



TAI Activities and Overview of Tunnelling Segment in India

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TAI AIM AND OBJECTIVES

- **PROMOTE USE OF UNDERGROUND SPACE**
- **ESTABLISHED IN 1976 UNDER AEGIS OF CBIP**
- **CURRENT MEMBERSHIP - 800**
- **EXCHANGE OF INFORMATION AMONGST STAKEHOLDERS**
- **ENCOURAGE COLLABORATION AMONST PROFESSIONAL BODIES**
- **ORGANISE STUDIES AND EXPERIMENTS AND DOCUMENTATION**
- **CONDUCT TRAINING, CONFERENCES, SEMINARS**
- **REPRESENT INDIA AT ITA**
- **HOST WTC WHENEVER CONVENED IN INDIA**
- **HOST TUNNELLING ASIA AND TAI AWARDS BI-ENNIALLY**
- **PROMOTE AND SAFEGUARD INTERESTS OF TUNNELLING INDUSTRY**
- **PUBLICATIONS, TECHNICAL JOURNALS**
- **LAUNCH OF TAIYM GROUP**

Tunnelling Association of India

Tunnelling in India 2023



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Sector Size, Trends and Developments

- ❖ Size and Growth
- ❖ Emerging Trends
- ❖ Contracting Practices and Standards
- ❖ Project Awards and Completion
- ❖ Recent Project Developments
- ❖ Segment Outlook

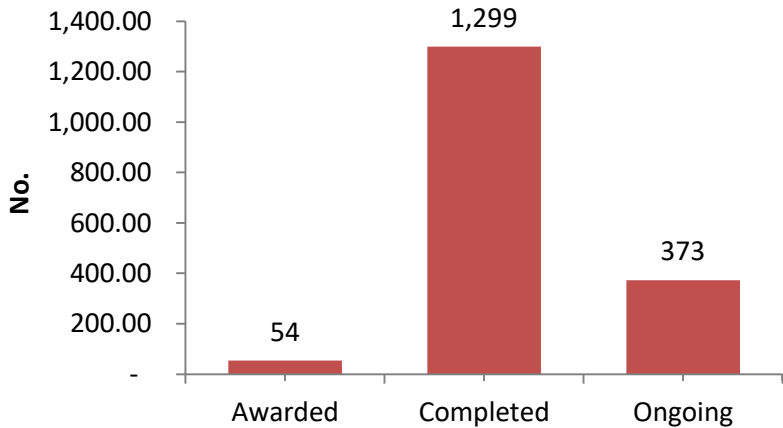
Size and Growth – Overall

Tunnelling Association of India has analysed 1,726 tunnels spanning a length of over 3,600 km. These tunnels are spread across three stages of development – awarded, under construction and completed.

Market Size of Tunnels in India

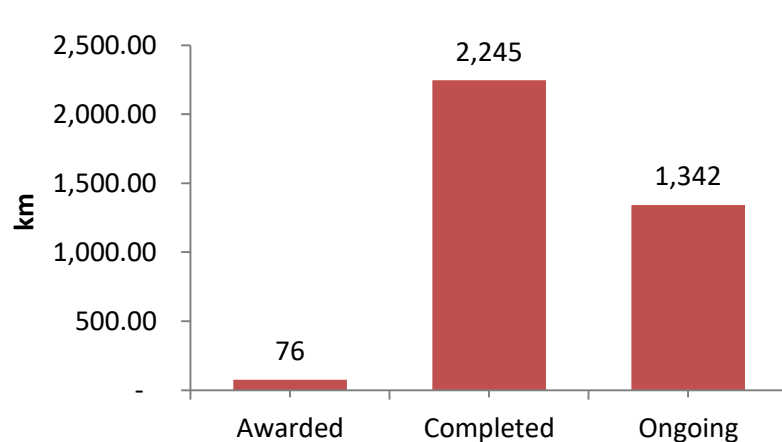
In Terms of Number of Tunnels in India

- Of the total no. of tunnels analysed, 75% have been completed, 22% are under construction and the remaining 3% have been recently awarded.



In Terms of Length of Tunnels in India (km)

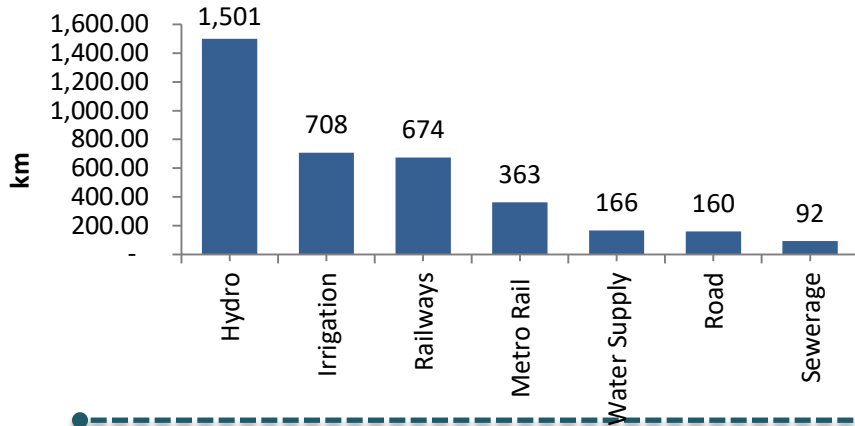
- Of the analysed tunnel length, 62% has been completed, construction work is going on 36% tunnel length and the remaining 2% has been recently awarded.



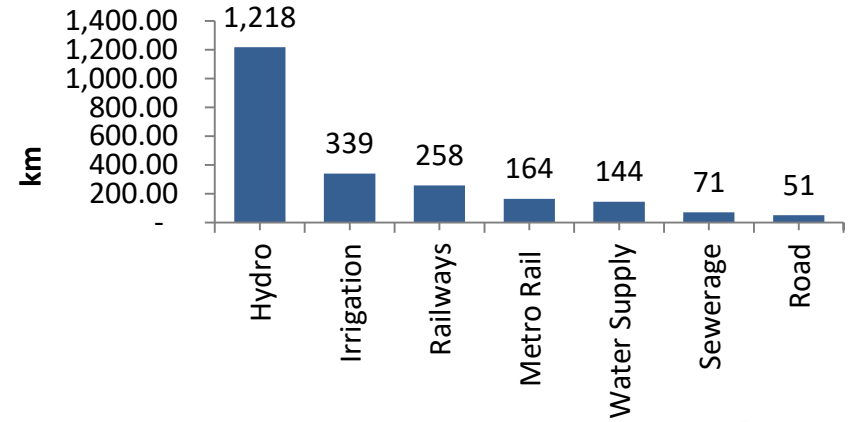
Note: Many of the metro projects considered have details on tunnel length, but not on the number of tunnels.

Size and Growth – Sector-wise

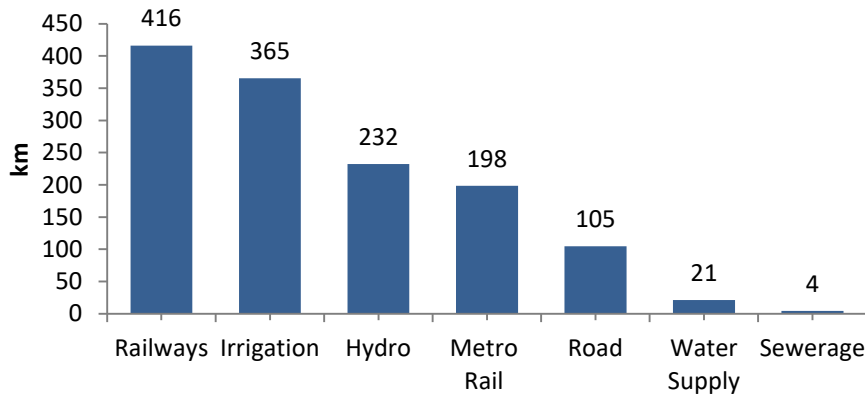
In Terms of Total Tunnel Length



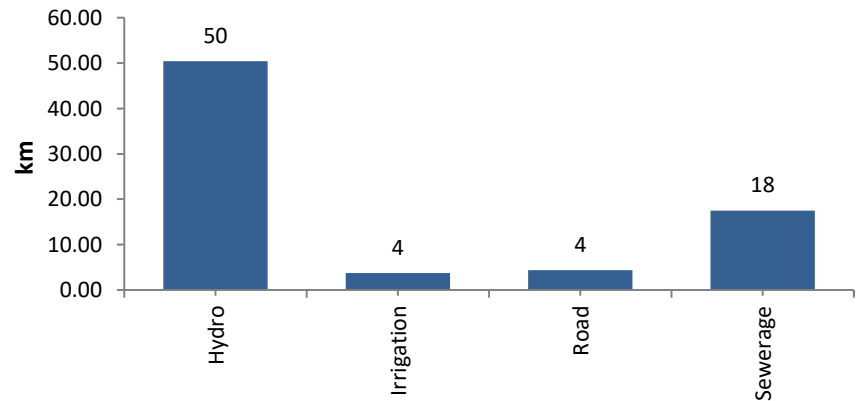
In Terms of Completed Tunnel Length



In Terms of Under Construction Tunnel Length



In Terms of Awarded Tunnel Length



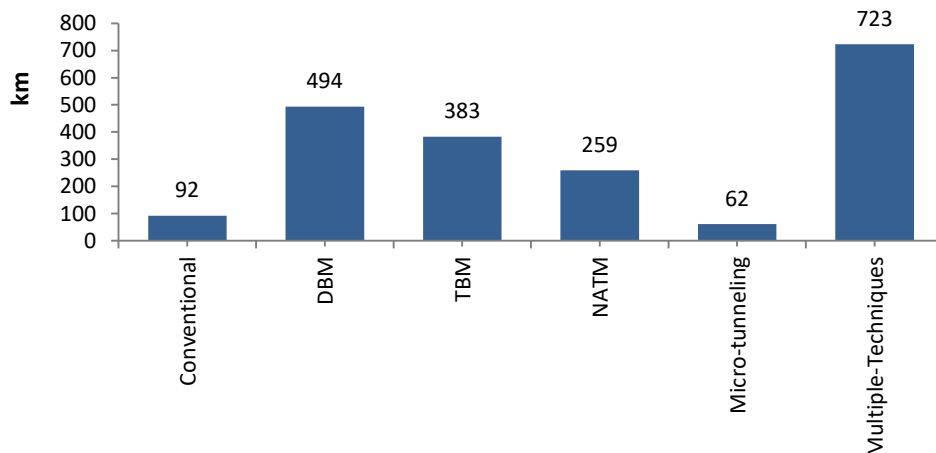
Roads projects include both Roads and Highways; Note: Oil Caverns have been excluded from the analysis because of difference in unit of tunnel length.

Size and Growth – *Technique-wise*

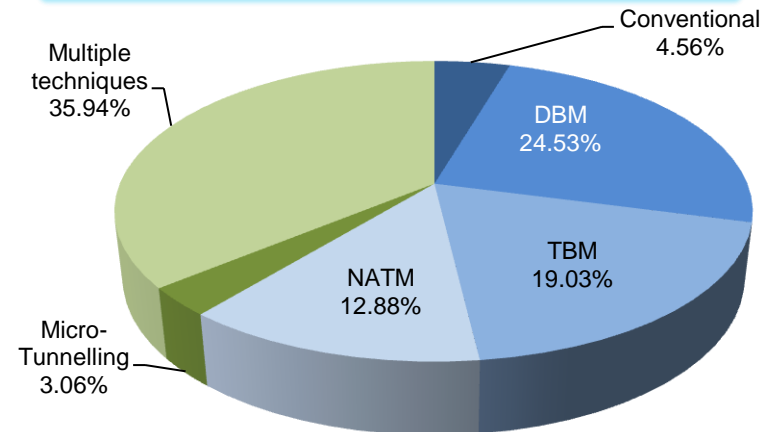
Tunnelling Association of India has analyzed a total of 899 tunnels spanning a length of over 2,011 km for the tunnelling technique analysis.

- Multiple tunnelling techniques have been deployed in 35% of the analyzed tunnel length. These include combination of DBM, TBM, NATM, road header rock bolts, shotcrete, steel ribs etc.
- DBM continues to account for a significant portion of analyzed tunnel length – 26%.
- DBM is closely followed by the deployment of mechanized/advanced tunnelling techniques such as tunnel boring machines (TBMs) which has a share of 19%.
- Other than TBMs, the NATM has also gained prominence over the years. A significant amount of tunnel length in the railways and roads sectors has deployed more advanced NATM technique, in sharp contrast to DBM.

In Terms of Length of Tunnels (km)



In Terms of No. (%)



Note: Oil Caverns have been excluded from the analysis because of difference in unit of tunnel length.

Emerging Trends

Increased use of advanced technologies like NATM, and TBMs

NATM Gaining Traction in the tunnelling sector

- NATM was first introduced in India in 1978 during the excavation of the Loktak Tunnel.
- NATM is a preferred method of tunnelling in uncertain geological and hydrogeological conditions.
- NATM is now being used in railways, metro and road projects.
- NATM technique was used in the excavation of Rohtang tunnel, Himachal Pradesh, India.
- With the pipeline of metro projects planned for implementation, the use of NATM is expected to increase further in the times ahead.

Extensive Deployment of TBMs Across Sectors

- Tunnel boring machines are gaining traction in the roads and highways sector as these are suitable for tunnel construction in urban areas.
- The country's biggest TBM-Mavala has been deployed in the Mumbai Coastal Road Project.
- Meanwhile, TBMs have been deployed in Delhi, Mumbai, Pune, Chennai, Bangalore and Kolkata, among others, to help build underground metro lines.
- TBM is used as an alternative to the drilling and blasting method and other conventional methods.

Emerging Trends

Focus on development of underground metro in the country

With rapid urbanisation, various cities in India are witnessing the development of metro rail systems. Since, many metropolitan cities in India are densely populated, underground metro systems are being preferred.

These underground metro rail systems are being developed with cooperation from some of the leading international players in the tunnelling segment.

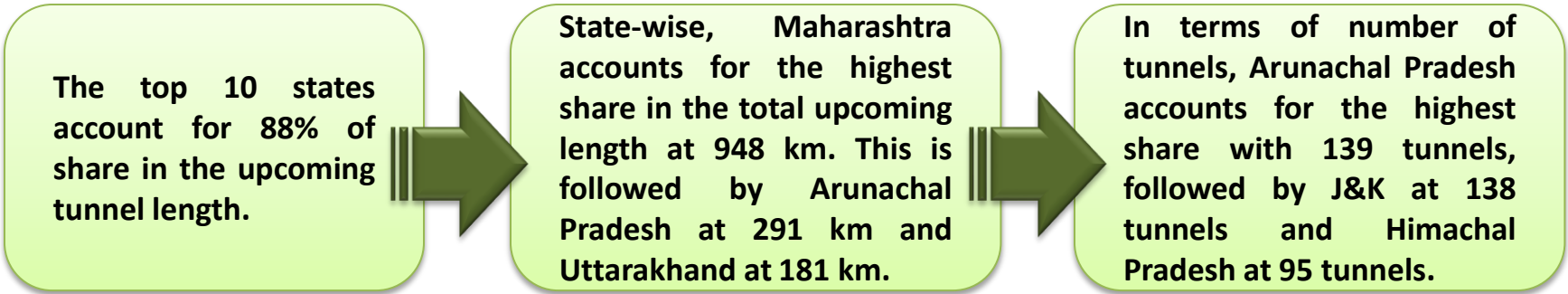
Metro Rail Tunnel Projects



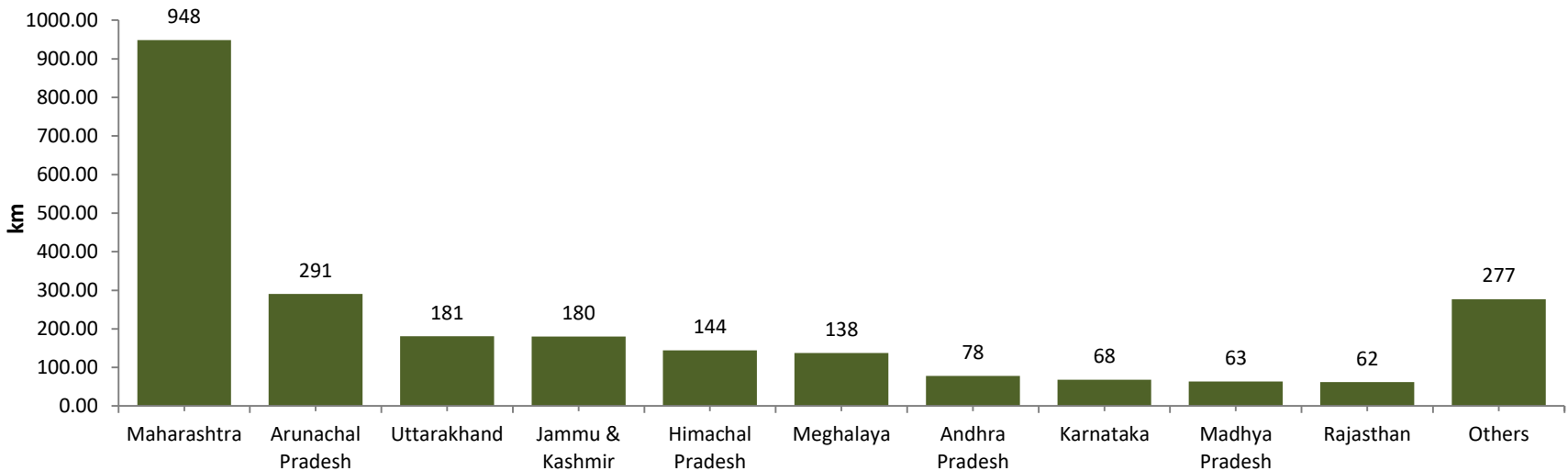
Introduction to Microtunnelling

- A tunnelling method which is seeing increasing acceptance is micro-tunnelling. Emerging as a new trend in India, it is being extensively used to lay water supply pipelines and sewers in congested areas.
- One of the important projects executed by the MCGM is a 5.06 km long sewer line using the micro tunnelling technique. It was completed in May 2021, 8.5 months prior to its scheduled completion.
- In July 2021, micro-tunnelling technique for utility diversion work began at the under-construction Anand Vihar station on the upcoming Delhi-Meerut regional rapid corridor

Unequal Distribution of Upcoming Tunnel Projects



State-wise Upcoming Tunnelling Projects in the Pipeline – In Terms of Tunnel Length (km)



Tunnel length of 200 km has been excluded from the analysis as it is inter-state.

Segment Outlook

The tunnelling industry is on a growth trajectory in the country and offers positive opportunity.

Tunnel development in India is largely accounted to investments in the metro rail, railway, roads and highways, hydropower, underground crude oil storage, and water and sewerage segments.

Based on projects tracked by *India Infrastructure Research*, the tunnelling segment offers a lucrative pipeline of 1,208 tunnels, spanning a length of over 4,000 km. These projects span across planned, under bidding, awarded and ongoing stages of development.

Sector-wise, irrigation accounts for 33% of the tunnel length in the pipeline. It is closely followed by hydropower at 30% and railways and roads at 13% (*even though the maximum number of stalled projects are in hydro sector*).

In terms of growth, metro rail tunnels will continue to be one of the biggest demand drivers of modern tunnelling equipment and technologies.

In light of the introduction of new high-end technology in the tunnelling sector, the market size for tunnelling equipment is expected to expand significantly in the next five-six years.

Segment Outlook

The tunnelling segment has seen the emergence of new trends such as the use of steel fibres in shotcrete; self-drilling anchor bolts; adoption of methods such as PU grout, pipe roofing and pre-grouting techniques; and use of other advanced materials; among others.

In the past few years, the Indian tunnelling industry has increased the deployment of modern technology for tunnel construction.

Advanced technologies such as TBM and NATM are also extensively being used for tunnelling activity in congested urban areas.

With regard to the equipment market, increasing investments in tunnel construction have resulted in high growth in the tunnel equipment market as well. Going forward, as the pressure on land increases (with land being required for other productive economic and social uses) there will be greater need to construct underground structures in the metro, water and sewerage, and road sectors.

Tunnelling projects in India are expected to increasingly deploy smart and digital solutions in order to enhance efficiency in operations and safety, and enable cost savings.

Going forward, Indian and foreign joint ventures are expected to continue to bid for construction of tunnels and more players are expected to enter the market.

However, there is a need to resolve pressing issues such as delays in land acquisition, contractual issues, lack of skilled manpower, etc., to ensure time bound and effective implementation of projects.



THANK YOU