WEDC

Developing knowledge and capacity in water engineering and development worldwide

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NEWSLETTER

August 2023

Water Engineering and Development Centre

School of Architecture, Building and Civil Engineering

Loughborough University

Welcome from Tanja Radu

Welcome to the 2023 edition of the *WEDC Newsletter*. It gives me great pleasure to address you for the first time as the new WEDC lead. May 2023 marks 11 years since I first joined **ABCE** as a Research Associate. Since that time, we have experienced many successes and challenges, and I am here today in the hope of further contributing to the teaching and research excellence of the School, and of WEDC, as its integral part.

Whilst WEDC's structure has changed significantly since I first joined, I strongly believe that we are in a fantastic position to make ourselves more relevant than ever, with a wide range of expertise covering major hot topics in research today: WASH, Environmental Quality, Energy from Waste, Flood Risk Management, Disaster Management and Resilience and Hydrodynamics, to name a few.

The changes in our expertise come hand-in-hand with the staff changes which we have experienced recently. I would like to take this opportunity to thank our leaving Group Lead *Professor Lee Bosher*, who recently moved to the role of Professor of Risk Management, at the **University of Leicester's** School of Business. Lee led our group for the last two years with great passion and enthusiasm, navigating through the rough times of the COVID pandemic. He was known to be WEDC's greatest advocate and supporter of our colleagues. I wish him the best for the future. Another person who will be greatly missed is *Andrew Longley*, who decided to pursue his career with the engineering consultants **Mott McDonald**. His passion for teaching on WEDC programmes was truly unmatched.

Fortunately, we now also have an opportunity to welcome new additions to WEDC. *Dr Sarper Sarp* is joining us from **Swansea University** for the post of Senior Lecturer in Water Engineering. His experience in Chemical and Environmental Engineering will be a great addition to our experimental lab-based research and teaching in relevant subjects. *Susie Goodall* – following her UT post – has now joined us as a full RTE staff for the position of Lecturer in Water Engineering. *Welcome, Sarp and Susie!*

Our updated and revamped Distance Learning (DL) MSc Programmes remain as popular as ever. We are now in the process of recruiting new students for Water Engineering for Development and Water Management for Development programmes for the next academic year's intake. The 10 recently secured Commonwealth Scholarships for this cohort will boost our DL student numbers even further, and we continue to improve our delivery on the DL programmes. For example, all of our DL modules now have the live, interactive component of online lectures. In the academic 2023-24 year, we will also be contributing to an MSc in International Sustainable Development, to be taught at **Loughborough University's** campus in London.

Other good news include a new fellowship within the Group – *Professor Chris Keylock* secured a 6-month fellowship from the prestigious **Leverhulme Trust**, to conduct research on: *"From Kolmogorov to Catchment: Scales of non-locality in river systems"*, in Germany and the USA. *Congratulations, Chris!*

The latest good news for the group is the successful progression of two bids for Centres for Doctoral Training (CDTs), which now have passed the initial proposal stage, and have been invited by the **Engineering and Physical Sciences Research Council** to progress to the full proposal stage. It is exciting to see that Water Engineering has been recognised as a hot topic! Congratulations, and good luck to both *Rebecca Scott* and *Professor Qiuhua Liang*, for leading these bids on behalf of our Group.

Finally, I would like to thank all WEDC colleagues for working hard, as ever, and for taking on new roles and responsibilities within the Group and across the School. Further details can be found on the staff pages of the WEDC website.

Tanja Radu

(Group Lead)

Learning and Teaching

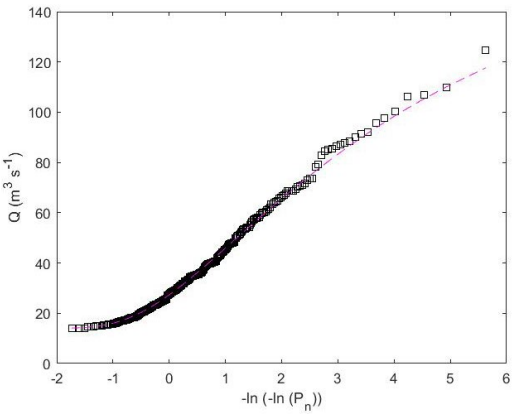
New WEDC Modules

Two new **WEDC** modules are contributing to the new *MSc in Civil Engineering* in the **ABCE**. The modules are *Quantitative and Numerical Methods for Engineering*, which takes place in the first semester of the programme and *Geographic Information Systems (GIS) and Data Management* in semester two.

Quantitative and Numerical Methods for Engineering was taught this year, by Professor Graham Sander and Professor Chris Keylock, and aims to provide students with an understanding of the numerical methods used to solve the equations used in the computational modelling software employed in water engineering, as well as to provide an introduction to key techniques in statistics and data analytics.

The module combines lectures on the relevant theory with complementary computer programming and data analysis exercises. An example solution from one of the data analysis classes is illustrated in the figure (right). This shows extreme river discharges for the River Soar at Pillings Lock (the main river gauging station closest to Loughborough) on the y-axis and transformed probabilities on the x-axis. A Generalised Pareto Distribution (dashed red line), commonly used to make predictions of extreme events, is seen to fit these data almost perfectly.

Geographic Information Systems (GIS) and Data Management is taught by Dr Huili Chen, and introduces the theory and practice of GIS and Remote Sensing techniques, and aims to equip students with the key concepts and skills required to perform GIS workflows from data collection, representation, manipulation, analysis and visualization. Apart from lecture sessions, parallel labs are run which concentrate on practical projects to give students first-hand experience of the GIS workflow.

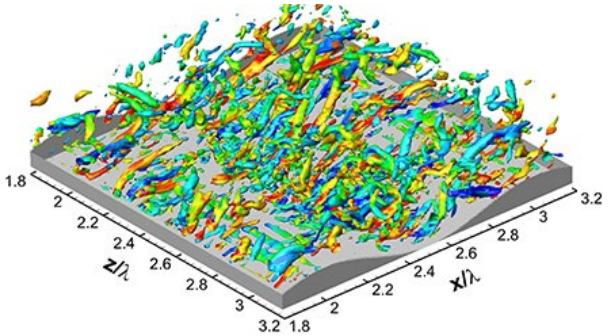


Understanding Flows Near Boundaries

In 2022, Professor Chris Keylock was invited by *Dongfang Liang* from the *Civil Engineering Group* at the **University of Cambridge** to write a feature article for *Journal of Hydrodynamics*, the leading Chinese fluid mechanics and hydraulics' journal.

The paper attempts to draw some links between recent theory developed by Chris and researchers in China and the USA, and then applies Chris' version of this to understanding how turbulent flows such as rivers or the flow in pipes or culverts behave near boundaries. Classical work on this shows that there are four types of event that can develop and two of these dominate: either slow events moving away from the boundary or fast events moving in towards the boundary. Chris' work showed that of all of these, it was the latter with the most unusual structure with respect to the flow in general. Such work helps us gain a better understanding of how to model the flow near boundaries.

The paper was published in November 2022 and is available online at: https://doi.org/10.1007/s42241-022-0068-6



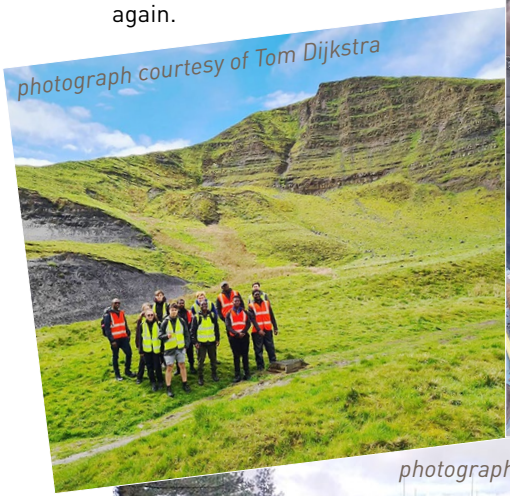
Learning and Teaching

Peak District Field Course

After a three-year break due to COVID, the *Part B Civil Engineering Geotechnics and Water Engineering field course* returned to the Peak district in May 2023. During the four-day trip to Hope Valley, students completed six exercises, each linked to practical civil engineering problems covering topics including geology, rock slope hazards, soil compaction and borehole drilling, stream flow gauging and dam hydraulics.

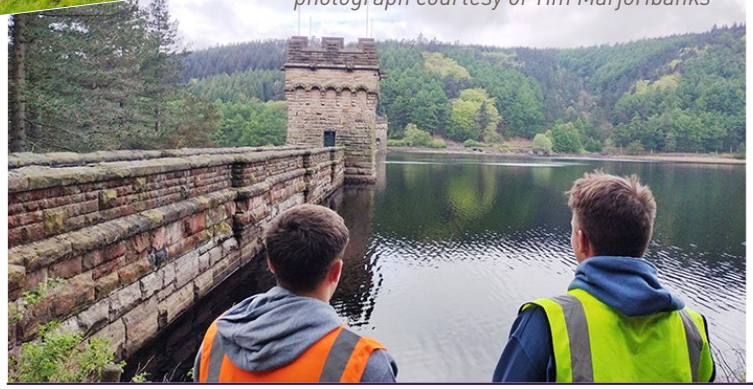
The reservoirs in the area are of particular interest as they supply the majority of our tap water in Loughborough, through the impressive *Derwent Valley Aqueduct*, which contains over 180 km of pipework, some of which dates back to the Edwardian era. Starting at *Derwent Dam* and finishing at *Hallgates reservoir* near *Bradgate Park*, the aqueduct passes under the Loughborough campus, through the middle of *Robert Bakewell Halls* and past the *University Library*. As part of the dam hydraulics exercise, students calculated the flow rate through the aqueduct in different configurations.

Across the week the weather was changeable but despite the rain showers, students engaged well and it was great to be able to resume running the field course again.



photograph courtesy of Tom Dijkstra

photograph courtesy of Paul Fleming



photograph courtesy of Tim Marjoribanks

Teaching Innovation Award

Professor Paul Fleming, Dr Tim Marjoribanks, Dr Tom Dijkstra, Dr Matthew Frost and Dr Scott Fernie received a Teaching Innovation Award to develop ABCE's innovative work on *'Student Assessment Mapping'*.

The award will enable our school to *"...embed a new student experience in ABCE for understanding their AY assessment journey and its effective planning and management from the student and staff perspectives"*, working with our students to build on the initiative we trialled this year and in collaboration with **AACME.**

This award will be showcased along with many other awards and presentations around best practice at this year's *LU Learning & Teaching Conference*, to be held on 11th July 2023.

Research & Innovation News

Seed Corn Funding

University of Belgrade
Faculty of Technology and Metallurgy

Following attendance at **Loughborough University's** *Global Challenges Food Systems and Food Security workshop*, Dr Tanja Radu applied for and secured seed corn funding from the **Research and Innovation Office**, as part of the *Health & Well-being and Secure & Resilient Societies Global Challenges* theme. The funding was awarded for the project titled *"Food systems: Unlocking renewable energy potential of lignocellulosic wastes from food production"*, with Tanja as the Principal Investigator and *Dr Hemaka Bandulasena* from the **School of Chemical Engineering** as the co-Investigator.

Food production often results in the generation of large quantities of waste, which is rich in lignocellulosic material (i.e., agricultural residues). Anaerobic digestion- AD- (Tanja's expertise) is a process that can convert this waste to energy (biomethane), but its full potential is difficult to achieve as lignocellulosic wastes are not easily biodegradable. Various types of pretreatment (Hemaka's expertise) may help unlock the full potential of the technology, resulting in greater biomethane yields. In addition, residues from the AD treatment are rich in nutrients and can be applied on land as fertiliser – this enables not only preserving of the nutrients but improvement of soil quality and potentially a positive impact on the further growth of food (crops).

Serbia is a country with a strong agricultural sector and food processing industry. It is rich in agricultural residues and biomass, but renewable energy from waste technologies is yet to be deployed on a large scale. Tanja has recently started collaborating with *Dr Aleksandra Djukić-Vuković* (Faculty of Technology and Metallurgy, **University of Belgrade**), an academic involved in biotechnology-related research working on the pretreatment of lignocellulosic wastes.

Photograph copyright of Tom Fisk, Pexels.com
https://www.pexels.com/photo/aerial-photo-of-milling-truck-on-field-harvesting-crops-1595107/

The awarded grant will fund a strategic networking trip to Serbia for Hemaka and Tanja with the following objectives:

- Visiting the Faculty of Technology and Metallurgy, University of Belgrade, to present seminars about their research at Loughborough University. Learning about the biomass pretreatment methods used by the Serbian colleagues, gaining hands-on experience by performing pretreatment of maize samples in their laboratories, and comparing their pretreatments and corresponding outcomes to that used at Loughborough University.
- Tanja and Hemaka organised a workshop at the *VIII International Conference: Sustainable Postharvest and Food Technologies INOPTEP 2023*, which was held in Serbia on 23-28th April 2023.

The Conference is co-organized and supported by **ISEKI - Food Association (European Association for Integrating Food Science and Engineering Knowledge into the Food Chain)**, and will be attended by prestigious Serbian national food institutions, including; **The Institute of Food Technology, Maize Research Institute "Zemun Polje", The Institute of Field and Vegetable Crops,** and **The Faculty of Technical Science**. The workshop will provide an opportunity to promote the activities and expertise at Loughborough University to Serbian and international colleagues, as well as identifying overlaps in research interests and establishing a network of food and biomass experts. It will also strengthen Tanja's and Hemaka's international profiles.

Furthermore, the widened network and partnership formed with the Serbian colleagues is intended to be used to form consortia for a joint application to the European funding sources, **Horizon Europe**, as well as for researcher exchange and potential recruitment.

Research & Innovation News

UK Waters are too Polluted to Swim in – but European Countries Offer Answers

Dr Tanja Radu was featured in **the Conversation**, addressing the topic of the very poor state of our bathing waters and what we can learn from the good practice examples from European Union countries to address it. Her story received a lot of a lot of media attention, reaching more than 35,200 reads, and thousands of tweets and FB shares. It has also been re-posted on websites of third parties such as the **World Economic Forum**.

Following the published article in the Conversation, the Editor of the **BBC's Science Focus magazine**, invited Tanja to talk about the UK's water pollution in a podcast episode. The podcast, which has already received more than 5000 listens, and is available at: https://podcasts.apple.com/gb/podcast/solving-the-uks-water-pollution-problem-with-dr-tanja-radu/id1296673906?i=1000615679690

Almost all of the UK's waterways are polluted. In 2022, a House of Commons Committee report on the state of UK rivers concluded that no river in England was free from chemical contamination. Only 14% of UK rivers had a "good" ecological status.

Both agricultural runoff and the release of untreated sewage are leading causes of river pollution in the UK. In 2022, untreated sewage was discharged into English waterways. The discharge of sewage has happened for several different reasons.

A lack of investment in dated infrastructure means the capacity of many sewage pipes is regularly exceeded. So, to avoid sewage backing up and flooding public spaces and people's homes, water companies often release sewage elsewhere through the combined sewer overflow network.

The situation has not been helped by disruption to wastewater treatment chemical supplies following Brexit and the COVID-19 pandemic. **The Environment Agency** responded to these shortages by introducing temporary waivers in 2021, allowing water companies to temporarily release not-fully-treated effluents into the environment.

Raw sewage can affect human health and is a threat to wildlife. Not only does it contain harmful bacteria and viruses, sewage discharge floods rivers with nutrients that aid the development of algal blooms. These blooms prevent light from reaching deeper layers of water, so do not allow some plants to photosynthesise. They can even reduce the oxygen content of water, which worsens habitat quality.

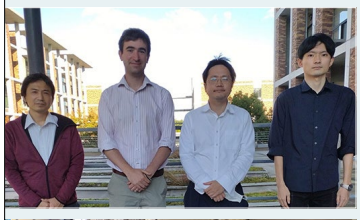
Within Europe, the UK's polluted waterways are largely an anomaly. Many other countries have reported significant improvements in bathing water quality in recent decades – indeed, bathing is now possible in some capital cities including Amsterdam, Berlin, Copenhagen and Vienna.

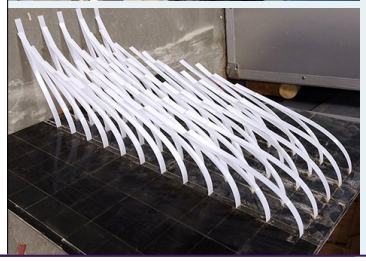
Between 1991 and 2019, the percentage of Europe's bathing waters with "excellent" water quality increased from 53% to 85%. In several countries, including Austria, Greece and Malta, more than 95% of bathing sites are now classified as excellent.

To read Dr Radu's full article, visit the Conversation at: https://theconversation.com/uk-waters-are-too-polluted-to-swim-in-but-european-countries-offer-answers-202013

Research Seminars in Japan

In late October 2022, Dr Tim Marjoribanks travelled to Japan to visit academics at **Meijo University** (Nagoya) and **Kyoto University**. The twice-delayed trip, originally scheduled for Autumn 2020, was part of a research project, funded by the **Great Britain Sasakawa Foundation** and also involving Professor Chris Keylock, to develop research collaborations on river channel hydraulics and vegetated flows. During the visit Tim met with *Professor Takaaki Okamoto* (Meijo) and *Professor Michio Sanjou* (Kyoto) and gave seminars to their research groups. There was also a chance to see their impressive hydraulic flume facilities, which are being used to run some collaborative experiments that will help us understand the impact of different vegetation properties (particularly plant flexure) on flow in rivers. A return trip for Professor Okamoto to visit **Loughborough University** is planned for August 2023.





Photographs courtesy: Tim Marjoribanks

Research & Innovation News

Turning Food Waste into Energy

Open-air agri-food markets across sub-Saharan African cities generate significant wet, heterogeneous agri-food waste daily, disposed of in unsustainable ways.

Current waste management practices – including unsanitary land filling and burning in the open – contribute to greenhouse gas emissions and environmental pollution, posing public health risks. For example, a recent study by **ABCE** on three major open-air markets in Kampala City, Uganda, revealed a staggering 14.1 kt. yr^{-1} of agri-food waste is disposed of in Kiteezi, the city's landfill.

This translates to land filling 34.8 TJ agri-food waste energy equivalent annually. The need to recover energy from this landfill-bound agri-food waste – and plug gaps in energy shortages – partly constitute the motivation for this research project funded by the **RAEng**.

Over the last 3+ years, Dr Sola Afolabi and the team have successfully developed the *Synergic Valorisation System (SVS)*, a prototype that achieves near-complete agri-food waste valorisation. This system combines two standalone waste conversion technologies, allowing for the processing of intermediates and by-products of one conversion technology for further energy recovery at source.

This approach, as indicated in another recent study, is critical to enhancing conversion efficiencies and value-added biofuel yield.

The current pilot program uses the Loughborough campus' Village Restaurant and Elvyn Dining food waste to produce multiple energy carriers. The initial results are promising and may bring us closer to our strategic vision of near-term adoption of this engineering solution in open-air markets across the global south.

LU-team (L-R): Tobi Kassim, Sola Afolabi and Beth Taylor during Malcolm Cook's tour of the prototype, piloted in the Frank Gibb Laboratories

Communication and Seminar on Rainfall Radars for Flood Prediction

Professor Qiuhua Liang, Dr Huili Chen and Ms Xue Tong, met with *Professor Dehua Zhu,* **Nanjing University of Information Science and Technology (NUIST),** China, on the 3rd of November 2022, to discuss an international exchange project from *International Exchanges Scheme – Cost Share Programme,* funded by the **Royal Society and National Natural Science Foundation of China (NSFC)**.

The project aims to develop new pluvial flood nowcasting technologies using phased array radars, high-performance hydrodynamic and deep learning models. Professor Zhu is a Professor in the School of Hydrology and Water Resources at NUIST, renowned for its meteorology research. He has strong research expertise in coupling weather radar and remote sensing data in the real-time flood forecasting, such as quantitative precipitation estimation, short-term rainfall nowcasting, distributed hydrological modelling, flood control and flood risk management. Professor Zhu has been active in building academic and research collaborations between hydrological and meteorological communities for a number of years, and gave a presentation at **ABCE**: *'Advances in Weather Radar Technology and the Role of Combined Weather Radar Systems in Predicting Small Scale Flooding Events'.*

He introduced a new solution of the cutting-edge and high-resolution radars for early warnings of urban flooding and offered valuable insights in the quality and effectiveness of this novel method for urban communities.

Research & Innovation News

Interdisciplinary Communication with Experts from Durham University

On Tuesday 25th and Wednesday 26th October 2022, *Dr Yang Long* (Assistant Professor) and *Haoran Duan* (PhD student), from the Department of Computer Science, **Durham University**, gave a seminar and attended a workshop, organized by Professor Qiuhua Liang and Dr Huili Chen, alongside other colleagues from **ABCE**.

Dr Long is also an MRC Innovation Fellow (**Medical Research Council**), aiming to design scalable AI solutions for large-scale healthcare applications. His research background is in the highly interdisciplinary field of Computer Vision and Machine Learning. He is passionate about unveiling the black-box of an AI brain, and transferring knowledge to seek scalable, interactable, interpretable, and sustainable solutions for other disciplinary research.

The seminar, *'Recent Advances and Challenges in AI: Perception, Deployment and Science'*, introduced the state of their recent AI models, deployment paradigms, and scientific findings, and lead to lively discussion between the attendees from ABCE, the **School of Computer Science** and the **School of Geography and Environment**.

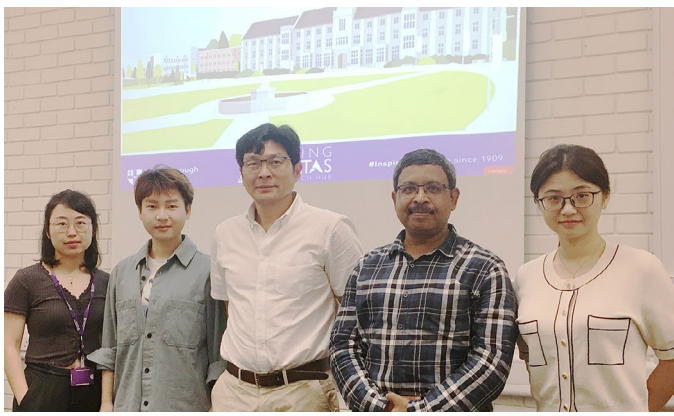
Following the seminar, an informal meeting with colleagues from **WEDC**, was held to discuss academic projects, creative ideas and potential collaboration.

Photograph courtesy: Haoran Duan

Photograph courtesy: Kelly Long

Visit from The Asian Institute of Technology (AIT)

Dr Indrajit Pal, from **The Asian Institute of Technology (AIT)**, Thailand, visited **Loughborough University** on 23rd June 2023. Dr Pal is an Associate Professor and The Chair in the *Disaster Preparedness, Mitigation and Management (DPMM)*, AIT, Thailand. He is Deputy Director of the Research Center, *"South- and South East Asia Multi-disciplinary Applied Research Network on Transforming Societies of Global South (SMARTS)"*, in AIT. Dr Pal met with Professor Qiuhua Liang and Qiuhua's team members to discuss the progress on the *GCRF Living Deltas Hub project*. Dr Pal gave a seminar to **ABCE** and the wider University, which was titled *'Interdisciplinary Research on Multi-Hazard Risk Assessment and Resilience Building in Global Sout'*. The seminar explained the current research on resilience development at various levels considering the multidisciplinary approach, and attracted more than 30 participants. Followed by the seminar, there were fruitful discussions on future collaborations.



Pictured attached l-r: Dr Xiaoli Su, Mr Haoyang Qin, Professor Qiuhua Liang, Dr Indrajit Pal and Dr Jinghua Jiang

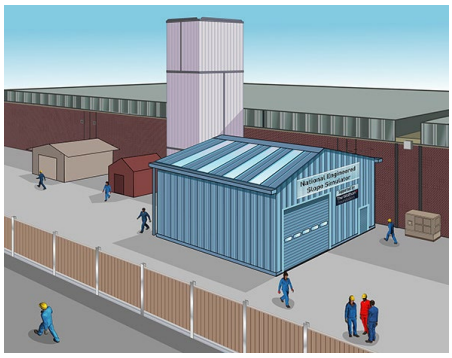
Research & Innovation News

The National Engineered Slope Simulator Facility

The *National Engineered Slope Simulator* facility in the laboratory compound has been installed, following delivery via a 90-tonne crane.

The outer building is now fully clad and the blue 15-tonne steel box inside will be filled with around 45 tonnes of compacted clay, then tilted to a typical infrastructure slope angle (e.g., ~20 degrees). The clay slope will be subjected to accelerated wetting and drying cycles to simulate seasonal weather conditions, deteriorating the clay's mechanical and hydraulic properties. A suite of instrumentation will enable monitoring of stresses, strains, deformation, pore pressures, suctions, moisture content and more. After several months of deterioration by wetting and drying, the slope will then be rotated to 45 degrees to cause failure, with the purpose to advance understanding of slope deterioration processes and climate change impacts, develop remediation strategies and new detection technologies, and inform design of new infrastructure.

Below: Original concept design of the National Engineered Slope Simulator (Illustration: Rod Shaw)



The images show how the project has progressed, from the original concept design, delivery, and the building as it is to date.

Both photographs courtesy: Lewis Darwin

From Kolmogorov to Catchment: Scales of Non-locality in River Systems

Professor Chris Keylock will be working in Germany and the USA, between November 2023 – May 2024, as part of an externally funded Research Fellowship considering the flow of water at multiple scales. First, he will be spending two months in the Physics department at the **University of Bayreuth** in Germany, working with *Professor Michael Wilczek*, on the fundamentals of the interaction of particulates and turbulent flows. The research then moves up to the scale of the river channel at the **University of Texas at Austin**, where Chris will be working with *Professor Blair Johnson*, and using her experimental facilities to look at the more engineering-scale aspects of water flow and sediment transport. For the final stage of the project, Chris stays in the Civil Engineering department in Austin, but moves to *Professor Paola Passalacqua's* group, which works on the large-scale dynamics of fluvial landscapes. The intention is to not only undertake work at these three scales, but attempt to develop a generalised statistical mechanical framework to aid the coupling across scales. In addition to this work, Chris has been invited to visit labs and give lectures at a number of leading universities on both coasts of the USA during his stay, which will hopefully provide a forum for discussing new research ideas and promoting **WEDC** research in the United States.

Research & Innovation News

Water-WISER

The **WaterWiser CDT** cohort have been travelling recently for training, learning and cohort-building activities.

In April 2023, the annual *Challenge Event* brought together over 40 Water-WISER students and staff from **Loughborough, Leeds** and **Cranfield Universities** in the Lake District. Over the course of three days, they carried out team-building exercises, visited nature-based interventions managed by the **Rivers Trust** to support flood risk management, learned about facilitation skills in a facilitated workshop and enjoyed walks and water-based activities in the beautiful setting of Patterdale and Ullswater. A key benefit of the event was the DRs getting to know each other better, sharing stories and supporting each other in their research journeys.

In May 2023, the cohort travelled to **The Hague**, to attend the IRC "All Systems Connect" Symposium. This three-day event brought together over 700 international delegates to discuss, listen, learn and connect around the themes of climate, social justice, health and finance as essential "connections" for meeting systemic challenges in providing safely managed, sustainable and resilient water, sanitation and hygiene services for all by 2030. The array of diverse parallel sessions included ministerial-level country dialogues, debates on whether or not to integrate the planning and implementation of water, sanitation and waste management services, interactive "marketplace stalls" enabling discussions on cross-learning from climate-resilient solutions to water management, as well as more traditional poster and presentation sessions based on research findings. Young and early career voices were given a central platform alongside those of ministers of finance, health, water and sanitation, international donors, national and international implementing agencies, civil society and advocacy groups, all levels of government, UN agencies and academic institutions. Our DRs were involved in planning and facilitating a range of sessions, while actively networking with key contacts in support of their own research impact. The final day was dedicated to the Water-WISER cohort in their own learning and feedback day, planned and delivered by them. Invited speakers presented their research work on decolonization and researcher positionality, and provided time for everyone to consider how these may influence their own research process. A lively session considered the learning gained and remaining questions from the Symposium, with suggestions gathered for a future Water-WISER conference.

WaterWiser CDT Students said:

"It was good to finally meet people in our sector from around the world in person having interacted online"

"The increasing global effort towards supporting informal workers, including waste pickers, is commendable and it has the potential to positively transform livelihoods"

A selection of photographs from the trips, courtesy of Susie Goodall

Updates

- Rebecca Scott has taken-over the role of Academic Manager since Andrew Longley's departure in December 2022. Rebecca will work with *Qiuhua Liang*, *Susie Goodall* and *Robin Rainier*, as part of the management team to support the future delivery of the *CDT*.
- Water-WISER, led by the **University of Leeds**, with **Cranfield University** and **Loughborough University**, will submit a re-bid to the *EPSRC-CDT call*, under the theme of engineering net zero.

Water-WISER Conference

ABCEs *Water-WISER CDT Early Career Research Conference* was a huge success, mixing research, keynotes and plenty of opportunities for interaction, adding in a sunset game of frisby to the mix!

It was an international conference, with delegates from as far afield as the Philippines coming together to address a number of the **UN's** *Sustainable Development Goals*. Our local organising committee of ECRs did an amazing job of organising and hosting this inaugural event. Thanks to Bartholomew Hill, Ayan Hujaleh, Rebecca Lewis, Alpha Koroma, Hannah Brown and Richard Dewhurst including support from: *Robin Rainier* and Jayshree Lakha.

As ever, our **WEDC** colleagues offered much support and access to some excellent world-class keynote speakers. Robin summed it up perfectly describing the conference as one of *'energy and enthusiasm'*.

Photo: Day 3 of the Water-WISER conference: Dr Andrew Longley explains the geology and hydrology around 'Old John' in Bradgate Park

Research & Innovation News

C-DICE

C-DICE Net-Zero Futures conference 2022

The second **C-DICE** annual *Net-Zero Futures Conference* took place on Tuesday 20th September 2022, with over 100 delegates including late-stage PhD students, postdoctoral researchers and colleagues from our partner universities, as well as representatives from **EPSRC**, **Research England** and industry.

Key themes of the conference included the importance of partnership and collaboration to accelerate progress to decarbonisation. Participants had the opportunity to listen to speakers at various career stages, and to join workshops and tours of facilities based at Loughborough, including the **Centre for Renewable Energy Systems Technology (CREST)**, and the **National Facility for Infrastructure (N-FIC)**. Dr Sola Afolabi and Dr Ana Blanco made valuable contributions by sharing their insights on securing funding. Highlights of the positive impacts on beneficiaries from the C-DICE programme were also celebrated.

You can read some the stories of the C-DICE participants of what it's like to benefit from being part of a C-DICE activity or winning C-DICE funding, online at:
https://www.cdice.ac.uk/programme/case-studies/

Photos from the conference are available to view on the conference webpages at:
https://www.cdice.ac.uk/conference/photo-gallery/

Delegates watching recorded welcome message by Professor Daniel Parsons, PVC for Research and Innovation.

Photograph courtesy: hollisphotography.uk

National Postdoc Conference 2023 comes to Loughborough!

Loughborough University and C-DICE will host the *National Postdoc Conference 2023* on Loughborough campus on Tuesday 19 September 2023, during *Postdoc Appreciation Week*. The *Transitions and New Horizons Conference* will be a platform to celebrate the impact and contribution of postdocs in changing the world for the better. It will be a chance to bring the postdoctoral community together to build networks, share experiences, develop their careers and equip postdocs to thrive in their current role and beyond.

The conference has three main themes: the first theme will celebrate the impact and contribution that postdocs have had in creating a better future for us all. The second theme will look at best practice, policy and action around recruiting, sustaining, supporting and retaining postdoctoral talent in the higher education, industry and third sectors. The third theme will explore career opportunities open to postdocs across a broad spectrum of employment, including sharing opportunities to develop postdoctoral impact, professional skills, collaborations, and embedding this in postdoctoral employment.

There will be opportunities to both nominate colleagues for and win awards which recognise postdoc achievement. The call opened in early 2023. More details about awards, speakers and the programme will be available on the C-DICE website.

Research & Innovation News

C-DICE

National Postdoc Conference 2023

Loughborough University and **C-DICE** are hosting the *National Postdoc Conference 2023* on 19 September 2023, in the James France Building, as part of *National Postdoc Appreciation Week*.

The one-day conference is a platform to celebrate the impact and contribution of postdocs in changing the world for the better, and is the only conference in the UK dedicated solely to the celebration of postdoctoral researchers from any university, in any discipline area.

The conference will bring together the UK postdoctoral community through an itinerary of face-to-face plenary sessions, workshops, and exhibitions.

PhD Published Article

In April 2023, PhD researcher Bartholomew Hill published an article titled *"A systematic review of natural flood management modelling: Approaches, limitations, and potential solutions",* in the *Journal of Flood Risk Management*. The review itself aims to summarise the current approaches to modelling natural flood management features, as well as discuss their key limitations related to data, modelling methods, and real-world applications. The paper goes further to highlight potential solutions to some of these challenges and provides guidance to assist modellers to improve future modelling and data collection processes. Bart is continuing his work on nature-based solutions (NbS), and is currently working on a paper looking at improving data collection methods for remote NbS sites.

Hill B, **Liang Q**, **Bosher L**, **Chen H**, Nicholson A (2023) **'A systematic review of natural flood management modelling: approaches, limitations, and potential solutions'**, Journal of Flood Risk Management, SJR 0.754.
DOI: 10.1111/jfr3.12899

Chengdu University Collaboration

Professor Xuanmei Fan and her team from **Chengdu University of Technology**, China visited **Loughborough University** on 15th May 2023. Professor Fan is an international influential academic in the field of geohazard risk control and mitigation. She is the Director of the *Department of International Exchanges and Cooperation*, and the Deputy Director of the *State Key Laboratory of Geohazard Prevention and Geoenvironment Protection (SKLGP)*, at **Chengdu University of Technology**, China. Professor Fan gave a seminar to **ABCE** and the wider University, which was titled, *'Mechanisms and prediction of earthquake and climate change-induced chains of geological hazards'*. The seminar focused on the mechanism and prediction of cascading hazards induced by earthquakes and climate change in the Tibet Plateau and its margins. The seminar attracted around 30 participants, and it was followed by discussions on potential collaborations between the two Universities.

Pictured below, l-r: Professor Chris Keylock, Professor Xuanmei Fan, Professor Qiuhua Liang, Dr Jie Liu, and Dr Huili Chen

Research & Innovation News

PhD Completions

Name	Supervisor(s)	Project Title
Tim Brewer	Ms Rebecca Scott / Dr Will Johnson / Professor Noel Cameron	Environmental Sanitation Provision Among Women With Children In Kumasi, Ghana
Jiajun Li	Dr Tim Marjoribanks / Professor Graham Sander	Evaluating data quantity and distributional uncertainties in the stage-discharge relationship
Qian Li	Professor Qiuhua Liang / Dr Xilin Xia	Development towards the next generation urban flood modelling system
Onyinyechi Okoligwe	Dr Jonathan Wagner (Chemical Engineering) / Dr Tanja Radu / Dr Mark Leaper	Sustainable fuels and chemicals from integrated conversion of biowastes
Mel Wami	Dr Tanja Radu / Ms Rebecca Scott	Assessment of risk factors for faecal-oral disease transmission in schools in southern Nigeria

April 2023 PhD Starters

Name	Supervisor(s)	Project Title
Farshid Ershadi	Professor Qiuhua Liang / Dr Huili Chen	Implementing the initiation, falling, sliding and toppling mass movement of landslides to DEM-DAM flow-like landslides simulation

October 2022 PhD Starters

Name	Supervisor(s)	Project Title
Kohyar Jahanbakhshi	Water-WISER CDT	TBC
Sadia Kadri	Water-WISER CDT	TBC
Pranesh Karthikeyan	Dr Tanja Radu / Dr Hemaka Bandulasena	Renewable energy from waste: Plasma-assisted pre-treatment of municipal solid waste for enhanced biogas generation
Marziye Lashkariani	Professor Graham Sander / Dr Huili Chen / Professor Chris Keylock	Develop and test new strategies for solving the system of equations developed in Loughborough, using adaptive, mesh-free methods
Hannah Leigh	Water-WISER CDT	TBC

January 2023 PhD Starters

Name	Supervisor(s)	Project Title
Rufus Dickinson	Dr Alessandro Palmeri / Dr Tim Marjoribanks	Modelling fluid-structure dynamic interaction
Liaqat Ali Shah	Professor Qiuhua Liang / Dr Tanja Radu	The impacts of climate change on the water-energy-food security nexus

Research & Innovation News

New Visiting Students

Name	Supervisor(s)	Project Title	Home University	Start Date	Finish Date
Aofei Ji	Professor Qiuhua Liang	Develop and compare different modelling approaches for simulating overtopping-induced dam failure and the following flood hazards	Zhejiang University, China	15 April 2023	14 October 2023

New Visiting Academic

Name	Supervisor(s)	Project Title	Home University	Start Date	Finish Date
Dr Alaaeldine Saleh	Dr Sola Afolabi	Assessment and modelling of surrogate radionuclide metal contaminants sorption on clay	Egyptian Atomic Energy Authority, Egypt	Oct 2022	Mar 2023

New Visiting Academics also joining ABCE for Periods of Research

Name	Research Interests	ABCE Liaison
Dr Xiaodong Ming	Visiting Fellow, Dr Ming, currently works as a senior flood modeller, developing and applying high-performance computing and data models to support flood risk assessment and providing advice to the insurance sector. He will support relevant teaching in the School and co-supervise Masters and PhD projects, as well as developing collaborative links with relevant industry and business partners to support research proposals	Professor Qiuhua Liang

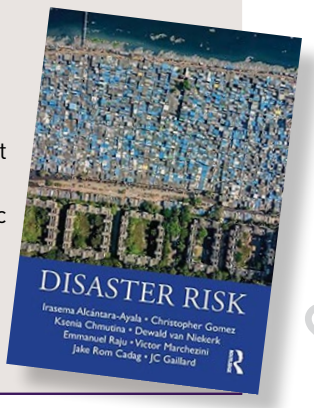
New Journal

Ksenia Chmutina is one of nine members of the Editorial Collective of a new *Journal of Disaster Studies,* that was launched in November 2022 by the **University of Pennsylvania Press**. The Journal of Disaster Studies is an open access, peer-reviewed, interdisciplinary journal that publishes the work of disaster researchers around the world and foregrounds historically and theoretically framed analyses of both slow and abrupt disaster, questioning how disasters have been designated, conceptualized, and politicized.

Journal of Disaster Studies JDS

New Textbook

A new textbook *'Disaster Risk'*, co-authored by Ksenia Chmutina together with seven authors from seven different countries, has been published last month by **Routledge**. The textbook offers a comprehensive and unique perspective on disaster risk and reflects the most recent debates but also older and pioneering discussions in the academic field of disaster studies as well as in the policy and practical areas of disaster risk reduction.



Research & Innovation News

Selected Journal Papers, August 2022 – May 2023

Paddy E, **Afolabi O, Sohail M** (2022) **'Toilet plume bioaerosols in healthcare and hospitality settings: A systematic review',** American Journal of Infection Control, Vol. 223, SJR 1.062. DOI: 10.1016/j.ajic.2022.07.006

Renaud FG, Zhou X, **Bosher L,** Barrett B, Huang S (2022) **'Synergies and trade-offs between sustainable development goals and targets: innovative approaches and new perspectives',** Sustainability Science, Vol. 42, SJR 1.221. DOI: 10.1007/s11625-022-01209-9

Cheraghi M, Rinaldo A, **Sander G,** Perona P, Cimatoribus A, Jomaa S, Barry DA (2022) **'Applicability of the landscape evolution model in the absence of rills',** Frontiers in Earth Science, Vol. 41, SJR 1.248. DOI: 10.3389/feart.2022.872711

Liu M, Li T, Wang Z, **Radu T,** Jiang H, Wang L (2022) **'Effect of aeration on water quality and sediment humus in rural black-odorous water',** Journal of Environmental Management, Vol. 10, SJR 1.161. DOI: 10.1016/j.jenvman.2022.115867

DiFilippo RM, David CP, **Bosher L** (2022) **'Groundwater vulnerability indicator assessment of Karst Island Water Resources: Enhancement of the Freshwater Lens Assessment Protocol',** Water, Vol. 14, SJR 0.634. DOI: 10.3390/w14244071

Schoell AT, **Scott R** (2022) **'Stakeholder acceptance of shared toilets to improve sanitation access in low-income urban settings: a case study of Gulu city, Uganda',** Journal of Water, Sanitation and Hygiene for Development, SJR 0.388. DOI: 10.2166/washdev.2022.172

Su, X., **Liang, Q.,** Xia, X. (2022). **'A new GPU-accelerated coupled discrete element and depth-averaged model for simulation of flow-like landslides',** Environmental Modelling and Software', 153, 105412. DOI: 10.1016/j.envsoft.2022.105412

Tumwebaze, I. K., Hrdlicková, Z., Labor, A., Turay, A., Macarthy, Joseph M., **Chmutina, K., Scott, R., Kayaga, S.,** Howard, G. (2022). **'Water and sanitation service levels in urban informal settlements: a case study of Portee-Rokupa in Freetown, Sierra Leone',** Journal of Water Sanitation and Hygiene for Development 12, 8, 612 - 621, 10.2166/washdev.2022.115. DOI: org/10.1177/0956247820922843

Roy, U.K., Wagner, J., **Radu, T.** (2023). **'Production of Metabolites in Microalgae Under Alkali Halophilic Growth Medium Using a Dissolved Inorganic Carbon',** Waste Biomass Valor. DOI: 10.1007/s12649-023-02053-3

Chukwuma EC, Okonkwo CC, **Afolabi O**, Pham QB, Anizoba DC, Okpala CD (2023) **'Groundwater vulnerability to pollution assessment: an application of geospatial techniques and integrated IRN-DEMATEL-ANP decision model'**, Environmental Science and Pollution Research, Vol. 30, SJR 0.858. DOI: 10.1007/s11356-023-25447-1

Mathias S, **Sander G**, Leung J, Newall S (2023) **'Revisiting Salvucci's semi-analytical solution for bare soil evaporation with new consideration of vapour diffusion and film flow',** Transport in Porous Media, Vol. 147, SJR 0.728. DOI: 10.1007/s11242-023-01917-5

Chmutina K, Lizarralde G, von Meding J, **Bosher L** (2023) **'Standardised indicators for "resilient cities": the folly of devising a technical solution to a political problem'**, International Journal of Disaster Resilience in the Built Environment, SJR 0.387. DOI: 10.1108/IJDRBE-10-2022-0099

Hill B, **Liang Q**, **Bosher L**, **Chen H**, Nicholson A (2023) **'A systematic review of natural flood management modelling: approaches, limitations, and potential solutions'**, Journal of Flood Risk Management, SJR 0.754. DOI: 10.1111/jfr3.12899

von Meding J, **Chmutina K** (2023) **'From labelling weakness to liberatory praxis: a new theory of vulnerability for disaster studies'**, Disaster Prevention and Management, SJR 0.47. DOI: 10.1108/DPM-10-2022-0208

Tumwebaze I, Sseviiri H, Bateganya FH, Twesige J, **Scott R**, **Kayaga S**, Kulabako R, Howard G (2023) **'Access to and factors influencing drinking water and sanitation service levels in informal settlements: Evidence from Kampala, Uganda'**, Habitat International, Vol. 136, SJR 1.336. DOI: 10.1016/j.habitatint.2023.102829

Research & Innovation News

New Grants since last newsletter

ODA Additional Funds

Lead PI:	Huili Chen
Funder:	UK Research and Innovation
ABCE funding:	£10,000
Total project Value:	£10,000
Period of Award:	01/04/2022 - 31/03/2023

Overview: The project is to fully complete some of the original objectives proposed in the UKRI-funded project FLASH interrupted by covid-19 restrictions. One of the main objectives of FLASH was to 'enhance researcher-stakeholder partnership to co-deliver research, maximise uptake and inform inclusive, transparent decision-making' through a face-to-face project dissemination workshop jointly attended by the Loughborough University (LU), Royal University of Bhutan (RUB) and the National Centre for Hydrology and Meteorology (NCHM) research teams and local stakeholders. Covid-19 restrictions necessitated running events online. This proposal therefore aims to accomplish this by enabling a face-to-face dissemination workshop to showcase the final outputs, enable more effective training in hazard modelling and maximise uptake/legacy. At the same time, the LU team will undertake field work, under the guidance of the Bhutan researchers, to better understand local rainfall-induced hazards and their impacts.
The LU team will use this opportunity to support local capacity development and provide training and support to the local partners to develop and use emerging technologies, and to also explore future funding opportunities from UKRI and other funders (e.g. EU/WB/ADB).

Algae-based Biogas Purification for Carbon-negative Biomethane Fuel Production

Lead PI:	Jonathan Wagner, Chemical Engineering
Collaborator:	Tanja Radu
Other collaborators:	University of Manchester, Heriot-Watt University
Funder:	IDRIC UKRI
ABCE funding:	£30,434
Total project funding:	£483,605
Period of Award:	01/02/2023 - 31/01/2024

Overview: The project will develop flexible technology for capturing and utilising CO_2 emissions from industrial waste gases or mixed process gases (e.g., biogas, syngas) to produce algae biomass which can be sold directly or processed into new valuable speciality products. Unlike conventional CO_2 absorption processes, the technology eliminates the need for thermal regeneration of the CO_2 absorbent solution and subsequent CO_2 compression, reducing capital and operating costs. Captured carbon solution can be either used on-site or processed in larger external algae facilities. Algae cultivation Using solubilised carbon significantly simplifies bioreactor design and offers new opportunities, such as offshore cultivation using floating bioreactors, and facilitates scale-up of UK algae production. This project will demonstrate the continuous operation, stability and techno-economic potential of the system for capturing industrial carbon emissions. Working with stakeholders across the supply chain, we will co-create a business case and demonstration case study to evaluate at-scale implementation within the UK's industrial clusters.

NbS – Contract Research

Lead PI:	Tim Marjoribanks
Collaborators:	Andrew Longley, Ksenia Chmutina, Lee Bosher, Qiuhua Liang, Robby Soetanto
Funder:	EPSRC
ABCE funding:	£49,410
Total project funding:	£49,410
Period of Award:	07/11/2022 - 24/02/2023

Overview: Nature-based solutions (NbS) have the potential to mitigate many of the environmental risks we face as a result of climate induced change e.g. reducing flood peaks, storing water, protecting biodiversity and enhancing soil (and food) security. However, there is currently a need to better understand the limits of NbS interventions, what constitutes good practice and how they address risk, equity and prevent trade-offs. There are also notable financial and governance challenges involved in implementing NbS at scale, demonstrating the need for further research. Furthermore, a lack of knowledge about the suitability and feasibility of NbS in different global contexts is a major barrier to uptake by Low and Middle Income Countries (LMICs).
UKRI-NERC is aiming to address this knowledge gap by supporting the world-leading interdisciplinary research needed to understand how NbS can increase resilience to climate-associated risks and be mainstreamed into transformative agendas towards more equitable and sustainable development.
This project will work on behalf of UKRI-NERC to scope and design a potential new collaborative research programme focussed on 'nature-based solutions for equitable climate resilience'. Priority research questions identified as part of this scoping exercise will form the basis of the potential joint NERC-FCDO research programme.

Discipline Hopping

Lead PI:	Alessandro Palmeri
Collaborator:	Tim Marjoribanks
Funder:	Natural Environment Research Council
ABCE funding:	£11,849
Total project funding:	£11,849
Period of Award:	01/01/2023 - 31/03/2023

Overview: Aquatic vegetation in riverine and coastal ecosystems plays a crucial role in maintaining the health of the habitat, transportation phenomena, and flood risk. Understanding flow-vegetation interactions is essential for ecosystem restoration and nature-based solutions. However, currently available analytical models fail to capture critical aspects of the problem. This "discipline hopping grant" aims to develop more sophisticated nonlinear computational models for the mechanics of highly flexible vegetation stems under flow-induced drag forces. The project brings together researchers from structural engineering, computational mechanics, eco-hydrodynamics, and aquatic ecology to jump-start new collaborations and explore a combination of methods and data that can result in new approaches to understanding and quantifying flow-vegetation interactions.

Staffing News

New Colleagues

- *Dr Sarper Sarp*, currently at Swansea University, appointed to Senior Lecturer in Water Engineering. (Preferred name: Sarp) Sarp is a chemical engineer, but with skills across the civil engineering portfolio. His first research bid will be to the EU collaborating with Fiat on textiles and nano plastic emissions (S.Sarp@lboro.ac.uk)

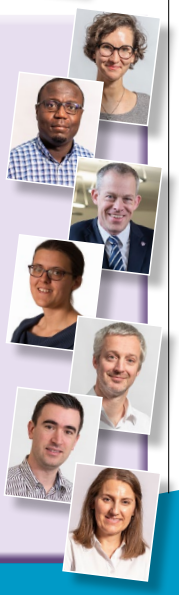
New Research Associates and Research Assistants

- *Ayan Hujaleh*, Doctoral Researcher, research interests: urban service provision, social inclusion, and governance and public policy
- *Alpha Koroma*, Doctoral Researcher, *Waste Pickers: Social and environmental factors influencing emotional well-being*
- *Jinghua Jiang*, Research Associate in Flood Risk Assessment working with Qiuhua Liang on the *Living Deltas Hub Project*

Staff Departures

- Professor Lee Bosher, April 2023, for the University of Leicester
- *Dr Andrew Longley*, January 2023 for Mott MacDonald
- *Robin Rainier*, left 24 May 2023, to join the Wolfson School
- *Dr Innocent Tumwebaze*, April 2023 for the African Population and Health Research Center (APHRC), Nairobi, Kenya

Promotions and Appointments



- Dr Oluwasola (Sola) Afolabi takes over from Tanja Radu as ABCE Research Seminars Coordinator. Sola is also an International Special Envoy for sub-Saharan Africa
- Professor Ksenia Chmutina, Professor of Disaster Studies, also awarded a Personal Chair in January 2023 and International Special Envoy for East Asia
- Professor Malcolm Cook, Dean, February 2023
- Susie Goodall, Lecturer in Water Engineering
- Professor Chris Keylock, Director of R&I Environment and Output Quality
- Dr Tim Marjoribanks, promoted to Senior Lecturer and ABCE Director of Student Experience
- Dr Tanja Radu has taken over from Lee Bosher as the new Lead of the Water Group

Achievements, Awards and Fellowships

- **ABCE** awarded the *Bronze Athena Swan* charter mark. These awards recognise and celebrate good practices in higher education and research institutions. The award strengthens our position on all fronts, from research bidding to course accreditation, as well as giving us an internal facing framework around which we conduct ourselves and care for each other. The submission was led by Professor Ksenia Chmutina, supported by the School Athena Swan Team (SAT)
- Dr Tanja Radu, Member of the **UKRI** Talent Peer Review College 2023
- The *Inaugural VC Annual Awards ceremony 2022*, was held on campus, for all short-listed nominees to celebrate the achievements of **Loughborough University** staff. Nominations were received from all Schools and Professional Services. **C-DICE** was nominated for the *Partnerships Category: for activities that had had significant local, regional, national or international impact.* The C-DICE programme (led by LU, with the Universities of **Birmingham** and **Cranfield**) is funded by **Research England**, with matched, and in-kind contributions from a growing range of partners, making C-DICE the biggest single investment in postdoctoral researchers in the UK. To read about other categories of the awards, visit: https://www.lboro.ac.uk/internal/vc-annual-awards/

New Arrivals

Congratulations to...

Professor Ksenia Chmutina, on the birth of her baby boy, Artemiy Philip Rogers, born on 6th February 2023

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