

The chance for a better future

Underground space development is a testament to human ingenuity and a solution to modern urbanisation challenges. **Ioannis Fikiris**, Vice-President of the International Tunnelling and Underground Space Association, gives an insight into the organisation that is leading the way for such engineering feats

Right: **Nant de Drance hydropower cavern in Switzerland**



Below: **Tunnel steel lining and welding in a hydropower tunnel. Underground projects are integral components of hydro projects and water storage reservoirs**



THE INDUSTRY RELATED TO underground projects is constantly evolving, and various topics and trends are of interest to professionals and stakeholders in this field. Underground projects are increasingly focusing on minimising their environmental impact and increasing their sustainability through the reduction of carbon emissions, preserving ecosystems, and implementing sustainable construction practices.

Concerning urbanisation and infrastructure development, many underground projects are related to expanding urban areas, including subway systems, water supply tunnels, and underground utilities. As cities grow, the use of underground space becomes essential for efficient transportation and infrastructure development.

Indeed underground projects are integral components of the system of structures that make up hydroelectric projects or water storage reservoirs. Tunnels or other types of underground structures are used as spillways, water diversion routes, accesses, grouting galleries, water conveyance and storage, shafts, plus underground caverns for energy production equipment etc. There are countless hydropower or dam projects worldwide where underground space

solutions facilitated the constructability of such projects and enabled their technical feasibility. Across these projects all kinds of challenges such as difficult ground conditions, large depths, adverse working environment etc, have been effectively dealt with.

In terms of equipment, the use of sophisticated tunnel boring machines and automation technologies is growing while battery electric vehicles are becoming crucial for operations underground and in tunnels. Such modern machines improve efficiency, safety, and precision in tunnel construction.

The industry is also adopting high efficiency digital tools (digitalisation, BIM, artificial intelligence) to improve project planning, design, construction, and operation as well as maintenance. These technologies enhance collaboration and reduce errors.

In the adverse geological environments, underground projects within difficult geological conditions exhibit numerous challenges. Engineers are developing innovative techniques both to investigate the ground well in advance of construction and to deal with each specific particularity.

As existing underground infrastructure is getting

older, maintenance and rehabilitation become critical. Implementing effective strategies for maintenance is essential for ensuring their long-term functionality and safety. Tunnel safety remains a top concern during construction and operation and advances in safety protocols, equipment and training are continually improving the safety of underground projects. In addition, governments and industry organisations are continually updating standards to ensure the safety and quality of projects.

An emerging trend, especially in densely populated urban areas, is the use of underground space for various purposes, such as parking, underground farming, data centres and storage. Of the 17 sustainable development goals adopted by the United Nations, the use of the underground can contribute to seven of them. As such, there is no need to argue that an underground urban future should be part of city development.

Facilitate collaboration

Founded in 1974 through the initiative of 19 Nations in response to the growing importance of tunnelling and underground construction in various engineering projects worldwide, the International Tunnelling and Underground Space Association (ITA) is a non-governmental and non-profit organisation which is globally recognised as a world leading organisation dedicated to underground engineering, space development and use. It was formed to:

- Facilitate collaboration and knowledge sharing among professionals involved in underground projects.
- Establish best practices in the field.
- Promote and advance the science and technology of tunnelling and underground space use.
- Inform about the multiple advantages of the construction and operation of tunnels and generally underground projects at an environmental, social, technical, and economic level.

Over the years ITA has developed considerably and currently gathers 79 Member Nations and more than 260 corporate or individual affiliate members. Since its creation, committees and working groups have been an important cornerstone of ITA's organisational structure. Their contribution is key and they drive membership engagement and communication across the organisation on issues, challenges and opportunities. ITA has four different committees dedicated to the operational safety of underground installations (ITA-COSUF), underground space (ITACUS), new technologies (ITAtch), training and education (ITA-CET), as well as 25 working groups, 15 of them very active.

ITA carries out its mission through various activities, including the annual World Tunnel Congress (WTC) which provides a leading platform for experts, engineers, and professionals to discuss the latest developments, share experiences and present innovative underground projects. It also organises the annual ITA Tunnelling Awards which recognise outstanding achievements in tunnelling and the underground industry.

The ITA Awards showcase the industry's best practices and inspire further advancements in tunnelling techniques and methodologies, playing a crucial role in acknowledging and promoting excellence in the world of tunnelling and underground construction.

The ninth edition will take place in Mumbai, India at the occasion of the Tunnelling Asia Conference



2023 organised by the Tunnelling Association of India and will be held in a hybrid format on 24 November 2023. The ITA Awards programme encompasses a variety of categories, each designed to highlight different aspects of industry excellence and include awards for large scale projects in terms of budget, innovative projects in terms of both design and construction, groundbreaking tunnelling technologies, environmental sustainability in tunnelling projects, and safety initiatives etc.

One of ITA's missions is to pass on knowledge and information through a wide range of documents and it publishes regular reports and guidelines related to tunnelling and underground construction, contributing to the dissemination of knowledge in the field. Among the seven documents published in 2023 one deals on urban underground space with the aim of discovering the challenges of urban areas and finding practical and innovative solutions through a sustainable and responsible approach to the planning, design, construction, operation, and long-term end use of urban underground space. Others deal with logistics aspects of long and deep tunnels, plus the third edition of the code of practice for risk management of tunnel works.

Within ITA-AITES, a young member group operates. Officially founded in 2014, it aims to engage and support early-career professionals, under the age of 35, who are interested in the field of tunnelling and underground constructions. Key objectives are knowledge sharing, professional development, engagement in association activities, promoting the industry, networking, mentoring and support and organisation of social and cultural activities to foster a sense of community among young members.

Fascinating feats

Underground projects are fascinating engineering feats that serve multifaceted roles, including water transportation and supply, energy transmission, and even underground cities. Underground projects work towards prioritising sustainability, provide resilient solutions, and minimise environmental impact. The myth regarding the high construction costs of underground projects is debunked by the long-term benefits that such structures provide.

We believe that the significance and potential of tunnelling in solving urban challenges and advancing infrastructure is nowadays well-established. Underground space development is a testament to human ingenuity and a solution to modern urbanisation challenges. ●

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References

More information about the ITA Awards and the latest winners is available on ITA's official website at <https://www.awards.ita-aites.org/>