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The International Tunneling and Underground Space Association (ITA) is the organisation that represents the tunnelling industry to the world. Its president since 2019 has been Jinxu Yan. Here she speaks to **Julian Champkin** about her background, her role and her hopes for the ITA

## JINXIU YAN INTERVIEW



### have been working in the tunnelling

industry for over 50 years now. As a research team leader or an expert appointed by project owners, I have been involved in many long and challenging tunnelling projects. One was the New Guanjiao Railway Tunnel, which at 32km is the longest railway tunnel in operation in China. Another is the 18km Qilong Zhongnanshan road tunnel, the longest of its kind in China; and the 7.8km Qingdao Jiaozhou Bay undersea road tunnel.

I have worked internationally as well, but mainly in China, and a lot of my work and some of my most challenging tunnels, have been through Karst geology.

I have also been involved in metro projects in Qingdao, Chengdu, Guangzhou, and Shenzhen.

The project that has given me perhaps the most satisfaction was the Qingdao Jiaozhou Bay undersea road tunnel. Construction began in December 2006, and it came into operation in June 2011. It has three tubes, two main tunnels and one service tunnel in the middle, and carries six lanes, so a pretty big project. I think that I like it because not only was it very challenging, with its long submerged distance and with some geological difficulties also, but it was done very well. It has been in operation now for more than ten years, so it is proved a successful project. Still, I figure the reason I like it is that throughout there was a delighted co-operation with the project owner, Qingdao Conson. They concentrated on the overall cause of the project itself and tried to avoid distractions; and they respected everyone involved. Too often, the project owner, the contractor, the designer, and the technical provider are not entirely on the same page or wavelength; but in this project, they respected all the participants and created a very nice atmosphere.

Another reason I am happy with it because they have just started building a second undersea tunnel in the same region ten years later! That shows that the users are comfortable, and the project organisers are happy, which is a sign of a successful project. The new tunnel is 17.5km and also of three tubes; I think it is the world's longest undersea road tunnel of this kind.

I first became involved with the ITA in 1990. In that year, its annual meeting was held, in Chengdu – they called it the 16th annual meeting and the international congress in those days, rather than the more impressive World Tunnel Congress that it has become. I was a young engineer

and served on the organising committee to support it. After that meeting, I began translating ITA news and papers and sharing international tunnelling information with Chinese colleagues.

And from around 1990 to 2012, I was one of China's representatives to the ITA. As you know, the ITA has member nations – 78 of them at present – and the associations of those member nations send representatives to the ITA. So, I was one of the representatives for China.

I also joined ITA working groups: I served on Working Group 11, which is about immersed and floating tunnels, and on Working Group 17, which is on long tunnels at great depth. I also served on the editorial board of Tunnelling and Underground Space Technology. In 2013 I was elected as an ExCo member, in 2016 as vice president, and in 2019 I was elected as ITA president. So that is my background. I suppose you could say the ITA and myself go back a long way together.

The ITA is the leading international tunnelling organisation. I think our strength does not come from each of us; it comes from all the member nations working together. So I think my role as ITA President has to be to organise all our resources to help make that happen, to ensure that we do indeed all work together.

It is the same for the ITA ExCo team. This ExCo team could be the most ever diverse one from 15 countries on 5 continents, and everyone has his special focus and strength.

Despite being from different parts of the world, with different cultural backgrounds, different experiences and different personalities, this diversity has brought value to our team to serve ITA. The key is to let each member play their role and, at the same time, work as a team.

ITA is the association of member nations. Some countries are very experienced in tunnelling, while other countries may be developing and have fewer tunnels and less experience of building them. And the ITA, as an association, provides a platform for all, to share knowledge; and so our industry gets stronger, and tunnelling becomes more widely available and better used.

The association should be an integrated one for the whole global industry. We have working groups and committees, each with their areas and specialities, and those too should be working together and sharing their different experiences. They need each other's input; in that way they can work on systematic solutions. I think that is important and is one of the great values of the association.

Sustainability is one of the critical elements of ITA's strategy. We all know that tunnels and underground space can provide sustainable solutions to society. For example, among the 17 UN Sustainable Development Goals (SDGs), tunnelling and underground space can contribute to several. However, the construction of underground projects requires lots of



Above: ITA President Jinxu Yan has worked on many large tunnel projects in China



Above: ITA President Jinxiu Yan sees rising international demand presenting many opportunities for underground space to serve society



Above: President Jinxiu Yan has had a long relationship with ITA on many activities, including engagement in sustainability

materials and equipment and produces emissions. Therefore, we should pool our resources to make our construction greener and more sustainable. Among the efforts, innovation is significant to reduce the carbon footprint of a tunnel become not just desirable but possible. We need to be using new technology that reduces CO<sub>2</sub>.

And there is certainly a huge amount of technological development in tunnelling. Treatment and re-use of spoil is an example. Materials from hard rock tunnelling can be used for many different purposes fairly simply, but the spoil from EPB or slurry TBMs is wet or even liquid which is very difficult to handle. We now have the technology to treat these spoils. We can separate them into aggregate, sand, dry clay and clean water. I think that is important for a good environment and sustainability.

Another interesting technology is for pre-fabricated and assembled metro stations, built in factories away from the site and therefore made by machine, not

by hand, more efficiently, with less labour and fewer emissions. We are now working on concretes that emit less carbon, and designs for more efficient tunnel linings and therefore save carbon.

As the equipment is essential for tunnelling, we need to think from the design stage of the reusability of the equipment, including the reusability of the machine itself and the reusability of its components when the equipment cannot be used anymore. It is something related to both cost-effectiveness and sustainability.

My term as President of the ITA is for three years, but more than two of those were taken up by the Covid pandemic. I think that must have made it perhaps the most challenging presidency term ever! But we have managed to move most ITA business online and have even been able to increase the number of activities. A physical event was not possible but we have held our general assembly online, our ITA awards online, and we have monthly online meetings.

Tunnelling itself of course has to happen in the real world, not virtually, so those projects that went ahead in the pandemic had to work out how to do it, keeping safe separation and so on, it was difficult but even during the pandemic real tunnelling activities moved forward steadily worldwide.

The ITA has another role, which is to encourage the better use of tunnels and underground spaces. For that reason, we have been trying to promote ITA to high-level organisations and policy-makers, especially to United Nations bodies. Over the past two to three years, we have supported the UN SDGs. We invited its UN Environment Programme (UNEP) official to our workshop in Geneva in February 2020, and the ITACUS has become an official partner of the UNEP. On behalf of ITA, I attended in person the second UN Sustainable Transport conference held in Beijing last year, and we organised for this UN event an online side-event entitled 'Sustainable Urban Underground Transportation.' I think that we received very positive feedback from the audience and the UN.

We have close cooperation also with the Asia Infrastructure Investment Bank (AIIB). That is important because it is a bank that

funds sustainable infrastructure and tunnels are important parts of the infrastructure. So, we have organised ITA-AIIB joint workshops to share tunnelling's contributions to sustainability and new technologies to their projects.

I think another priority is to try to use the talents and resources of the ITA family and the industry. Another thing we have done during my time as President is to set up an ITA advisors' group. The advisers are very experienced even though they are no longer executive members, and some of them have been lifetime supporters of ITA. The ITA is going on its 50th anniversary in 2024, and one of the things we discussed at the group's first meeting was the ITA strategy for the next level.

Globally, there is probably more tunnelling in progress now than there has ever been. In Europe some large projects are under construction, such as the Brenner Base Tunnel, Mont Cenis Base Tunnel, and Fehmarnbelt tunnel, which will move more freight from road to rail to reduce CO<sub>2</sub> emissions and air pollution. In Asia, China, India, Singapore etc. have many projects ongoing. In China, more than 6000km of urban transit rail projects are under construction, and around 80% are underground. Many cities on other

continents are building new metro systems—look at Australia, Canada etc.

And, of course, tunnelling is not only for transport. Bringing clean water and disposing of sewage keeps people healthy. A 98km water transfer tunnel was broken through early this year in Shaanxi Province, China, transferring water from the Han River to the Wei River to alleviate the water shortage of cities and industries along the Wei River. Those tunnels are hidden from public view, most people don't see them or even realise that they are there, and they may be less glamorous than the traffic projects but they are every bit as important as tunnels for road and rail. Again it is about sustainability.

So tunnelling is important for sustainable infrastructure and development, which means it is critical that we attract more people to work in this industry. Innovation such as mechanisation and automation of the tunnelling process and new materials will help here, as well as as much use as possible of advanced equipment, smart systems, programmes, and new materials.

Automation, of course, helps make working conditions easier. If machines can be controlled remotely the tunnellers don't have to work amid the dust and the noise

and the bad conditions of underground. Improve the construction conditions of tunnelling and you will not only reduce labour intensity but also attract more people to join the industry – especially young people. Why should they not spend their working lives in a pleasant environment?

And 'young people' of course includes young women. When I began in tunnelling, thirty years ago, I was the only woman in my group. Now there are lots of us. The Young Tunneller of the Year 2019 was a lady, Amanda Kerr. The co-chair of ITACUS, our Committee on Underground Space, is Antonia Cornaro. The current chair and vice chair of ITA young members group are both female; a few ITA member nation representatives as well. I believe that more ladies will join us. ■

WTC2024 will be held in Shenzhen, China, after 34 years from the first ITA conference in China in 1990. There are so many exciting tunnelling and underground space projects here, built, under construction and to be built soon, which will be a nice place to see different projects and exchange ideas on tunnelling technologies here. Welcome to WTC2024 – tunnelling for a better life!

“THE PROJECT THAT HAS GIVEN ME PERHAPS THE MOST SATISFACTION WAS THE QINGDAO JIAOZHOU BAY UNDERSEA ROAD TUNNEL”