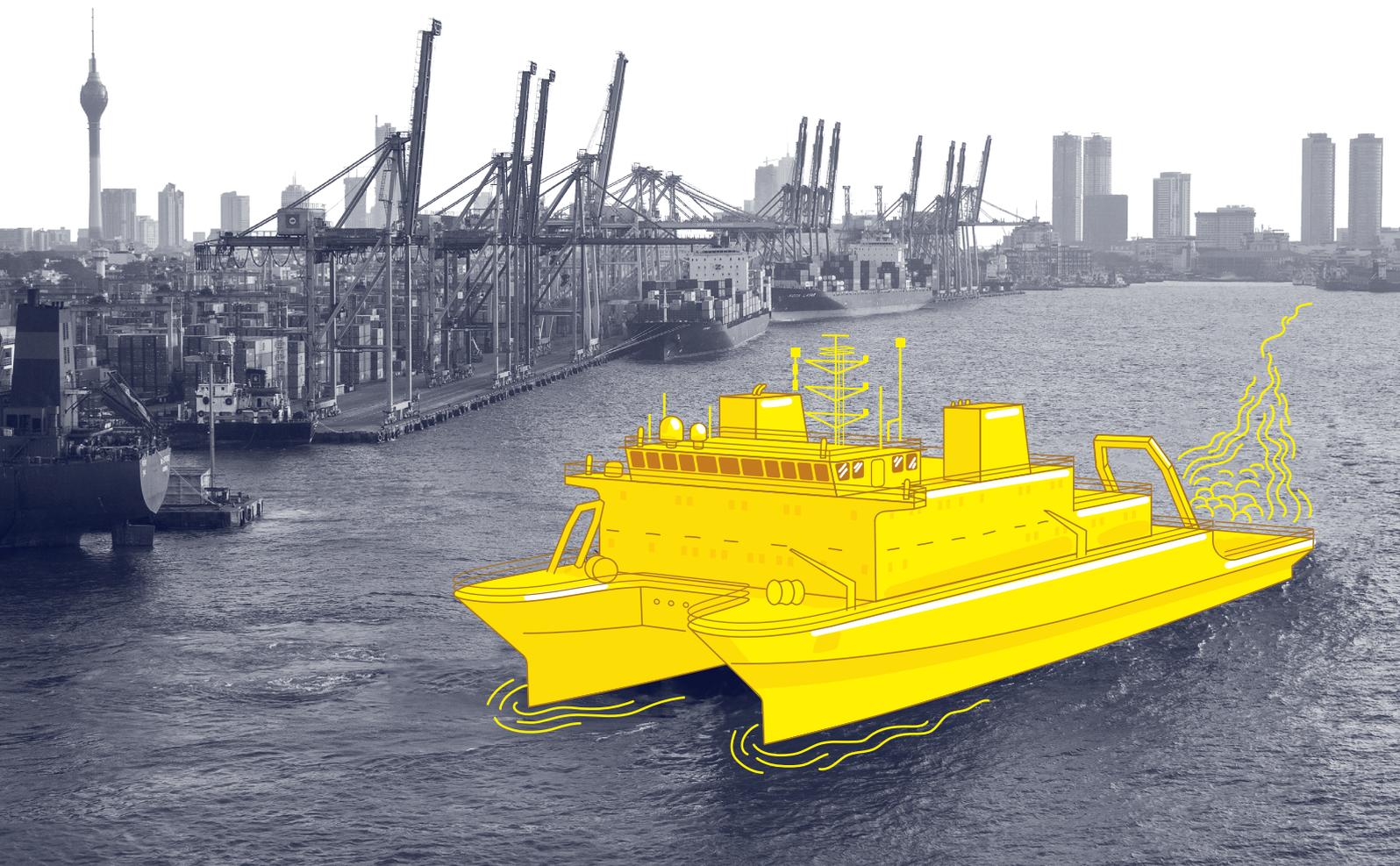


SOUTH ASIA'S PIVOT TOWARDS CHINA

Scientists in Pakistan and Sri Lanka are turning to China for support and collaboration as their countries take centre stage in the Belt and Road Initiative.

BY EHSAN MASOOD



It's nearly 10 p.m. and a shopping mall called 'Lucky One' is buzzing in the heart of Karachi. In the ground-floor food court, throngs of extended families enjoy a night out before the start of the weekend, while a boisterous group nearby plots the future of science in Pakistan. Seated at a long table, a dozen Chinese and Pakistani researchers are talking about how they will collaborate on everything from studies of medicinal plants to the impacts of mountain tourism.

"I like it here. I'm excited," proclaims Di Liu, a principal investigator

who is visiting Pakistan from the Wuhan Institute of Virology in China. Yan Wang, an early-career Chinese biochemist, nods vigorously. She likes it so much in the country that she decided last year to move there and set up a lab. Even a few years ago, it would have been difficult to imagine seeing international visitors at a public restaurant in a country laid waste by the international war on terror. But today's Pakistan is relatively peaceful. And although European

A Chinese research vessel visits the port of Colombo.

ROLF RICHARDSON/ALAMY

and US visitors are warned by their governments that this is a dangerous country to travel to, China's scientists are flocking there.

Three thousand kilometres southeast of Karachi, Sri Lanka is also seeing a growing stream of Chinese researchers. Oceanographer Tilak Priyadarshana is taking a group of visitors around a newly built ocean and climate research facility that he heads with Wang Dongxiao of the Chinese Academy of Sciences (CAS) South China Sea Institute of Oceanology in Guangzhou. The facility, so new that office chairs are still carefully wrapped in protective plastic, is based at the University of Ruhuna in Matara, less than a pebble's throw from the blue waters of the Indian Ocean.

The facility is part of a partnership with, among others, the CAS oceanology institute. Joint teams are planning to take to the ocean on board a Chinese research vessel to investigate the meteorology of the Indian Ocean and the geology of the sea bed — neither of which Sri Lanka has been able to do before now, Priyadarshana says.

Nearly forty students from Ruhuna have gone to China to study for master's degrees. "Our biggest problem is human resources," Priyadarshana says. "I couldn't just put up a building, as we are a poor nation and lack a scientific culture. That is what we are getting from China."

NEW MARKETS

Sri Lanka and Pakistan are two of 126 countries that have officially signed up to China's Belt and Road Initiative (BRI), the world's largest infrastructure-building project since the US Marshall Plan to rebuild Europe after the Second World War. China is providing more than US\$1 trillion in loans for motorways, high-speed rail, power plants, sea and airports in at least 100 participating countries. Chinese companies are even constructing new cities, such as Port City Colombo, which is slated to become a South Asian maritime financial hub next to Sri Lanka's capital. The participating countries stand to benefit from gleaming new infrastructure and China, in turn, is finding new markets for its goods and services, as well as new roads and railways to transport them.

Pakistan is the single-largest recipient of Chinese grants and loans for big infrastructure — thought to total around \$40 billion. This funding is for power stations, motorways and, eventually, high-speed rail that will be used to transport manufactured goods from China's mountain border near Kashgar, 2,500 kilometres south to the Arabian Sea (see 'Western gateway'). China Overseas Port Holding Company has also built and is now operating a seaport at Gwadar to transport its wares to the world's markets. At the end of March, construction also began on a \$230-million airport there, which will become one of Pakistan's largest by area when it opens in three years.

China's involvement in Sri Lanka is comparatively smaller — at least for now — although more sensitive politically. China and India are competing to become Sri Lanka's largest source for imports (each country exports around \$4 billion in goods to Sri Lanka each year). Furthermore, Sri Lanka owes China \$8 billion, which is around 87% of what the government receives in tax revenue. That has given China extra leverage in the country, and China Merchants Port Holdings in Hong Kong, one of the world's largest ports operators, now has an 85% stake in Sri Lanka's southern Hambantota Port. At the same time, China Harbour Engineering in Beijing is building Colombo Port City.

This has triggered a range of concerns, particularly in India, where the government is watching its neighbours pivot towards China. Economists warn that Pakistan and especially Sri Lanka might not be able to repay some of the massive loans, and environmental groups worry that the construction boom is racing ahead without thoroughly assessing the ecological and social consequences.

But as the BRI building boom ramps up in South Asia, China's researchers and universities are starting to get involved, and the activity is taking place on a scale never before seen.

In Pakistan, China has far surpassed Saudi Arabia and the United States as the leading partner in scientific collaborations, according to an analysis of co-authored papers from Elsevier's Scopus database. For collaborations with Sri Lanka, China has caught up with India in

WESTERN GATEWAY

Road and rail projects are connecting western China to the port of Gwadar in Pakistan to develop the China–Pakistan economic corridor, which is one of the main elements of the Belt and Road Initiative.

- Existing rail
- Rail improvement
- Existing road
- Road improvement
- Biodiversity hotspots



terms of co-authored papers, but remains behind the United States, the United Kingdom and Australia. In both Pakistan and Sri Lanka, research collaborations are being planned — or are under way — in fields from rice genomics to geophysics, and meteorology to medicinal chemistry. As in other BRI projects, there are opportunities for China's companies to commercialize their research products; and exciting potential for China's scientists too.

Take Wang, who quit her job researching the biochemistry of traditional medicines at the Chinese Academy of Agricultural Sciences' Institute of Food Science and Technology in Beijing to take an academic post at the University of Karachi. She misses her friends and family and it's a wrench not to be able to play competitive table tennis. But Wang sees the Karachi move as a way to secure her future. "In China, there's too much competition for promotions, and even as an assistant professor, I had to book flights and be the secretary for my boss. Here, I have autonomy to set my agenda and apply for my own funding," she says. Wang is looking to work with Pakistan's herbal-medicines industry. The medicinal plants used in formulations are mostly picked from the wild and "I want to explore whether Pakistani medicinal plants can be cultivated, as they are in China," she says. "I also want to compare the ingredients in traditional Chinese medicine with those used in Pakistani herbal medicine. I have too many things I want to do."

Liu is using his virology background to look into a different type of medicine. "I want to explore joint research in areas such as avian influenza or dengue," he says. China is seeing a spike in infectious diseases in the large numbers of Chinese workers who participate on BRI projects, and Liu thinks this could be the basis for a China–Pakistan project in genomics and disease epidemiology.

STUDENT SURGE

The academic contacts with China are growing quickly. Every year, China offers Pakistani students around 7,000 fully funded scholarships to master's and PhD courses. In February, its ambassador to Islamabad, Yao Jing, pledged to nearly treble these, up to 20,000 annually. Some



SAYNA BASHIR

Instructor Zhou Xu teaches a Mandarin class at the National University of Modern Languages in Islamabad.

28,000 Pakistani students are already studying in China, and around 6,000 are doing PhDs.

And back in Pakistan, Mandarin is being rolled out as an optional language choice (after English) in schools and universities. Most public universities already have some degree of cooperation with Chinese counterparts. The latest will be Islamabad National University, which is moving into the former official residence of Prime Minister Imran Khan, who vacated it on taking office a year ago. The university has partnered with China to build a joint centre that will focus on the environment, climate change, terrestrial and marine hazards and the ocean economy, says Safdar Ali Shah, who heads the China team at Pakistan's university regulatory body, the Higher Education Commission.

"My generation of scientists did our PhDs mostly in the UK and the USA and that is where many of us still have collaborations," says geologist Qasim Jan, president of the Pakistan Academy of Sciences and an alumnus of King's College London. "The next generation will be different. After we are gone, most of their links will be with China," he predicts.

Iqbal Choudhary, director of the International Centre for Chemical and Biological Sciences at the University of Karachi, is in that pioneer generation of Sinophile Pakistani scientists. Choudhary's centre is one of the oldest — it celebrated its 50th birthday just a few years ago — and largest institutes in Asia dedicated to the chemistry and biology of natural products. Choudhary sits in a narrow open-plan office. The wall by his desk is decorated with framed appointment letters for the many visiting professorships he has accumulated at Chinese universities. "My office alone receives two or three visiting delegations from Chinese universities every month," he says.

In January, Choudhary was hosting the Wuhan virology team and researchers from other universities in China. Two months earlier, he had been in Hangzhou at a ceremony to inaugurate the Chinese branch of the Sino-Pakistan Hybrid Rice Research Center (the Karachi branch

opened in 2017). The centre, a collaboration with the China National Rice Research Institute, is testing rice varieties that could be grown in some of Pakistan's more arid regions.

The pace of collaboration between China and Pakistan has picked up measurably in the past five years, Choudhary says. "I have been coming and going to China for 30 years, and even I have never seen anything like what is happening now."

SECURITY CONCERNS

Despite that growth, China's presence on Pakistan's campuses is not easy to spot. Chinese nationals — as with researchers from other countries — live and work inside walled communities, and some Chinese workers have been targeted by terror groups opposed to China's involvement in Pakistan. Pakistan's army has nearly 15,000 personnel that help to protect the country's Chinese communities.

Security is also of paramount importance for one of the largest collaborations taking shape near the capital. At the edge of a small dam in Haripur, and surrounded by mountains to one side, buildings are rapidly going up for four separate centres of excellence. These are being funded jointly by Austria, China and Pakistan, and will host Pakistani students and a mixed Chinese-Pakistani faculty working in artificial intelligence, food technology, mineral resources and railways. They will also offer undergraduate, master's and PhD programmes so that BRI projects across Pakistan have access to trained personnel, says Atta-ur-Rahman, one of the prime minister's science advisers. The campus will be protected, as are all Pakistani universities, by 24-hour armed security patrolling entry and exit points.

On the research side, the centres will focus on issues related to the BRI. The railways facility, for example, will explore how high-speed train networks can continue to provide the types of job that often become redundant through automation, such as signal operators and train guards. "We need the latest technology," says project director Nasser

Ali Khan, “but we also don’t want people to become unemployed.” The minerals centre, meanwhile, plans to investigate the extent of illegal mining. The first staff members and students were expected to start in October, but their arrival might be delayed over funding issues. Under its agreement with China, the local government of the northern province of Khyber Pakhtunkhwa must pay an estimated \$65 million for its part of the centres’ costs. And because that money will come out of the province’s total universities’ budget, the local government will have to either make cuts to accommodate the China project or find new money.

That’s a problem, “because it could feed resentment among academics”, says a source in a public funding agency. “The prime minister and our Chinese friends should really find extra funds for their new universities, not take money away from existing ones.”

DON'T ASK

It’s a feature of Pakistan’s relationship with China that even relatively benign questions, such as over university funding, are not easily answered. One reason is that Pakistan’s military — and especially its Inter-Services Intelligence agency — retains an outsized influence on both government and on society, explains Ayesha Siddiqi, author of the book *Military Inc*, which reveals the scale of military involvement in the economy, and who is based at SOAS University of London.

The military is hugely invested in the relationship, because China’s support strengthens Pakistan’s position against arch-rival India. That forces researchers and journalists in the country to moderate the questions they ask and the stories they write.

For this reason, some of the sources for this story were unable to go on the record. However, the situation is different for international scientific organizations, especially those backed jointly by Western powers and by China. One such group is the International Union for Conservation of Nature (IUCN), whose scientists are beginning to sound warnings of the need for more environmental due diligence in the BRI. China’s leadership is listening, although it is too early to say what will happen.

The IUCN is running a major policy study on the environmental impacts of the BRI in both Sri Lanka and Pakistan. The study was commissioned by the China Council for International Cooperation on Environment and Development, which advises China’s government and was launched after ecologists from CAS and from the environmental group WWF warned that many of the new or upgraded BRI transport routes will disrupt ecologically fragile regions from Asia to Europe.

At the same time, Pakistan’s Ministry of Planning and Development has estimated that greenhouse-gas emissions will quadruple, to the equivalent of around 1,600 million metric tonnes of carbon dioxide, between 2015 and 2030. BRI projects are expected to contribute nearly one-third of the increase.

Pervez Hoodbhoy, a physicist at Forman Christian College in Lahore, Pakistan, says that more light needs to be shed on the BRI’s environmental costs. For example, he says, a planned BRI-funded coal-fired power station in the desert region of central Pakistan will both add to greenhouse-gas emissions and worsen water shortages by depleting aquifers. “There will be migration of people out of the area,” he predicts.

But Aban Marker Kabraji, Asia director at the IUCN in Bangkok, says that China’s leaders are well aware of potential environmental problems. “China is thoughtful. It accepts international criticism. They know there are risks to the Belt and Road and they are open to learning better models,” she says.

SRI LANKA'S SCIENCE PLANS

Standing next to the azure blue waters of the Indian Ocean, oceanographer Priyadarshana sees more benefits than worries in the future relationship with China. He explains how China’s investments in Sri Lanka are benefiting both countries — a prime example of the win-win philosophy that runs throughout the BRI investments.

Sri Lanka gains by having access to China’s ocean research expertise. And CAS gets full access to all the data generated from joint projects, including those from its surveys of the Indian Ocean and from the monitoring station at the University of Ruhuna. The weather and climate data will feed into CAS’s global environment and climate database, which is part of China’s Digital Belt and Road — a platform for sharing information between BRI countries.

Chinese scientific investments are also helping to address crucial issues in central Sri Lanka, says Sujithra Weragoda, director of the China–Sri Lanka Research Grant Project in Peradeniya, pointing to coloured pins on a large wall-mounted map of the country. Weragoda is working closely with scientists from CAS to investigate a mysterious chronic kidney disease that afflicts mostly rural Sri Lankans. Each pin represents a disease hotspot.

Despite two decades of research, a precise cause still isn’t known, although contaminated well water is a strong candidate. “There are around 35 published hypotheses,” Weragoda laments. And that’s where China can help. Its commerce ministry is contributing \$12 million in aid towards research and technologies so that CAS researchers can work with Sri Lankan colleagues to whittle down the causes, and provide water-purification technologies and dialysis services.

But the terms of that aid have raised concerns. Chinese companies are building the main water lab building at Sri Lanka’s University of Peradeniya and supplying the water-purification technologies that are in use at several pilot sites as well as the home dialysis kits that Sri Lanka’s primary health-care workers are being trained to use. China will also eventually help Sri Lanka to establish a nationwide system for clean water and sanitation, which will provide the potential for more commercial income.

The decision to allow China’s private companies into Sri Lanka’s largely publicly funded health-care system worries some scientists. Among them is Kamini Mendis, an independent malariologist and joint architect of Sri Lanka’s successful efforts to keep the country malaria-free. “If China’s scientists are looking for win-win, the problem is that this compromises the mission,” she says. “If you have to buy this or that machine; or if

you have to use this or that technology, even if it is not in the best interests of your people, then you are compromised,” she adds.

There are also concerns about lack of transparency. Channa Jayasumana, who studies chronic kidney disease at Rajarata University of Sri Lanka in Mihintale, would like to work on the China–Sri Lanka project but neither he nor his collaborators have been invited, even though he says his university is the only one based in the larger areas affected by the disease.

But Weragoda argues that involving Chinese companies will help to raise Sri Lanka’s product standards and will reduce what he says is an epidemic of rogue product suppliers that is endangering public health. Priyadarshana, too, is upbeat about the future. Yes, CAS is collecting large quantities of data. But no one will invest money without return, he says. And that is no different from Western private companies that use public data for commercial return, in Sri Lanka or elsewhere.

Despite all the questions that surround the BRI, researchers in China, Pakistan and Sri Lanka say that the overriding win for all sides is in the scientific benefits. Whatever happens next, the BRI’s lasting scientific legacy to Sri Lanka and Pakistan is likely to be a large number of highly skilled scientists — something that Western aid has not achieved. “China delivered where the West failed,” says Weragoda emphatically.

In Sri Lanka, Priyadarshana is bowled over by the changes he sees in his students who are studying in China. “Their exposure to China’s academic system and to Chinese culture has made them so much more confident, to the extent that I could no longer challenge them. Now, thanks to China, we have the next generation of scientists who will be our scientific leaders for many more generations to come.” ■

Ehsan Masood writes about science policy from London.

“WE NEED THE LATEST TECHNOLOGY, BUT WE ALSO DON'T WANT PEOPLE TO BECOME UNEMPLOYED.”