

Frontiers of Development

Inclusivity and wellbeing:
Coastal communities in a 3°C world

15-18 July 2018 | Rio de Janeiro, Brazil



Introduction to Frontiers of Development

The Frontiers of Development programme brings together 60 of the best early- and mid-career researchers and practitioners from engineering, medical, social and natural science backgrounds from across industry, NGOs and academia in multidisciplinary workshops.

These highly interactive and curated symposia look at international development themes through an interdisciplinary lens, encouraging collaboration and knowledge transfer between a range of participants.

Competitively allocated seed funding is available to strengthen the collaborations developed at the symposia.

The Royal Academy of Engineering is a delivery partner of the UK government's Global Challenges Research Fund (GCRF), that supports cutting-edge research to address the challenges faced by developing countries. The GCRF funds the Joint Resilient Futures Initiative that consists of a group of programmes run across the four national academies. The Frontiers of Development programme is one such programme, run by the Royal Academy of Engineering with support from the Royal Society, the Academy of Medical Sciences and the British Academy.



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Inclusivity and wellbeing

The second Frontiers of Development symposium took place from 15 to 18 July 2018 in Rio de Janeiro, Brazil. It was the second event in the Inclusivity and wellbeing series of events. At the Coastal communities in a 3°C world symposium, over 60 leaders from different disciplines and countries came together to discuss how interdisciplinary collaboration can tackle the challenges faced by citizens of an over-heating planet.

Adapting to a changing and warming world is central to the UN Sustainable Development Goals. The theme was particularly pertinent in the wake of the Paris Climate Agreement. The United Nations Environment Programme released its Emissions Gap Report in November 2016, which detailed that emissions are likely to reach 54-56 gigatonnes of CO₂ equivalent per year by 2030 – some way off the Paris target of 42 gigatonnes¹.

The impacts of a hotter world will cross borders and have wide-reaching effects on weather, ecosystems, social structures and economies. While the entire planet and all its people will be touched by these changes, it is likely that the most vulnerable people will be the most impacted. The Emissions Gap Report also indicates that global temperatures are set to increase by 3°C above pre-industrial levels by 2100, with 275 million people worldwide living in areas that are predicted to be flooded due to rising sea levels². With this in mind, delegates of the symposium explored how communities build resilience and protect and manage vital ecosystems.

The symposium sought to explore these challenges through the following subthemes:

1. Climate-induced disaster mitigation and resilience
2. Management and protection of marine ecosystems
3. Sustainable blue economy

The event was co-chaired by Professor Minhan Dai and Professor Mark Pelling. Minhan is a Cheung Kong Chair Professor of Marine Biogeochemistry at Xiamen University, China. He currently serves as the Director of the State Key Laboratory of Marine Environmental Science. His research interests include ocean biogeochemistry of carbon and nutrients and geochemistry of radioactive elements in surface and ground waters.

Mark is the UKRI Global Challenges Research Fund Challenge Leader for Resilience to Environmental Shocks and Change and Professor of Geography at Kings College London. His research interests are in the institutions and social relationships that shape vulnerability and adaptation to natural disasters, including those associated with climate change, and the ways in which conflicting values and practices of development inform resilience and transformation in the face of environmental change.

This report summarises learnings and insights from the discussions and activities that took place at the symposium.

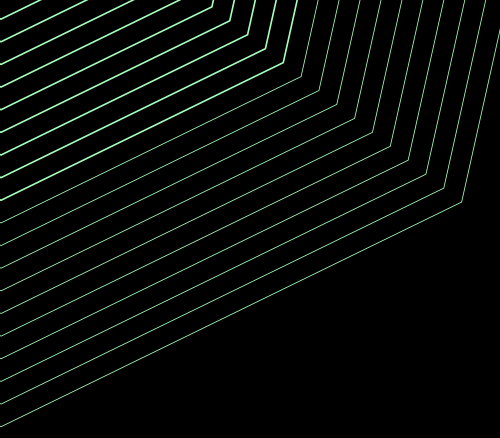


“Coastal communities around the world are facing unprecedented threats from global-scale environmental and climate change. There are no magic solutions to the challenges brought about by rising temperatures but it is clear that it requires a global, collaborative response, one where we bring together regional and large-scale initiatives to learn from each other and combine knowledge from across disciplines. Communication, interaction and cooperation are key to saving millions of people across the world from a bleak future.”

Professor Minhan Dai

1 http://wedocs.unep.org/bitstream/handle/20.500.11822/10016/emission_gap_report_2016.pdf?sequence=1&isAllowed=y.

2 Ibid.



The symposium was organised in partnership with the UK-Brazil Year of Science and Innovation, and included a networking reception at Rio's Museum of Tomorrow, with speakers from the British Embassy and the Brazilian Ministry of Foreign Affairs. The Academy would like to thank everyone who made the symposium possible and a resounding success, especially the event chairs, the Global Challenges Research Fund, and the British Academy, the Academy of Medical Sciences and the Royal Society.

60 leaders from different disciplines and countries came together to discuss how interdisciplinary collaboration can tackle the challenges faced by citizens of an over-heating planet



“The opportunity that science has in front of us is not just to deploy individual sciences but to use those sciences to open spaces for new stakeholder groups to form. New solutions to challenges such as urban flooding can bring together informal settlement dwellers with city governments and the private sector, opening up the opportunity to maintain those relationships, even once that particular innovation has finished. The real opportunity to make change is not so much in technical innovation, but in the governance space around it.”

Professor Mark Pelling

Climate-induced disaster mitigation and resilience

Session chair

Paulo Artaxo, University of Sao Paulo and Michelle Mycoo, University of the West Indies

Presentations

1. CSSP Brazil: Explaining the role of climate in extreme flooding events in South America

Andy Wiltshire, Met Office

2. Future of cities, climate change and related disaster risks: are we at a crossroads?

Benjamin Delali Dovie, University of Ghana

3. Climate disaster resilience and cities: policies and challenges

Joana Setzer, London School of Economics

This session looked at the science of climate change, briefly touching on how communities can be affected by climate-induced shocks, both in terms of economic and social impacts. The first speaker, Andy Wiltshire of the Met Office, used the case study of a 2017 flood in Uruguay that displaced 6,000 people and caused an economic loss of US\$100 million. Andy argued that combining information from robust climate modelling with data about vulnerability can help make the case to policymakers and governments that they need to mitigate and adapt to a variable climate.

The second session speaker, Benjamin Delali Dovie built on Andy's idea and put it in urban context. He argued that for many city authorities the need to protect residents, especially those who are most vulnerable, comes second to the desire to increase profit margins. He used the example of his home city, Accra, Ghana, which he described as an "economy in transition" where climate scientists and practitioners struggle to get the attention of key partners in the government and business. To develop a city that is safe from flood risks, Benjamin made the case for stakeholders to collectively manage risks to the population and minimise population exposure while accounting for cross-boundary challenges.



Joana Setzer was the third and final speaker of this session. She spoke about how recent years have seen a surge in interest and ambition to tackle climate change and related disasters. For example, in 2018 the World Bank announced a US\$4.5 billion partnership with the Global Covenant of Mayors for Climate and Energy to support cities in the implementation of climate action plans³. She highlighted that funding alone would not solve all the challenges, but that decentralised, multi-stakeholder, adaptive and participatory governance was key to realising ambitious plans. However, realising these ideals has proven challenging – especially where there is a mismatch between those with responsibility, resources and power. She gave three key examples of this: party politics, the trans-boundary nature of climate risks, and hard-to-shift national realities. She left participants with a tool from the Grantham Research Institute on Climate Change and the Environment that allows users to explore climate legislation and policies globally.



³ <https://www.worldbank.org/en/news/press-release/2017/12/12/global-covenant-of-mayors-and-world-bank-announce-partnership-for-climate-action>

Management and protection of marine ecosystems

Session chair

Monica Muelbert, Federal University of Rio Grande

Presentations

1. The green-blue nexus: a land-based perspective
Dolors Armenteras, Universidad Nacional de Colombia
2. Technological innovation or social change? The battle for the seas
Shona Patterson, Future Earth Coasts
3. Research needs for coastal and marine environments conservation: a plastics pollutions case study
Monica Ferreira de Costa, Federal University of Pernambuco
4. MPAs, biodiversity and climate change
Beatrice Padovani Ferreira, Federal University of Pernambuco



Activities around the world are connected by the oceans. This means that issues such as the blue economy, climate change and variability, ecosystem health and biodiversity, pollution, maritime safety and ocean hazards, ocean health (food, water and human), food security and energy are all linked. Data and information systems and governance are therefore very important. If the global community is to establish and achieve common goals, especially in the context of a diversity of interests and logistical capabilities, it will need to combine scientific collaboration with intergovernmental diplomacy.

Costal and marine systems are constantly changing because of biophysical and socio-economic activities. The first talk by Dolors Armenteras looked at the boundaries between land and seas. In many areas around the world this means mangroves, coral reefs, beaches or estuaries, which provide a range of ecosystem services such as food provision, water storage, and water and air purification, to name just a few. They are also delicately balanced ecosystems and net carbon sinks, and therefore essential tools and fragile assets in tackling the impacts of climate change.



The second talk looked at coastal zones that humans inhabit. Over three billion people depend on marine ecosystems and their resources. To illustrate this, Shona Patterson explained that 13 out of the 20 megacities in the world are coastal⁴, a testament to their importance for national and global socioeconomic wellbeing and growth. It is imperative to build capacity to measure, comprehend, and adapt to coastal change and to recognise potential thresholds in the coastal system. This requires an understanding of the physical, chemical, and biological processes that define coastal dynamics, and the role of human activities in these changes. Managing these systems includes decisions on what to regulate, what enterprises and initiatives to promote, and which ecosystem services are most important to citizens and businesses. Protecting these systems, and the services they provide has become a complex and interesting challenge of trade-offs and compromise, especially in the face of changing climates.



3 out of the 20 megacities in the world are coastal⁴, a testament to their importance for national and global socioeconomic wellbeing and growth

The third talk discussed marine pollution from plastics and microplastics to illustrate the research urgently needed to make sure coastal and marine environments are properly protected. Monica Ferreria de Costa guided participants through a conceptual model of the state of marine pollution research via a trip through South American rivers all the way down to the middle of the Atlantic, where she took the room on a tour of the islands of Trindade, Fernando de Noronha and Saint Peter and San Paul Rocks. She finished this journey by diving to the depths of the ocean to show how microplastics have already altered these remotest reaches of the planet. She advocated for integrated coastal conservation as the example for managing the situation.

This session served to call into focus how important it is to maintain delicate marine and coastal ecosystems, not only for the services that they provide for communities, but also their economic, social and cultural importance.

⁴ https://www.un.org/en/events/citiesday/assets/pdf/the_worlds_cities_in_2018_data_booklet.pdf

Sustainable blue economy

Session chair

Karyn Morrissey,
University of Exeter

Presentations

1. Can we create sustainable blue economies through community-led aquaculture?

**Margaret Gatonye, FoodTechAfrica
Larive Africa Group**

2. Can we create sustainable blue economies through renewable energy?

Tom Rogers, Coventry University

3. Can we create sustainable blue economies through marine technology?

an Watson, SafetyNet Technologies

Human activities in the world's oceans and on coasts are now at an unprecedented scale and expanding rapidly. The oceans have become a focal point for new activities including wind and wave power, marine biotechnology, marine technology and other enterprises. More recently, these activities have been branded as the 'blue economy'. The emergence of the term 'blue economy' coincides with the increased emphasis on 'greening' the economy and by virtue of its colour, the blue economy has become synonymous with the sustainable development of the world's oceans and seas. Whether this branding will result in a more sustainable marine economy is up for debate. Session chair Karyn Morrissey led this session as an interactive session where panellists gave a pitch as to how their area of innovation or research will contribute to a sustainable blue economy and to discuss whether it is an achievable goal given current grand challenges.

The first pitch was from Margaret Gatonye who has vast experience in fresh water aquaculture with a focus on sustainable small, medium and large-scale aquaculture and social-economic development of rural communities in Kenya and east Africa. She explained that aquaculture is a diverse and quickly growing sector, with millions of people around the world relying on it for survival. Aquaculture, she argued, must be the future for the sector as capture stocks are already declining. Understanding the challenges and opportunities of aquaculture, and feeding these into policy decisions, is of paramount importance if people are going to be able to not only survive but thrive in this sector.

Tom Rogers gave an alternative vision of a sustainable blue economy based on renewable energy. As well as the existing services offered by coastal areas, covered in session two, Tom explained that following many years of development, and some setbacks, marine-based renewable energy technologies are on the brink of commercialisation. He discussed a case study of Caribbean policymakers and utilities companies



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that are seeking alternatives to their often expensive and heavily polluting fossil-fuel based energy systems. In this context, he argued that marine energy can provide the answer.

The final pitch came from Dan Watson of Safety Net Technologies, whose goal is to help fishermen sustainably catch only the right fish. He noted that a sustainable blue economy will not be a static programme – it will require constant innovation and development. Responsible management of resources to meet the changing needs of society will require the ability to monitor the natural environment and direct effort across a range of scales and timeframes. Technology development and innovation underpin all of this, and industry and entrepreneurs must be made aware of marine issues and be incentivised to fix them. Solutions must themselves be sustainable, both financially and environmentally, to avoid recreating the same issues for the marine environment that have been established on land, such as waste materials. Dan made the case for a versatile and motivated marine technology ecosystem with responsible harvesting, processing and application of marine resources, as well as attempting to curb the damage caused by past mistakes.

At the end of the pitches and discussions, participants used an online voting tool to vote for their favourite pitch. Each pitch received approximately one third of the vote, leading Karyn to summarise that all sectors and stakeholders have a vital role to play in ensuring that marine ecosystems are used sustainably.



Critical emerging topic: Marine plastic

The Plastic Tide

Ellie Mackay



This talk looked at a topical subject relevant to the overall theme to give wider context to the event.

Through this highly interactive session, Ellie described how in the last decade the amount of plastic washing up on our beaches has increased by 250%⁵. One of the gravest concerns is that of the millions of tonnes of plastic that wash into the oceans each year, we can only account for the 1% on the surface of the ocean⁶. Furthermore, the presence of plastic in oceans is having a detrimental effect on the health of marine life and ecosystems; so much so that it is estimated that 99% of seabirds will have ingested plastic by 2050⁷.

To reduce this threat to our marine environment, the session explored how integrated solutions that tackle waste management, promote circularity and increase knowledge of the problem are urgently needed. Above all, the solution needs to be 21st century in terms of scale, speed, efficiency and interdisciplinary collaborations.

⁵ <https://www.theplastictide.com/>

⁶ Ibid.

⁷ <https://www.sciencedaily.com/releases/2015/08/150831163739.htm#:~:text=The%20researchers%20predict%20that%20plastic,eaten%20plastic%20of%20some%20kind.>

One of the gravest concerns is that of the millions of tonnes of plastic that wash into the oceans each year, we can only account for the 1% on the surface of the ocean⁶

Rovani Sigmoney

UNESCO



Through her UNESCO work developing engineering education, Rovani aims to bring more young people into engineering to tackle the UN Sustainable Development Goals and improve the wellbeing of people around the world. In her keynote speech, Rovani discussed how climate change will affect everyone and their everyday lives. She argued that it is crucial that civil society, academics, policymakers, governments and international organisations, such as the United Nations, seek practical changes that can be made, at all levels, to embed sustainable development, climate adaptation and mitigation into the lives of individual people around the world.

Professor Carlos Nobre

World Resources Institute, Senior Fellow



From his perspective as a former member of the government and an eminent Brazilian academic, Carlos gave shared insights into the challenges that climate change poses for tropical ecosystems and the nation states (and people) that live within them. He spoke in particular about his research in the Amazon rainforest and called on the participants to find a development paradigm. He explained that current models are resource-intensive, destructive, and do not put local communities at their heart. By reframing prosperity and measuring the greatest wealth in terms of biodiversity, Carlos believes that those living in ecosystems such as the Amazon can promote a science-driven bioeconomy that benefits local people while protecting the environment.

Frontiers insights

During the symposium, the event and session chairs were tasked with identifying a small number of key questions for deeper discussion at the Frontiers insights session, the final part of the event. The mantra “you’ve got to measure it to manage it” was identified as a common thread from the discussions – without good, reliable, usable and proportionate data about climate change and its impacts, stakeholders will not be successful in implementing management strategies, policies or innovation.

Participants were split into groups for these discussions, as summarised here.



The mantra “you’ve got to measure it to manage it” was identified as a common thread from the discussions

How do we structure a global governance system to deal with climate change?

This discussion identified a need for integrated approaches to work at various levels (global, regional, national, and local), while recognising that there will be very different priorities at each level. The group wanted to see more accountability and responsibility taken by political leadership, because while there seems to be a lot of action, concern and innovation at ground-level, the group felt that a top-down approach would help create real change. Furthermore, the current institutions and time scales of governance structures were not felt to be fit for purpose – they were thought to be too slow and clunky.

The European Union model was identified as an example of operating regionally while considering different national and local needs. There was some debate as to whether it would be desirable to see similar models working globally or for other regions, with the hope that this would lead to better integration of interventions at the different scales. Participants also saw huge value in the private sector as a stakeholder to tackle climate change. Identifying and highlighting the business opportunities presented by the challenges of adaptation and mitigation activities may help governments to see that there is economic value, and therefore be more inclined to take action.

Should scientists and policymakers focus on poverty alleviation or consumption management to fulfil goals of inclusivity and wellbeing in a 3°C world?

Governance

This was identified as a crucial component in resolving the tension between poverty (often in the Global South) and excessive consumption (typically in the Global North). The group questioned whether there is a role for governance to regulate supply chains at a global level. While there is cheap labour in low and middle-income countries, excessive consumption is enabled in more developed countries. The group wanted to see fair pricing models implemented to incentivise more sustainable production and consumption patterns.

Legislation

This can be a powerful tool to change behaviours. The group identified the need for legislation to enact fair regional and global trade agreements, to enable appropriate technology development and roll-out, and address the challenges of rapidly growing populations in the Global South. They discussed the pros and cons of implementing a 'carbon tax' to address inequity. On the one hand, carbon taxation might bring about behavioural change, while on the other it could mean that the wealthy corporations or individuals 'pay to pollute' in a way that leaves the burden on the poor.

Behavioural change

This was felt to be an essential part of this debate. There is no simple answer to the question posed, and participants felt that both addressing poverty and managing consumption were equally important. However, on both sides of the equation behaviour change is essential – the group wanted to see outreach and education work done together with local community groups to bring about change. They wanted sustainable behaviours to be rewarded, and polluting behaviours to be legislated against, implementing a 'carrot and stick' model.



What are the challenges and opportunities presented by observations of oceans, coasts and climate?

The need for good data, observations and measurements was at the centre of many conversations at the symposium. The group spent some time discussing data sharing, not just through journals and open sources, but also how crucial it is to see the publication of algorithms, as well as the data and metadata behind observations.

The group noted challenges relating to the inequality of access to data, which may be a limiting factor for some researchers or innovators. They also noted how increasingly important observation and data will become, for example for early warning systems in the context of increasingly unpredictable weather systems.

The standardisation of data collection and observation methods was identified as a further challenge. The group wanted to see robust frameworks that accounted for scale and guided the quality of observations, to ensure data sharing is possible. This also brought up questions about data ownership and methodology with a view to ensuring inclusivity.



What is the role of policy in developing an inclusive and sustainable blue economy?

This discussion focused on the importance of bringing stakeholders together to input into policymaking. Key stakeholders were identified as academics and researchers, the business community, local communities, and NGOs, as well as those involved with policy decisions.

There was a feeling that low- and middle-income countries tend to be more active and innovative in the blue economy sector, and often have more influence over policymakers than their counterparts in higher income countries. The group wanted to see champions from various sectors working together to build an enabling environment for a sustainable and inclusive blue economy for low- and middle-income countries.

How can we apply transdisciplinary skills to tackle the marine plastics problem?

The discussion distilled the challenge of marine plastics into three areas:

1. Identification of the problem

While it's clear that there is a marine plastic problem, it's an emerging area and much more needs to be done to fully understand it. Scientists need to better understand:

- where plastic is coming from and at what scale
- what the chemical composition of the problem plastic is
- what pathways the plastic travel
- what the destination is – be that in plankton, fish, mammals, or a deposit in sediment.

While modelling can be a good tool, the models are not yet adequately robust because the system is poorly understood – the delegates agreed that they need to add better monitoring tools to the models, including the use of artificial intelligence and/or machine learning, to give a full picture.

2. Mobilisation

The group emphasised the importance of outreach, for example through profile-raising activities – they proposed a 'World day for plastic clean up on beaches' to give worldwide visibility to the challenge. In parallel, the group wanted to see citizen science used as a tool to collect data and feed up into an 'International Alliance for Plastics' – they argued that a multinational organisation, such as the United Nations, should be seen as a portal for activities and information.

3. Transformation

There is a need to find alternatives for plastic. The group agreed that there was scope to learn from the pre-plastic era, when people used glass, metal or other materials. However, there is also a need to develop new and improved technologies and materials. This is a field that needs significant investment, and the price point must be right if businesses and consumers are going to adopt them.

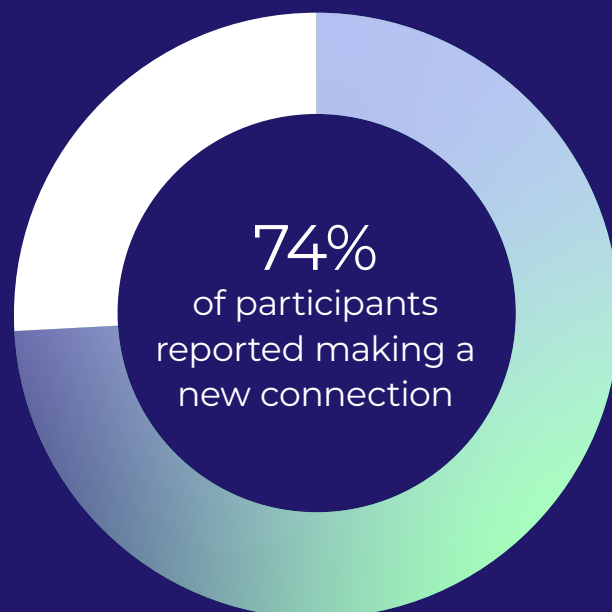


LIF Innovation Unconference

In conjunction with the symposium, a joint Innovation Unconference was hosted with the Academy's Leaders in Innovation Fellowship (LIF) programme. The event brought together four years of LIF alumni from Brazil, Chile, Colombia and Mexico as well as participants of the Frontiers symposium.

Beyond encouraging new research partnerships, the Innovation Unconference allowed LIF alumni to share their experiences of commercialising research and explore how entrepreneurship can be used to develop regional and global solutions to the threats of climate change.

In the feedback, 74% of participants reported making a new connection, including with someone working on a similar or complementary project, or someone they felt they could help in some way. A quarter of attendees said that networking and meeting new people had been their favourite part of the event and 83% of attendees said the event had helped them understand a new topic.



Seed funding awards

Promoting climate-resilient aquaculture through shared space for co-designing adaptation measures

- Olalekan Adekola, York St. John University
 - Margaret Gatonye, Aquaculture Association of Kenya
 - Bart Malaba, Larive International
 - Dr Paul Orina, Kenya Marine and Fisheries Research Institute
-

Geophysical investigations of groundwater for rural community-use in Lobitos, Peru

- Lai Bun Lok, Lancaster University
 - Dr Xiaogang Shi, University of Glasgow
 - Diego Almendrades, Ecoswell
-

Low cost sensors for monitoring drinking water in Nigeria

- Zhugen Yang, University of Glasgow
 - Mojisola Owoseni, Federal University Lafia
-

Sustainable ship breaking process for cleaner environment and better wellbeing

- Md Jahir Rizvi, University of Plymouth
 - Margaret Oguguah Ngozi, Nigerian Institute for Oceanography and Marine Research
 - Olalekan Adekola, York St. John University
 - Mohammad Rafiqul Islam, Bangladesh University of Engineering Technology
-

Community-led air quality monitoring in a Kenyan informal development

- Francis Pope, University of Birmingham
 - William Avis, University of Birmingham
 - Michael Gatari, University of Nairobi
 - Vera Bukachi, Kounkuey Design Initiative
 - Mark Pelling, King's College London
-

Resilience of cultural heritage to climate change in Southeast Asia

- Alexandre Gagnon, Liverpool John Moores University
 - Bui Quang Thanh, VNU University of Science
 - Witiya Pittungnapoo, Naresuan University
-

Attendee list

Name	Organisation
Alexandre Gagnon	University of West Scotland
Andy Wiltshire	Met Office
Anna Okello	Practical Action Kenya
Bart Malaba	FoodTechAfrica Larive Africa Group
Beatrice Padovani Ferreira	Federal University of Pernambuco
Benjamin Dovie	University of Ghana
Bui Quang-Thanh	VNU University of Science
Christian Baretta	University of Leeds
Clênia Rodrigues Alcântara	Federal University of Campina Grande
Dan Watson	Safety Net Tech
Diego Almendrades	EcoSwell
Dolors Armenteras	Universidad Nacional de Colombia
Ellie Mackay	Plastic Tide
Enedir Ghisi	Federal University of Santa Catarina
Flavia Zanetto	University of Sao Paulo
Francis Pope	University of Birmingham
Henrique Frassard	TechDuto
Jahir Rizvi	University of Plymouth
Joana Setzer	London School of Economics
João Paulo Machado Torres	Rio de Janeiro Federal University - Institute of Biophysics
Joel Kariuki	Mabati Rolling Mills Ltd
Judith Torimiro	University of Yaounde 1
Julianne Otim	Makerere University
Karyn Morrissey	Exeter University
Ksenia Chmutina	Loughborough University
Lai Bun Lok	Lancaster University



61 participants



Based in
20 countries

Name	Organisation
Leo Rios	University of Edinburgh
Margaret Gatonye	Larive International, Aquaculture Association of Kenya
Marie Antonette Menez	University of the Philippines
Mario Juruena	Kings College London
Mark Pelling	Kings College London
Michelle Mycoo	University of West Indies
Minhan Dai	State Key Laboratory Marine Environmental Science
Mojisola Owoseni	Federal University Lafia
Monica Ferreira de Costa	Federal University of Pernambuco, Brazil, Join institution
Monica Mulbert	Universidad Federal de Rio Grande/University of Tasmania
Norman Apsley	Catalyst
Olalekan Adekola	York St John University
Paulo Artaxo	University of Sao Paulo
Peter Liss	University of East Anglia
Rene Manriquez	Universidad Austral de Chile
Reza Ahmadian	Cardiff University
Robert Kayanda	Lake Victoria Fisheries Organisation
Ronald Twongyirwe	Mbara University of Science and Technology
Rovani Sigamoney	UNESCO
Saiful Islam	Bangladesh University of Engineering and Technology (BUET)
Septian Suryo	PUFFER
Shona Patterson	Future Earth Coasts
Tom Rogers	Coventry University
Witiya Pittungnapoo	Naresuan University
Yunqing Xuan	University of Swansea
Zhugen Yang	University of Glasgow

Event feedback

In the post-event survey, completed by 29 respondents, 100% of respondents said they would recommend attending a Frontiers of Engineering for Development event. 86% rated the overall event 'excellent' and the remaining 14% rated it 'good'.

"The highlight of this event has been how it's been able to bring together so many researchers and practitioners from engineering, social sciences, people who are creating new technologies, policies and legislation... it's really an amazing opportunity to be together!"

"You felt included, listened to and helped"

"A unique opportunity to share knowledge and identify potential partners"

"Frontiers is a fantastic global collaboration"





**Royal Academy
of Engineering**

The Royal Academy of Engineering is harnessing the power of engineering to build a sustainable society and an inclusive economy that works for everyone.

In collaboration with our Fellows and partners, we're growing talent and developing skills for the future, driving innovation and building global partnerships, and influencing policy and engaging the public.

Together we're working to tackle the greatest challenges of our age.

Our 2025 ambition

Talent & diversity

We'll grow talent by training, supporting, mentoring and funding the most talented and creative researchers, innovators and leaders from across the engineering profession – with an aim to help over 7,500 professionals to enhance their leadership skills.

We'll develop skills for the future by identifying the challenges of an ever-changing world and developing the skills and ideas we need to build a resilient and diverse engineering profession. We've set ourselves a target to work with over 500 engineering businesses and organisations to champion diversity and inclusion in the workplace.

Innovation

We'll drive innovation by investing in some of the UK's most creative and exciting engineering ideas and businesses. In partnership with industry, entrepreneurs and academia, we're on course to support the growth of more than 500 companies through our Enterprise Hub.

We'll build global partnerships that bring the world's best engineers from industry, entrepreneurship and academia together to address the greatest global challenges of our age. As a leading voice in engineering and technology, we're working to build networks and partnerships in over 40 countries, across six continents.

Policy & engagement

We'll influence policy through the National Engineering Policy Centre – providing independent and expert guidance to government, drawing on the expertise and creativity of over 450,000 engineers. In our 2020-25 strategy we've committed to working with over 1,000 policymakers in the UK and internationally to improve people's lives.

We'll engage the public by opening their eyes to the wonders of engineering and inspiring young people to become the next generation of engineers. Through campaigns like This is Engineering, we're changing perceptions of the profession and by 2025, we'll have helped a million young people – from every background in the UK – to explore a career in engineering.



For more information, including eligibility,
please visit raeng.org.uk/frontiers and follow  [@RAEngGlobal](https://twitter.com/RAEngGlobal)

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