long tunnel from Holsfjord west of the city into the existing net of water pipes. The TBM, going eastward from the Holsfjord, started in January 2023 and the TBM going westward towards the Holsfjord started excavation in March 2023. In addition, The Fornebu Line continues. This will be a metro tunnel that will connect Fornebu with the rest of the metro system in Oslo. Several of the tunnelling contracts are up and running. The project will open to traffic in 2029.

As a curiosity, we also have to mention the Stad tunnel – the world's first tunnel for ships? The request for tenders is planned for this year. Construction work could start in 2025 with preparatory work starting earlier.

STATISTICS

Length or volume excavated - % mechanized / % conventional during 2021

- 78,488min total, including 6,945m with TBM
- 6,010,948fm^3 in total

EDUCATION ON TUNNELLING IN THE COUNTRY

Norway has several universities giving both bachelor and master degrees within several aspects of tunnelling, the major ones being NTNU in Trondheim and University of Oslo. In addition to the higher degrees of education, Norway can offer a set of schools preparing students through a four-year program for the certification for rock blasters. In addition to these educational institutes, there is a set of courses and classes with different levels of classifications and certifications.

PAKISTAN

Name of Association: Pakistan Tunneling and Trenchless Society (PTTS)

Type of Structure: Non-profit, open association

Number of Members: Total number-142, number of corporate members-08

ASSOCIATION ACTIVITIES DURING 2023 AND TO DATE

Workshops (x2)

- Workshop #1: 03-02-2023 (Topic: Concrete Mix Design & Sand Analysis through Sika App by Dr. Oscar Marazzini & Kashif Gardazi, SIKA Pak)
- Workshop #2: 27-09-2023 (Topic: Bendable Concrete by Dr. Rao Arsalan, Bendcrete Pak)

Tunnel Talk Series (x4)

- Tunnel Talk #3: 02-02-2023 (Topic: Soft Ground Tunneling by Dr Oscar Marazzini, Asif Riaz (FWO), Ashraf Hussain (TIP)
- Tunnel Talk #4: 02-08-2023 (Topic: Innovative Solutions for Underground Waterproofing by Mr. Johnny Poulsen, Dolenco Tunnel System)
- Tunnel Talk #5: 10-10-2023 (Topic: What do we learn from Tunnels by Prof. Shahzad Bhatti)
- Tunnel Talk #6: 22-02-2024 (Topic: Importance of Monitoring in Tunnels and Current Technologies Available by Mr. James Matley, CODEL, UK)

Site Visits (x3)

- Site Visit #1: 17-08-2023 (Project Name: 969MW Neelum Jehlum Hydropower Project)
- Site Visit #2: 29-09-2023 (Project Name: 48MW Jagran-II Hydropower Project)
- Site Visit #3: 17-11-2023 (Project Name: 4500MW Diamer Basha Dam Project)

Publications (x2)

- Publication#1: Title: Impacts and challenge faced during deep excavation 1125.3m, rock encountered its effects on support and solution: A case study review from Suki Kinari Hydropower Project 870MW Pakistan, Authors: Asif Riaz, Haris Waheed, Ashraf Hussain, Dr. Abdul Qudoos Khan, WTC-23
- Publication #2: Title: Mixed used potential of existing road tunnels for conveying water for hydropower generation: A case study of motorway tunnels in swat Pakistan, Authors: Asif Riaz, Ashraf Hussain, Ajdar Nawaz, Dr Zia ud din, WTC-23

CURRENT TUNNELLING ACTIVITIES

Ongoing Tunnelling & Hydropower Projects:

Diamer Basha Dam & Hydropower Project (4500MW)

- Location - Kohistan & Diamer Districts in KPK and GB Province
- Total Length of Tunnels: 17km
- Tunnelling Method: Drill & Blast/ conventional
- Design Capacity: 4500MW

Dasu Hydropower Project

- Location - Kohistan District, KPK Province
- Total Length of Tunnels: 26km

Diamer Basha Beach Project

Suki Kinari Hydropower Project

- Tunnelling Method: Drill & Blast/ conventional
- Design Capacity: 4320MW

Suki Kinari Hydropower Project (880MW)

- Location - District Mansehra, KPK Province
- Total Length of Tunnels: 40km
- Tunnelling Method: Drill & Blast/ conventional
- Design Capacity: 880MW

Mohmand Dam & Hydropower Project (800MW)

- Location - KPK Province
- Total Length of Tunnels: 8km
- Tunnelling Method: Drill & Blast
- Design Capacity: 800MW

Gorkin Matiltan Hydropower Project (84MW)

- Location - District Swat, Province KPK
- Total Length of Tunnels: 7km
- Tunnelling Method: Drill & Blast/ conventional
- Design Capacity: 84MW

Jagran-II Hydropower Project (48MW)

- Location - AJK
- Total Length of Tunnels: 8km
- Tunnelling Method: Drill & Blast/ conventional
- Design Capacity: 48MW

Kurram Tangi Dam & Hydropower Project (83.4MW)

- Location - District North-Waziristan, KPK Province
- Total Length of Tunnels: 3km
- Tunnelling Method: Drill & Blast/ conventional
- Design Capacity: 83.4MW

Gorkin Matiltan Hydropower Project (84MW)

- Location - District Swat, Province KPK
- Total Length of Tunnels: 7km
- Tunnelling Method: Drill & Blast/ conventional
- Design Capacity:84MW

FUTURE TUNNELLING ACTIVITIES

- Project Name -Lahore Water & Wastewater Management Project (LWWMP)
- Project Owner - Lahore Water & Sanitation Agency(LWASA)
- Financier - AIIB (Asian Infrastructure Investment Bank)
  Project Cost: US$533.3M)
  - $400M – by AIIB & $133.3M by local Govt
- About 28km of Sewerage Tunnel
- Surface Water Treatment Plant (SWTP) at BRBD Canal, Lahore

STATISTICS

1. List of tunnels completed

River Diversion Tunnel on the Diamer Basha Dam project

2. List of tunnels under construction

Adits and tunnels on the Dasu, Mohmand, Suki Kinari, Kurram Tangi, Diamer Basha hydropower projects

EDUCATION ON TUNNELLING IN THE COUNTRY

- Tunnel Talk Series and Training Workshops initiated by the joint efforts of the Pakistan Tunnelling and Trenchless Society (PTTS) and Tunnelling Institute of Pakistan (TIP)
- Diploma Certification Course at Tunnelling Institute of Pakistan (Third Batch)
- MSc Tunnelling at UET Lahore, Pakistan (First Batch)