BRITISH COUNCIL

Global report by
Nadia El-Awady

The Climate Connection Higher Education Roundtable

Innovative Approaches for Collaborative Research: UK, Japan, ASEAN Initiative

Date: 27 October 2021

About the Climate Connection

The British Council's Climate Connection programme brings people around the world together to meet the challenges of climate change.

Drawing on our global network, the Climate Connection programme connects 200 million people from different countries, generations and backgrounds – young people and policy makers, artists and scientists, business and community leaders, and many others.

In particular, it focuses on the next generation of climate leaders and gives practical support to young people and communities most impacted by climate change, helping them share their perspectives globally and achieve real change.

About the author

Nadia El-Awady

Nadia El-Awady is a freelance science writer and editor. She is the chief editor of Nature Middle East and a senior writer at Asia Research News. She also freelances for several Springer-Nature publications and clients. Nadia was a co-founder and the first president of the Arab Science Journalists Association, a president of the World Federation of Science Journalists, and a co-director of the 2011 World Conference of Science Journalists. She has taught university undergraduate-level online and science journalism, worked as a communications director of a large science institution in Egypt and managed journalism training programs. When she's not working, Nadia is out in the hills, on the mountains, diving in seas, or running, swimming and cycling.

Nadia has a MB BCh in medicine and surgery from Cairo University and a master's degree in journalism and mass communication from the American University in Cairo.

Twitter: **@NadiaE**
Linkedin: **https://www.linkedin.com/in/nadiaelawady/**

Foreword

In October 2021, in the lead up to the COP26 climate summit and as part of The Climate Connection, the British Council hosted a series of online roundtables in Australia; Egypt; Japan; Indonesia, and South Africa.

The roundtables brought together stakeholders from higher education (HE); industry; governments and civil society to explore the role and purpose of the HE sector in responding to the climate crisis. The roundtable series explored a range of core issues including:

- **The role of universities in supporting governments to develop evidence-based climate policies.**
- **Whether the HE sector is equipping the next generation with the skills they need to live with the reality of climate change.**
- **How universities can be more adept at knowledge production and exchange and at working across traditional academic boundaries.**
- **Showcasing some of the latest collaborative climate research projects between the UK HE sector and counterparts around the world.**
- **The role universities play in the public discourse around climate change to help build wider trust in and understanding of the science.**
- **Exploring how Higher Education Institutions can reduce their own carbon footprint, whilst realising their internationalisation ambitions.**

The Roundtables, which were open to all, attracted audiences of students and Early Career researchers, academics, climate activists and policy makers. Importantly, attendees were given the opportunity to submit questions to the panel in advance of each roundtable. These helped inform and guide of the discussion and ensured that there was genuine and valuable interaction between panellists and the audiences.

Although each roundtable was hosted by a specific country, and the themes they addressed were relevant to that country and region, the issues addressed by the panels of experts and the resulting calls to action have significance for Higher Education sector leaders, researchers and policymakers globally. The roundtable series has already created new perspectives and have triggered conversations which we hope will result in new collaborations and ways of working.

Japan report

The final roundtable in the series, **Innovative approaches to collaborative research,** explored the challenges and successes of research teams funded by The Climate Connection trilateral ASEAN/Japan/UK grant programme, which brought together researchers from ODA and non-ODA to focus on climate related research. **See: https://www.britishcouncil.jp/en/events/innovative-approaches-collaborative-research-uk-japan-asean-initiative**

Panellists discussed what researchers can learn from multilateral collaboration models, how they can be improved and what incentives should be put in place to bring together international research expertise to achieve maximum impact. They also discussed the importance of engaging government, industry and local communities based on an understanding that this is the most reliable way to ensure their research impacts the real world, and the importance of mentoring early career researchers, particularly in the ASEAN region, to become the next generation of senior scientists.

List of panellists

Professor Craig Hutton (Chair)
University of Southampton

Associate Professor Taufiq Asyhari
Birmingham City University

Dr. Guangming Zhang
Liverpool John Moores University

Dr Michael Short
University of Surrey

Dr Disni Gamaralalage
University of Tokyo

Professor Yasuto Tachikawa
Kyoto University

Dr Flora Somidin
Universiti Malaysia Perlis

Dr Iswan Dunggio
Gorontalo State University

When research isn't just about the findings

Multinational, transdisciplinary collaborations are tackling climate change in the ASEAN region, leading to knowledge exchange and support for early career researchers.

In April 2021, four multinational research teams launched one-year collaborations aimed at solving climate change problems within the ASEAN (Association of Southeast Asian Nations) region. Their projects were chosen from 15 submissions for funding by the British Council's COP26 Trilateral Research Initiative. Halfway through, important research findings were already evident.

Perhaps even more importantly, friendships are developing, partnerships are strengthening and early career researchers have been empowered to put their figurative foot in the door to pave the way towards becoming the senior scientists of the future.

As part of its Climate Connection initiative, the British Council hosted a roundtable discussion that showcased each project's progress, highlighting the importance of multinational, transdisciplinary research for solving the world's most pressing issues.

Strong bonds for green electronics

Researchers at Liverpool John Moores University (LJMU) in the UK and Universiti Malaysia Perlis (UniMAP) had already been working together for a few years when something clicked during a high-level UniMAP visit to Liverpool. 'We were able to see the complementarity between their materials science team and our electronic engineering team,' says David Harvey, a professor at LJMU's General Engineering Research Institute.

This was the spark that led to a collaboration between the two teams and with Gunma University in Japan to develop the next generation of lead-free solders.

Solder joints are used to connect together electronic chips and components within devices. They are conventionally made of tin-lead alloys, but there is a move within industry to develop lead-free solders to reduce their negative health and environmental impacts. **The problem is that lead-free solders degrade when electronic components heat up inside electric vehicles and in the hot, harsh environments that some electronic devices need to work in, like in solar and wind energy farms.**

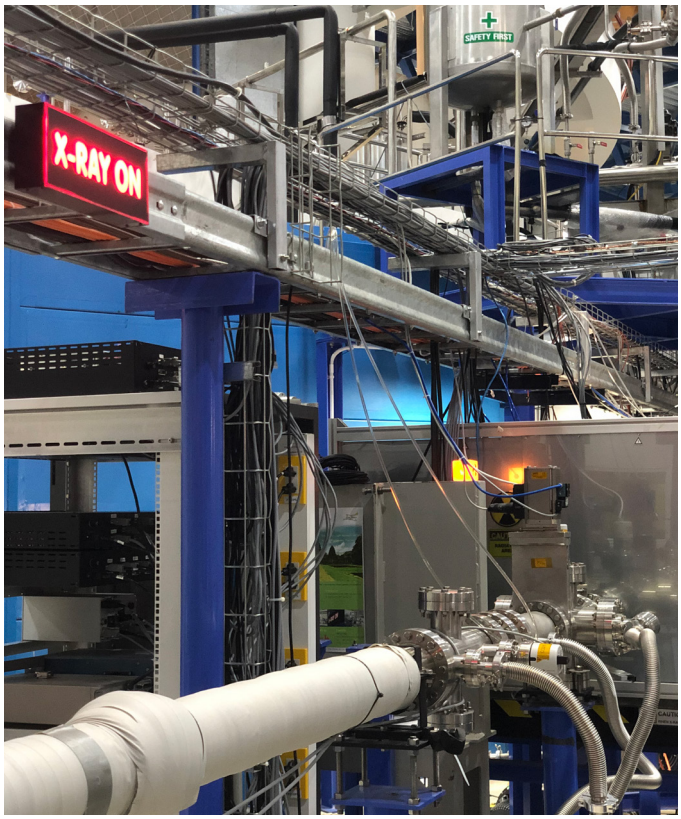
'Action is needed now to design more reliable green solders and electronics to extend product lifetimes and reduce manufacturing energy costs,' says Harvey.

Now materials scientists at UniMAP have developed tin-based, lead-free solders made with micro-alloyed and reinforcing materials. These solders are formed into small balls and used to connect electronic chips manufactured on industry-standard printed circuit boards.

The UniMAP team is investigating the solder material's behaviour and performance by analysing its microstructure and phase formation using conventional approaches and also advanced characterisation techniques at synchrotrons in Thailand and Japan.

Gunma University is investigating how the solder balls respond to impact, while the LJMU team is conducting non-destructive reliability testing and using micro-imaging to monitor the material's lifetime performance.

The UniMAP team testing lead-free solder



The project team is also organising webinars to raise awareness on the use of green electronics in electric vehicle manufacturing. Their first webinar hosted 190 participants, mainly from Malaysia's higher education, government and industry sectors, but also from the UK, Japan and Australia.

'I hope this research is continued in order to strengthen the network between industry and academia,' says Poobalan Shumuganathan, the managing director of Qualitek Solution, a Malaysia-based solder manufacturer and supplier for the broader Southeast Asia region.

The project is impacting the careers of its younger researchers. Flora Somidin, an early career researcher at UniMAP's Centre of Excellence for Geopolymer and Green Technology Materials Engineering, says it would have been difficult for her to set up collaborations on her own as someone who has only recently finished her PhD. She adds that her involvement in this project has made her even more aware of other groups' research. '**Also, our research progress has been faster than if we were working alone because of the expertise of the different groups,'** she says. While Somidin continues her work on the project, she aims to also visit the partner universities to explore potential future partnerships.

"Our research progress has been faster than if we were working alone because of the expertise of the different groups."

Flora Somidin, UniMAP

Planning decarbonisation in ASEAN

Purosothmn Nair is another early career researcher benefiting from multinational collaboration. A chemical engineer at the University of Nottingham Malaysia, he learned the high-level programming language, Python, from scratch to develop an open-source software program that can help policymakers and industry stakeholders in his country decide how best to allocate resources to reduce carbon emissions.

The program, called DECO2 (decarbonisation options optimisation), has an Excel sheet interface. Users input data relating to energy forecasts, the different types of decarbonisation technologies being considered, the types of fuel that will be used, pricing forecasts for different fuels, and budgets. The program then shows the user how different decarbonisation options will function over time, given the input constraints. The information should help users develop appropriate decarbonisation strategies.

DECO2 has an easy to use Excel sheet interface.

PLANT DATA

The definition of each parameter in Table 1 is as follows:

Fuel	Type of fuel utilised for each plant
LB	Lower bound for energy output for each plant
UB	Upper bound for energy output for each plant
CI	Carbon intensity of fuel used for each plant
Cost	Cost of fuel utilised for each plant

Key points to note:

1. In Table 1, renewable energy sources i.e. wind, solar, hydro etc. should be laballed as 'REN' at the 'Fuel' row
2. For Table 1, kindly delete columns which are not required. Deleting data alone would result in Python registering the data as N/A, thus triggering an error
3. For Table 2, kindly delete rows which are not required. Deleting data alone would result in Python registering the data as N/A, triggering an error
4. For Table 2, the entries for the 'Period' column should be numerical e.g. 1,2,3 etc.

User to define heading for each plant

User to define parameters for each plant/period

User should not alter these headings

Parameter units in Table 1 (to be specified by user)

Energy	**TWh/y**
CO2 Intensity	**Mt/TWh**
CO2 Load	**Mt/y**
Cost	**mil USD/y**

Optimisation Objective

min_budget	This objective minimises the total budget allocation, subject to the satisfaction of the demand and emissions constraints for each period
min_emission	This objective minimises the total CO2 emissions, subject to the satisfaction of the demand and budget allocation constraints for each period
Optimisation Choice	**min_emission**

TABLE 1: PLANT ENERGY PLANNING PARAMETERS

	Gurun	Sungai Siput	Bidor	Pasir Gudang	Pengerang	Paka	YTL Paka	Manju
Fuel	REN	REN	REN	NG	NG	NG	NG	COA
LB	0	0	0	0	0	0	0	0
UB	0.36	0.35	0.22	1.98	2.88	1.85	4.21	7.2
CI	0	0	0	0.5	0.5	0.5	0.5	1

PLANT_DATA | EP_DATA | ENERGY_DATA | ALT_SOLID | ALT_GAS | CCS_DATA | CI_NET_DATA | COST_NET_DATA | MB1

The model is the product of a collaborative project between the University of Nottingham Malaysia, the University of Surrey in the UK and the University of Tokyo in Japan. Other partners include De La Salle University in the Philippines and Monash University in Malaysia.

'The Malaysia team has expertise in energy planning, while the Surrey team is highly experienced in modelling and optimisation,' explains University of Surrey information and process systems engineer Michael Short. 'The topic is also of great interest to the University of Tokyo because Japan imports biomass from Malaysia,' he adds.

The team has used the program in a preliminary case study to model how funds could be invested from 2020 to 2050 to reduce the carbon emissions of 38 power plants in peninsular Malaysia. The input data, extracted from forecasts and discussions with Malaysia Green Technology and Climate Change Corporation, allowed for plants switching or mixing their energy sources, for retrofitting them with carbon capture and storage technologies, or for decommissioning them. A carbon dioxide emission target and the energy demands of the plants are then set. The program subsequently shows how the targets can be met using different types of energy sources. **The model showed that biomass and biogas could act as fuel replacements for the coal and natural gas power plants respectively, and that negative emission technologies are needed if a net zero target is to be achieved.** The model also showed the budgets needed to limit carbon emissions in order to set realistic targets. Additionally, it validated the Malaysian government's decision to decommission certain plants.

"Global problems need global teams to solve them."

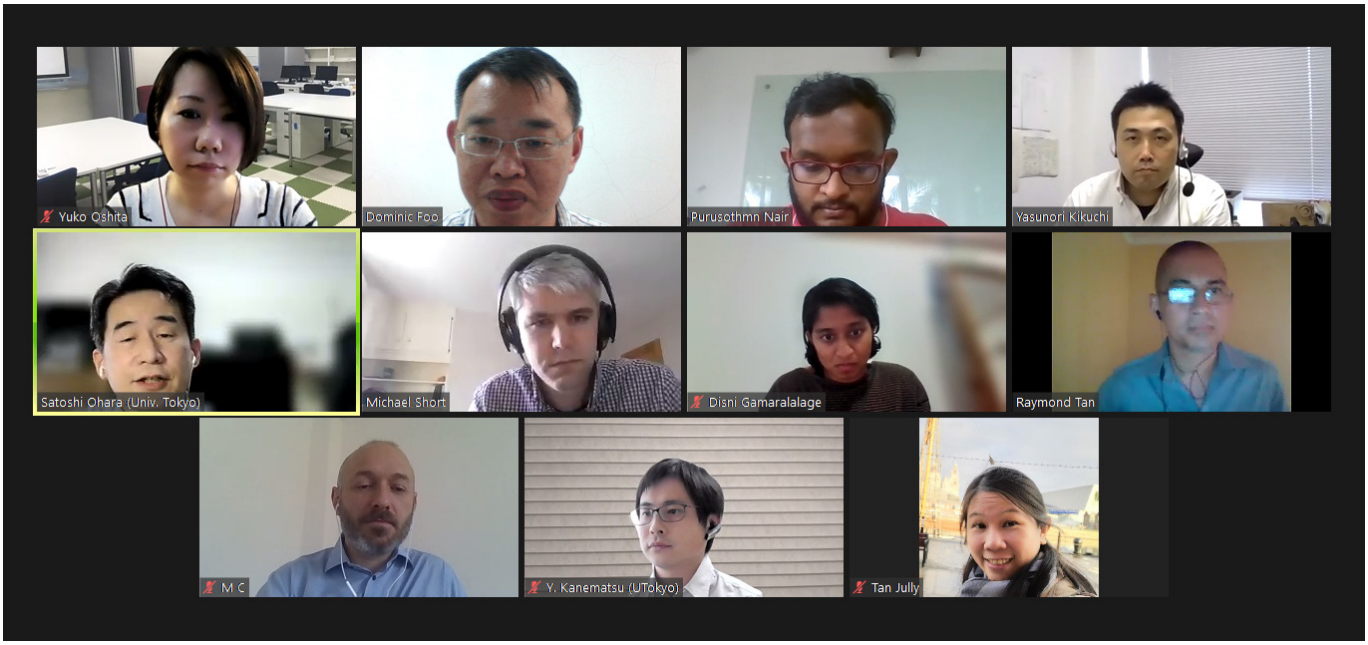
Michael Short, University of Surrey

‘Working with the UK and Japan teams has been great knowledge transfer for me,’ says Nair, who has had weekly video calls with the teams in order to gradually develop the model into its current form. He hopes to further develop his programming skills during an upcoming visit to the UK, and aspires to achieve even more concrete results in the second half of the project.

Disni Gamaralalage is an early career environmental engineer at the University of Tokyo, who is also working on the project. She has found it particularly interesting to learn how a multinational collaboration is managed and how workloads are shared.

‘Global problems need global teams to solve them,’ says Short, adding that the types of projects put together by the British Council’s COP26 Trilateral Research Initiative really do help. And learning in this type of collaboration is mutual: **‘We got a lot of ideas for solving British problems from working with our partners overseas,’** he says.

The learning is reciprocal: **‘We got a lot of ideas for solving British problems from working with our partners overseas,’** says Short.



Finding fuel in Indonesia's biodiversity

A decade ago, forest scientist Iswan Duggio and information engineer Taufiq Asyhari met while doing their PhD research in the UK. '**At the time, we didn't consider collaboration because we were working in very different fields,**' says Asyhari. But in 2021, when the opportunity arose, they noticed that their research areas could come together to bring new insight for Indonesia's energy sector.

Their friendship has led to a collaboration between Birmingham City University in the UK, Gorontalo State University in Indonesia and the University of Tokyo in Japan to assess the bioenergy potential of one of the world's top biodiversity hotspots: the islands of Wallacea in eastern Indonesia.

Indonesia aims to reduce its dependence on fossil-based fuel. Its target is to fulfil 40 per cent of the country's energy demands by 2030 using energy generated from organic matter, called bioenergy. Currently, bioenergy satisfies only 11.2 per cent of the country's demands, much of which is derived from oil palm. But destroying natural forestland in Indonesia to make way for oil palm plantations has had an unintended consequence: it has released the significant amounts of carbon stored inside the dense forest plants into the environment. So Indonesia needs to look for alternative bioenergy supplies.

Duggio, Asyhari and their colleagues think they might be found on the islands of Wallacea.

The team is using drones to take aerial images of plant life in Gorontalo Province on Sulawesi Island in Wallacea. By combining the forestry knowledge of the Indonesian team with the artificial intelligence expertise of the British team, the researchers have been able to comb through the images and identify the various plant types in the province. They have also used artificial intelligence in combination with remote sensing to assess the plants' bioenergy potential. The team in Japan then works on identifying different components in the plants, like fruit shells, sap, fibres, cobs and stems, that could be used as organic matter for conversion into bioenergy. Finally, **the project team will analyse the best technologies to use for energy conversion, the economics involved and how applicable each option is.**

"The project brings the opportunity to create community awareness of the potential of bioenergy and plant species to generate income and thus enhance their children's access to education."

Wa Ode Eti, Gorontalo State University

It's particularly important that the local community will be able to use the project team's suggested solutions. **'Local support is vital for conservation management,'** says Zulham Sirajuddin, who specialises in agricultural education at Gorontalo State University.

The team also hopes its research results will lead to projects that support local community livelihoods. **'The project brings the opportunity to create community awareness of the potential of bioenergy and plant species to generate income and thus enhance their children's access to education,'** says Wa Ode Eti, an early childhood education researcher at Gorontalo State University. Her involvement demonstrates just how transdisciplinary this project is.

'Collaboration, not only between institutions but also between different fields of study, is an interesting aspect of this research,' says Sirajuddin.

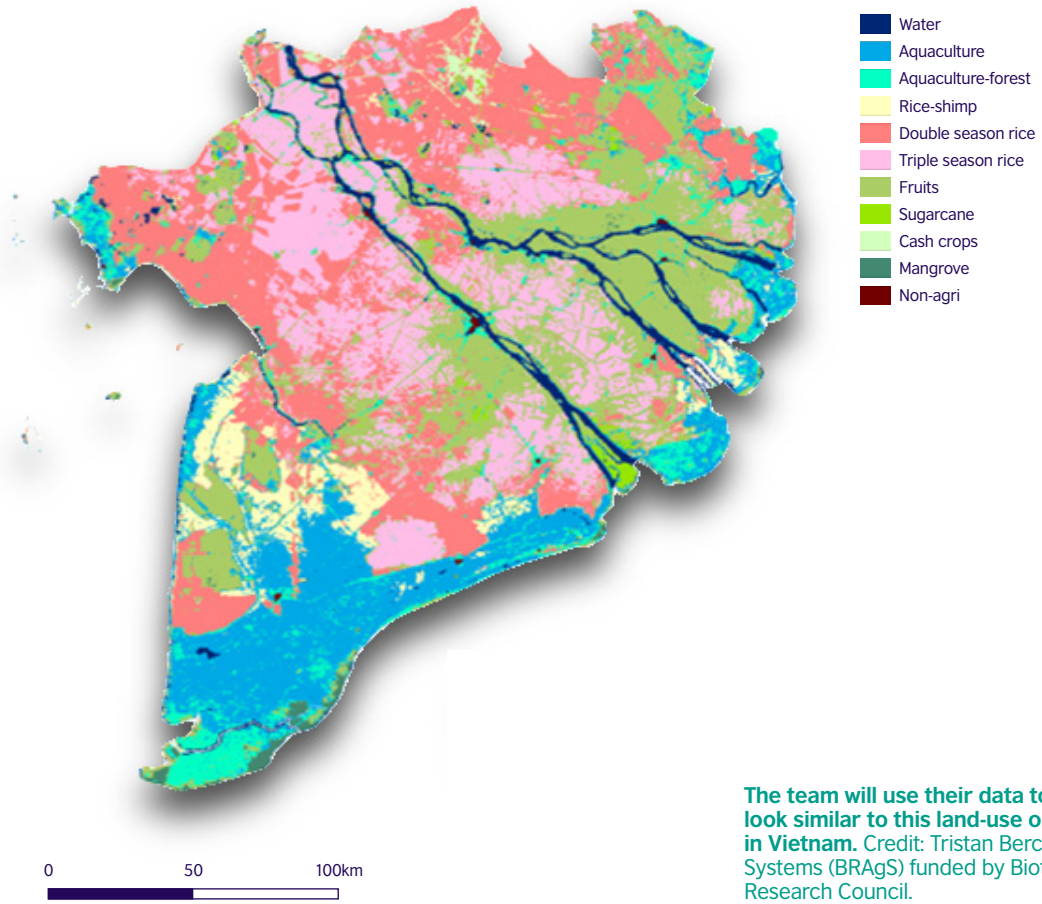
The UniMAP team

Managing risk

Where the last three projects focused on mitigation, with their energy-saving, decarbonisation and alternative energy approaches, the final project supported by the British Council's COP26 Trilateral Research Initiative aims to help ASEAN countries better adapt to the risks of climate change.

'Our project focuses on understanding the potential risks of climate change and extracting the data and information needed for policymakers to respond and adapt to those risks,' says Craig Hutton, professor of sustainability science at the University of Southampton, UK.

The University of Southampton has a strong connection with Kyoto University through a large UK–Japan research network called RENKEI, explains Yasuto Tachikawa, who specialises in the spatiotemporal modelling of hydrological processes at Kyoto University. The two universities also had strong collaborations with Chulalongkorn University in Thailand and Can Tho University in Vietnam respectively. The teams joined forces in response to the British Council's call for proposals.



The team will use their data to develop risk maps, which will look similar to this land-use one they made for another project in Vietnam. Credit: Tristan Berchoux, Building Resilient Agricultural Systems (BRAgS) funded by Biotechnology and Biological Sciences Research Council.

The researchers in this multinational collaboration are sifting through the literature to find data on flood and water resource management risks due to climate change in the Chao Phraya basin in Thailand and the Mekong Delta in Vietnam. They are also reviewing the policy landscape and the models available for analysing climate driven water resource and flood risks. The ultimate aim is to take the data from this project and get funding for a longer-term follow-up project that develops high resolution risk maps that can inform policymakers in Vietnam, Thailand and possibly other countries. 'It is a scoping project,' explains Hutton.

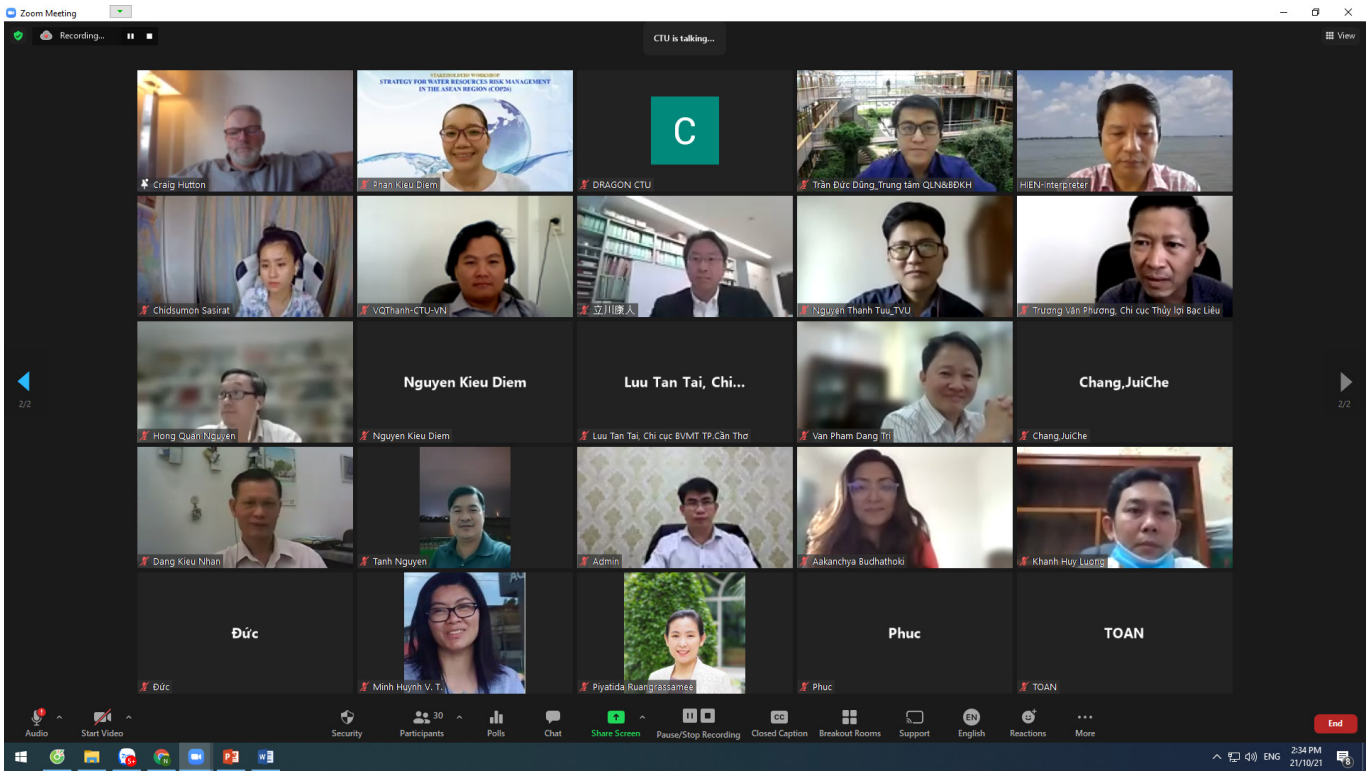
The audit is already identifying knowledge and policy gaps. For example, the two regions don't have risk models for typhoons or cyclones, and very few for soil erosion, despite these being areas of concern for policymakers. The team has also found that gender, culture and literacy do not appear to be high on the agendas of stakeholders involved in water management in the two regions.

Critically, the project aims to identify socio-economic vulnerability to water resource and flood risks. **'This type of modelling requires a complex understanding of socio-economics,'** says Hutton, **'so it's not surprising it doesn't currently exist in the two regions. But it's a gap that needs to be filled.'** Hutton stresses that the project places special emphasis on supporting early career researchers. **'We have channelled all the British Council funding into supporting early career researchers in our UK, Japan, Thailand and Vietnam partner universities,'** he says.

Hutton stresses that the project places special emphasis on supporting early career researchers. **'We have channelled all the British Council funding into supporting early career researchers in our UK, Japan, Thailand and Vietnam partner universities,'** he says.

Phan Kieu Diem of Can Tho University in Vietnam says the project has improved her confidence to work with international partners. Diem has a PhD in environmental technology and has learned a lot this year about climatedisaster vulnerability. **'Balancing family responsibilities and project work can be difficult,'** she adds, but the project team is helping her improve her planning skills so she can get the best of both worlds. **'I hope funders will give more priority to multinational projects and more opportunities for young female researchers to learn, expand their connections, contribute and work in an environment that helps develop our future careers.'**

The project gives particular emphasis to the inclusion of early career researchers.



Recommendations and reflections

'We need to create inclusive and friendly environments in our research teams,' says Short, explaining that early career researchers can often find it difficult to get in on the conversation with senior researchers. 'We need to be human and not just sit in our ivory towers. We need to spend time asking about families and personal stuff. **The better we know each other, the more we can adapt our schedules to fit those of others. This opens doors for people who wouldn't necessarily be involved in research otherwise and allows more diversity, which is beneficial because we need their opinions and expertise.'**

Short adds there should be more funding for early career researchers to attend conferences, even those that are not directly related to their fields. **'We need them to see that the topics they are working on can be applicable in multiple fields,'** he explains.

'It is beautiful to see researchers from different countries with different academic backgrounds working together and contributing their expertise to achieve one goal,' says Disni Gamaralalage of the University of Tokyo, who is involved in developing the DECO2 software program for Malaysia's policymakers and was also the roundtable's provocateur. '**I am very lucky to acquire knowledge in a variety of research areas and widen my network,'** she adds.

Despite the projects' very different focuses, they share many points in common, says Japan-based writer Emma Parker, the roundtable's rapporteur. **They are engaging government, industry and local communities based on an understanding that this is the most reliable way to ensure their research impacts the real world,** she says. They are mentoring early career researchers, particularly in the ASEAN region, to become the next generation of senior scientists. **The project teams combine the technical expertise and specialist equipment of British and Japanese universities with the local knowledge and connections of the ASEAN universities, enabling knowledge transfer and reciprocal learning.** Finally, says Parker, several of the projects include researchers who had not previously applied their expertise to climate-related topics, demonstrating that the research grants have stimulated genuinely new collaborations.

'We hope this roundtable will demonstrate the power and value of the multinational approach to research, which brings together expertise from across the planet to focus on the shared global challenge of climate change,' says Julia Longbottom, the British Ambassador to Japan.

For full details and a video of the roundtable discussion, titled 'Innovative Approaches for Collaborative Research: UK, Japan, ASEAN Initiative', please visit: **https://www.britishcouncil.jp/en/programmes/higher-education/university-industry-partnership/cop26-trilateral-research-initiative**

"We hope this event will demonstrate the power and value of the multinational approach to research, which brings together expertise from across the planet to focus on the shared global challenge of climate change."

Julia Longbottom, British Ambassador to Japan