASCARET suite (www.opentelemac.org). It can model free surface water flow in one, two and three dimensions, and is used worldwide for solving coastal and fluvial wave, flow and sediment transport problems, as well as flooding challenges.
- Helping to develop Open Modelling Interface (OpenMI) which facilitates the linking of different models to solve complex environmental problems.
- Web based modelling of the breaching process in embankments constructed with zones of different materials – EMBREA Lite and EMBREA Pro.
- Driving down non-revenue water losses. Innovative web based water network leakage detection and location tool, to better understand the operation efficiencies of water supply networks - SimOn Water
- Creating operational efficiencies with real time gas distribution network modelling, state of the art, web based operational management tool - SimOn Gas
- Dengue fever early warning system for Vietnam and South East Asia, being developed by a consortium led by HR Wallingford and sponsored by the UK Space Agency's International Partnership Programme - D-MOSS
- Minimising the risk of water and tailings dams failures using satellite technologies, sponsored by the UK Space Agency's International Partnership Programme - DAMSAT
- Detailed analysis of water resource management and related hydrology – Kestrel software suite
- Providing access to our models through web portals; one example is a web-based tool to design and evaluate sustainable drainage systems (SuDS) (www.uksuds.com).
- Creating user-friendly apps and cloud-based software to meet challenges, ranging from carrying out ship mooring force calculations (www.shipmoor.com) to managing critical infrastructure such as dams and water supply networks.



▼ DAMSAT harnesses satellite technology to remotely monitor water and tailings dams. The system helps to reduce the risk of failure of these structures and the consequent risk to population and damage to ecosystems downstream upon which many vulnerable communities rely for both their source of water and livelihoods.

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