

INDUSTRIAL SPACE
Pushing limits - underground

Subterranean projects are underway to create more usable space and free surface land for other productive uses, reports EMILYN YAP

MENTION the underground and scenes of dark tunnels and claustrophobic chambers often come to mind - and this is something Hollywood has exploited in many of its blockbusters.



Space seeker: Other than oil refineries, Jurong Island (above) will also be home to the Jurong Rock Cavern; 'Besides using the surface as a resource to build on, we are trying to use the underground as an additional resource,' says Mr Ong (next photo)

But technology has made it possible for civilisation to venture underground in much better conditions. A successful and well-known example is the 19-mile-long underground city in Montreal, Canada, which boasts bright passageways linking metro stations, offices, shopping malls, hotels, restaurants, universities and attractions.

Providing shelter from the weather and smooth, traffic-free access to various places, more than 500,000 people reportedly pass through the underground city every day. The city has even become a tourist destination in itself.

With land being such a scarce resource in Singapore, there is certainly strong interest to create more usable space in the subterranean levels for industrial use. JTC Corporation, as the agency driving the country's industrial growth, has been developing the concept on several fronts.

New capabilities

JTC's core functions include master-planning industrial estates, allocating land for industrial use, and preparing land ahead of time with the right configuration of infrastructure and utilities. But as global competition heats up, 'JTC will have to grow new capabilities to deliver strategic infrastructure and cutting-edge solutions to sustain our competitive edge', said Prime Minister Lee Hsien Loong at the agency's 40th anniversary dinner in June.

And JTC has been doing that. Already underway is construction of the Jurong Rock Cavern (JRC) at Jurong Island. The facility, more than 100 metres below sea level, is set to become the first underground rock cavern for oil storage in Singapore and South-east Asia.

When completed, the JRC is expected to produce more than 2.7 million cubic metres of storage space, saving more than 100 hectares of land above ground for other uses such as higher-value manufacturing.

But as examples around the world show, innovation can turn the underground into large liveable spaces housing a wider range of economic activities. Recognising the potential, JTC called a tender in May for an 'underground rock cavern usage feasibility study' to explore how caverns beneath Singapore can be used.

Such caverns could house power stations, reservoirs, water reclamation plants, incineration plants, landfills, wafer fab plants, laboratories, data centres, warehouses and port and airport logistics centres to free up surface land for other productive uses.

The study will examine space, technical, functional, operational, maintenance and financial requirements of underground rock caverns. It will also cover possible environmental and health issues such as pollution, radiation and damage to existing buildings and infrastructure.

Given the diverse uses considered, the study is likely to involve other government agencies such as the Energy Market Authority, Civil Aviation Authority of Singapore and the Public Utilities Board.

Over at JTC, some underground projects are already taking shape. The first is an underground science city catering to research and development activities, which could be located near the existing Science Park at Kent Ridge.

Housing laboratories and other facilities in an estimated cavern space of 290,000 square metres, the city would free about 12 hectares of surface land with a plot ratio of 2.5.

Underground science city

The underground science city would complement the Biopolis and support a range of industries, including digital media, computer engineering and biochemistry.

'Besides using the surface as a resource to build on, we are trying to use the underground as an additional resource,' said JTC's assistant CEO Ong Geok Soo.

JTC will need at least another one-and-a-half years to conduct detailed analyses on the underground science city, which is still in the preliminary stages of study.

Another venture involves creating an underground warehouse in Tanjong Kling to provide storage space for manufactured products. Located within the Jurong Industrial Estate, the warehouse would have cavern space of 1,137,500 sq m, freeing 46 ha of surface land with a plot ratio of 2.5. The concept, also in the preliminary stages of study, is not unlike that of the underground ammunition facility at Mandai, commissioned by the Ministry of Defence for the storage of weapons.

JTC's potentially rewarding ventures are not without risks. 'We often plan ahead for industry needs and that will always involve a bit of uncertainty,' said Mr Ong. 'But we minimise the risks by working very closely with the Economic Development Board to find out the needs of the industries they are bringing in.'

Using in-house statistics and information from the EDB, JTC projects industrial demands and plans for them. Nevertheless, 'there will be some factors which are out of our control,' Mr Ong said. 'Construction costs, for instance, are determined by the market.'

JTC's role is particularly crucial when it comes to strategic projects involving certain scale, risks or technical complexity. 'We maximise the private sector's participation whenever possible,' he said. 'But if the risks or investments involved are too high, JTC will undertake the projects as the development agency.'

And the groundbreaking ventures look set to continue for the agency. As Mr Lee said: 'JTC must keep on pushing the limits of possibilities, to try out new ideas, and seek opportunities beyond known frontiers.'



Demand and supply: Multi-tenanted buildings in Science Park II (above); JTC's potentially rewarding ventures are not without risks, but it minimises them by working very closely with the EDB to find out the needs of the industries EDB is bringing in

POTENTIAL UNDERGROUND ROCK CAVERN USES	LEAD AGENCIES
■ Power stations and electrical substations	Energy Market Authority
■ Incineration plants	National Environment Agency
■ Water reclamation plants	Public Utilities Board
■ Landfills	National Environment Agency
■ Reservoirs	Public Utilities Board
■ Warehousing and storage	JTC & Defence Science and Technology Agency (DSTA)
■ Port logistics	Maritime and Port Authority of Singapore
■ Airport logistics	Civil Aviation Authority of Singapore
■ Data centre	Infocomm Development Authority of Singapore, JTC and DSTA
■ Wafer fab plants and R&D labs	JTC

Source: JTC Tender