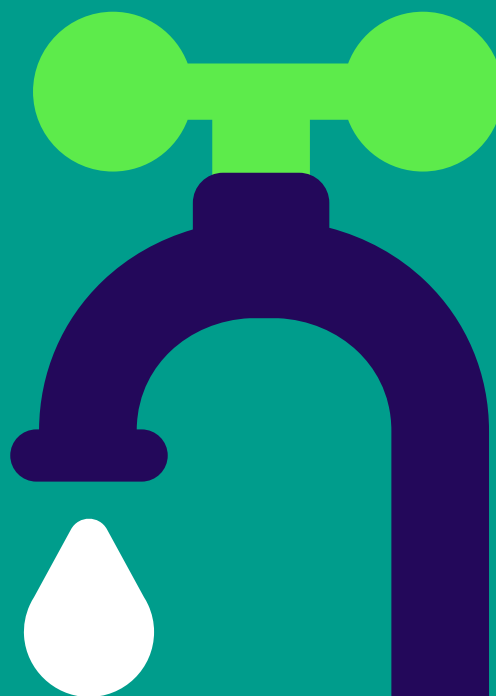


The Climate Connection Higher Education Roundtable

**Food, Water and Energy: Innovative and
Non-conventional Strategies to Mitigate
Climate Change Challenges in MENA**

Date: 19 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.

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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.

MENA report

Food, Water and Energy: Innovative and Non-conventional Strategies to Mitigate Climate Change Challenges, the third roundtable in the series, explored innovative and non-conventional approaches to mitigating the challenges the Middle East and North Africa faces in achieving food and water security.

In a stimulating discussion, panellists identified the need for more investment in research and development into the region's water, energy and food nexus to improve water efficiency, enhance agricultural production and minimize waste, and agreed that greater cooperation was needed between neighbouring countries to share resources.

List of panellists

Professor Erkan Oterkus (Chair)
University of Strathclyde

Rehab Abd Almohsen
(Provocateur and rapporteur)
Independent science journalist

Professor Hosam Shawky
Vice president of projects research station at Desert Research Center in Egypt

Professor Miriam Balaban
Secretary General of the European Desalination Society

Professor Dalila Loudyi
Hassan II University of Casablanca in Morocco

Professor Mohamed Dawoud
Manager of Water Resources Department at the Environment Agency – Abu Dhabi, UAE

Professor Fatma El-Gohary
Water Pollution Control Research Department of the National Research Centre

Professor Ahmed Kamal Moawad
Chairman of Egypt's Holding Company for Water and Waste Water

Dr Abdel Hadi Fawzy
Senior executive at Scottish Development International

Professor Inas abo Taleb
Former Executive Director of Environmental Agency Affair in Egypt

Every last drop

The Middle East and North Africa region is addressing the significant impacts of climate change on its water, energy and food nexus by developing innovative solutions through strong partnerships.

Growing water scarcity in the Middle East and North Africa (MENA) has significant impacts on its food and energy sectors.

Researchers from the region are developing strong national, international and public–private partnerships to address the complex issues facing water, energy and food supplies as a result of climate change. But are inter-regional partnerships the missing link that could make all the difference?

As part of its [Climate Connection initiative](#), the British Council hosted a [roundtable discussion](#), in partnership with the University of Strathclyde in the UK and the Desert Research Center in Egypt, to explore the impacts of climate change on MENA's water, energy and food nexus and the innovative strategies that could help address them.

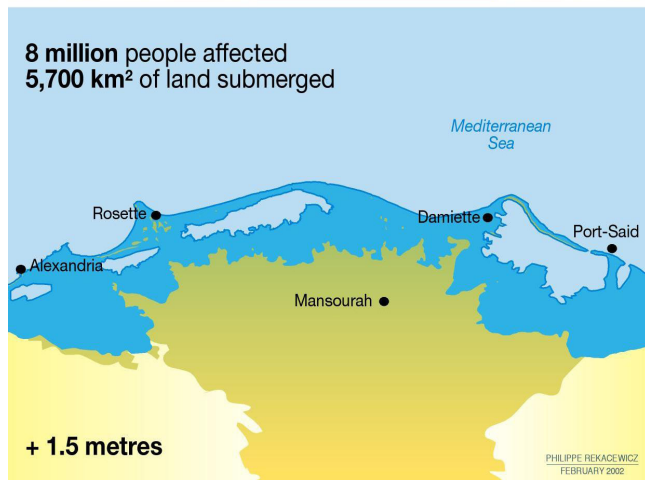
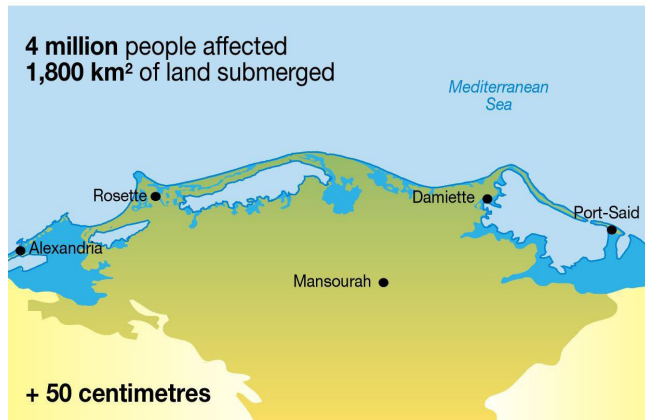
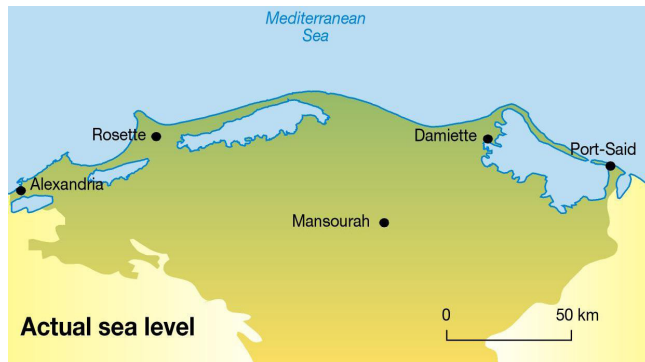


Significant challenges

The MENA region is hyper-arid and water is scarce, making it among the world's least self-sufficient in terms of domestic food production. It has a growing population that is projected to reach about 723 million by 2050. At the same time, many parts of the region are undergoing expansive economic development and facing a variety of regional conflicts and in-country instabilities.

The impacts of climate change will not make any of this easier. Sea-level rises of just 50 centimetres along the north coast of Egypt, for example, could submerge 1,800km² of land and displace four million people. A rise of 1.5 metres could be catastrophic, submerging 5,700 km² of the coast and displacing eight million.

Sea-level rises along the Egyptian north coast will also increase inland soil and groundwater salinity, disrupt supply and distribution chains, cause severe damage to large tourism investments and potentially lead to economic losses exceeding US\$35 billion, says Fatma El-Gohary of the water pollution control research department at Egypt's National Research Centre.



Sources: The Sea elevation model has been calculated by Otto Simonett (UNEP/GRID, Arendal and Nairobi) at the beginning of the 1990s. See also <https://blog.mondediplo.net/2008-01-22-Le-delta-du-Nil-menace-par-les-eaux>

Projected impacts of sea level rise on Egypt's north coast. Credit: Philippe Rekacewicz, February 2006, <https://www.grida.no/resources/5629>

The situation is further complicated by the fact that 70 per cent of surface water flow to the MENA region is through transboundary rivers, like the Tigris–Euphrates river system and the Nile, which are controlled by upstream countries outside the region, says Mohamed Dawoud, manager of the water resources department at Abu Dhabi's Environment Agency in the United Arab Emirates (UAE).

The projected impacts of climate change on the Nile River are confusing and causing considerable uncertainty, adds El-Gohary. 'Some studies suggest global temperature rises will increase evaporation from the Nile and reduce its water supply. Other studies suggest evaporation from the river will increase precipitation in the Ethiopian highlands, causing downstream flooding that cannot be accommodated by Egypt's Lake Nasser. The ultimate problem is that these two scenarios require completely opposite adaptation strategies,' she says.

All this is compounded by poor data gathering and sharing across the region and with neighbouring countries, insufficient financing of adaptation and mitigation measures and a need for improving institutional capacities to deal with the impacts of climate change, says El-Gohary.



The intersection of water, energy and food

In the western-most part of the MENA region, Morocco is facing severe water scarcity, which will only worsen in the coming years, says Dalila Loudyi, water and environmental engineer at Hassan II University of Casablanca. This will have significant impacts on the country's agricultural and energy sectors, she says. Nevertheless, the country has made significant strides to diversify its energy resources, with 52 per cent of Morocco's total energy demand now satisfied by local production of renewable energy. But even this comes with a challenge: Morocco's renewable energy stems from solar, wind and hydropower, the latter being particularly sensitive to the impacts of increasing water scarcity as a result of climate change.

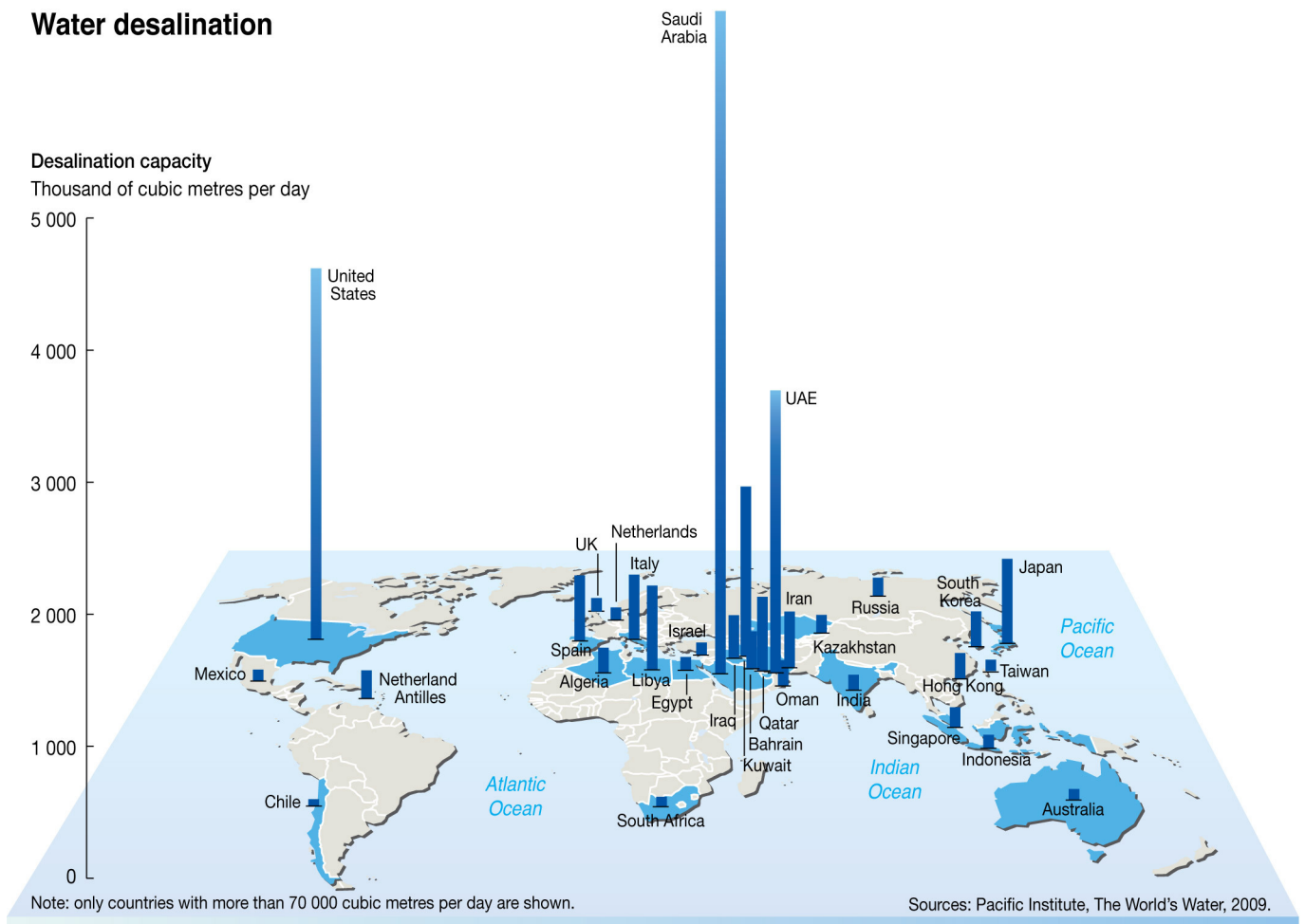
To address the country's water needs, Morocco is improving its capacity to use nonconventional water resources. For example, golf courses in the popular tourism destination, Marrakech, are now irrigated using treated wastewater, while the city's treatment plant gets its energy from biogas produced from the resulting sludge.

State-owned company OCP, the world's largest phosphate exporter, is also aiming to eliminate its use of freshwater by 2030 by building its own wastewater treatment and desalination plants. It is also investing in plants aimed to help Moroccan cities reuse treated wastewater for agriculture and the irrigation of urban green lands, says Loudyi.



Egypt has a long history of wastewater reuse. The Elgabal Elasar farm in Egypt's Eastern Desert has used untreated and partially treated wastewater since 1911, for example. The country continues to look for ways 'to use every drop of water before it is dumped into the sea up north,' says Ahmed Kamal Moawad, chairman of Egypt's Holding Company for Water and Waste Water. He says Egypt has opened two megaplants for agricultural drainage water reuse. The country continues to improve capacity for producing biogas from waste sludge to supply a large proportion of the energy demands of Egypt's wastewater treatment plants. It is also developing technologies for more efficient crop irrigation and making moves towards more dependence on water desalination where it is most cost-effective. For example, Moawad says the Egyptian government has decided the north coast will only be supplied with desalinated water.

Water desalination



The MENA region is home to a significant portion of the world's desalination capacity. Credit: GRID-Arendal
<https://www.grida.no/resources/7609>

In El Moghra in Egypt's Western Desert, the oasis's brackish groundwater is also desalinated for freshwater production, adds Hossam Shawky, vice president of projects and research stations at Egypt's Desert Research Center. The resulting waste brine from this process is used for local fish farming and to irrigate salt tolerant crops, such as safflower and quinoa.

The MENA region is home to around 60 per cent of the world's desalination plants. Desalination technologies are being continually developed and largely applied in the Middle East, where the need and financial resources for it are highest, says Miriam Balaban, the secretary general of the European Desalination Society.

But the desalination process is energy-intensive and produces a brine waste product that has considerable negative impacts on the environment.

Balaban says new technologies are being developed to turn desalination brine into a value product for the metals it contains, such as lithium and magnesium. But the expense involved in developing these technologies has hindered their use so far in a country like Egypt, says Moawad. In the meantime, Egypt has developed a desalination code to protect its coasts from the negative impacts of desalination brine disposal. The code prevents, for example, brine disposal in coastal zones where there are coral reefs. The country is also looking at technologies that improve brine diffusion into a wider area to reduce localised impacts.

Desalination plant



The fruits of partnerships

Researchers are also exploring how to power desalination using renewable energy. A research collaboration between Strathclyde University in the UK and Egypt's Desert Research Center, for example, investigated the development of a mobile, floating desalination platform powered by wind and solar energy, with the aim of providing freshwater to coastal communities. The project led to the development of a pilot station, now located in the Red Sea coastal city of Ras Sedr, which can produce 5m³/day of freshwater. The team projects that a full-scale station should be able to produce up to 10,000m³/day.

The two institutions are also collaborating to develop a smart wastewater treatment plant that uses renewable energy to power three different types of water treatment: ultrafiltration, photocatalysis and desalination.

Strathclyde University has another collaboration, with Port Said University on Egypt's north coast, to develop a large floating solar system that can produce renewable energy while protecting Egypt's North Lakes from evaporation.

Scotland is also developing partnerships in the region through its trade and foreign direct investment agency, Scottish Development International (SDI). The agency is supporting a range of desalination and wastewater treatment projects in MENA.

'What we are trying to do is transfer the desalination, separation and wastewater treatment skills and technologies gained by the oil and gas industry's subsea and offshore operations to rural communities and agriculture,' says Abdel Hadi Fawzy, senior executive at SDI. The agency is also supporting food technology projects in the region, mainly related to fish farming.

Researchers in the UK and Egypt developed a pilot desalination platform that is powered by renewable energy and can move in coastal waters to provide freshwater to difficult-to-reach communities. Credit: Erkan Oterkus and Mohamed E. A. Ali



In the eastern part of the MENA region, a rather surprising collaboration has developed between the UAE government and Emirates airline.

The UAE is focusing much attention on enhancing agricultural production without adding to the country's water stress. Currently, for example, Abu Dhabi has invested US\$350 million to transfer 500,000m³ of treated wastewater to irrigate 4,200 farms, says Dawoud. The country is also investing in innovative irrigation technologies, like subsurface irrigation, and in salt-tolerant crops, like salicornia and quinoa, that can be irrigated with brine water harvested from aquaculture.

But plants like salicornia are not a typical component of Middle Eastern diets. So the UAE has organised awareness campaigns involving renowned chefs and social media influencers to popularise it. They have even struck up an agreement with Emirates airlines to offer salicornia juice and biscuits on their flights.

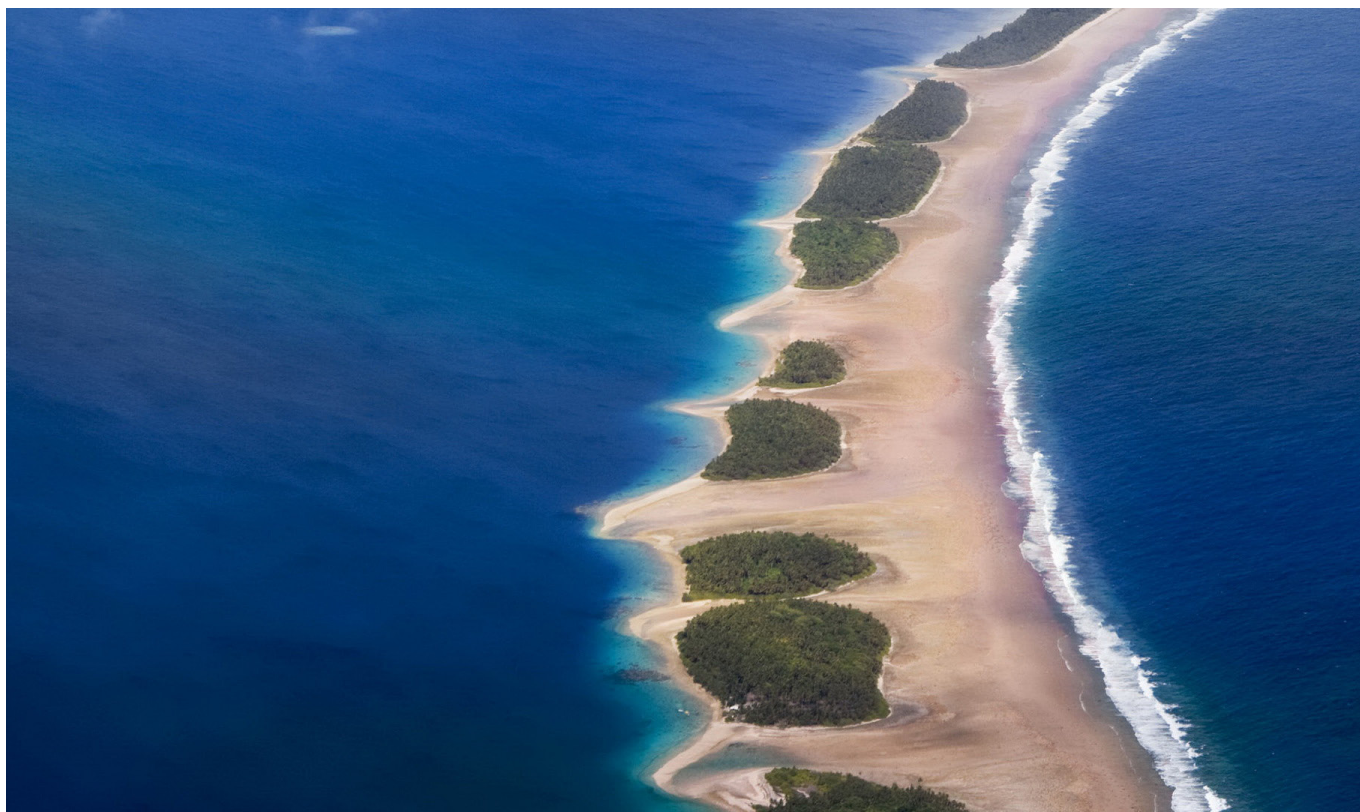
Filtration ponds
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Reflections and calls to action

Although these growing partnerships are proving fruitful, much more needs to be done. 'I find it very difficult to influence decision-makers in our countries,' says Loudyi. As an example, she describes the importance of modelling, especially when it comes to projecting the impacts of climate change on the region's water, energy and food nexus. **'Modelling is for decision support,'** she says. **'We want to assist policymakers to help them understand climate change risks, impacts and solutions.'**

'I find there is a lot of focus by researchers on the technical and engineered solutions of climate change, while sometimes ignoring local knowledge,' says Egyptian science journalist and water reporter Rehab Abd Almohsen, who was the roundtable's provocateur and local rapporteur. Abd Almohsen finds that this and similar conversations in the region fail to pay attention to the importance of scientists working with the media or even collaborating with each other across the region.



El-Gohary agrees. **‘I would like to see co-operation between neighbouring countries sharing any resources,’** she says. El-Gohary also emphasises the need for the region to produce more accurate climate impact data. Balaban adds that scientists need to become more active communicators of their research in a more understandable way.

Loudyi and Dawoud stress the importance of developing more public–private partnership models in the region and improving links to industry in order to respond to local problems with local solutions. **‘Each country needs to build their own strategies because they each have their own special resources,’** adds Islam Amin, of the department of naval architecture and marine engineering at Egypt’s Port Said University.

The roundtable’s panellists agree that more investments are needed in research and development related to the region’s water, energy and food nexus. This could lead to the adoption of new and innovative technologies to improve water efficiency, enhance agricultural production and minimise waste.

Finally, and perhaps most importantly, **‘Global co-operation is crucial to address the world’s shared challenges,’** says Elizabeth White, the director of the British Council in Egypt. **‘We all have a role to play in bringing the world together to address the global climate emergency.’**

For full details and a video of the roundtable discussion, titled ‘Food, Water and Energy: Innovative and Non-conventional Strategies to Mitigate Climate Change Challenges’, please visit: <https://www.britishcouncil.org/climate-connection/get-involved/tcc-HE-roundtable-series>

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