

ROAD TUNNELLING

Underground Solutions Provider

CREG TBM

Make Tunnelling Safer,
Better and Faster

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Underground Solutions Provider

In mountainous areas or regions with complex terrains, topographical obstacles such as mountains and hills can make the construction cost of roads extremely high. Road tunnelling can shorten the journey, improve traffic routes, enhance traffic safety, reduce damage to the earth's surface and protect the ecology.

As an equipment manufacturer that best understands construction and a comprehensive service provider that is most proficient in manufacturing, CREG adheres to a customer-centered concept and is committed to providing customers with all-round comprehensive solutions. With the help of tunnel boring machines of different diameters, it can make tunnel construction under various geological conditions safer, better and faster.

- 08** Western Harbour Tunnel Project
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- 12** Zhuhai Tunnel in southern China
- 14** Świnoujście Tunnel in Poland
- 16** Kvesheti-Kobi Road Tunnel in Georgia

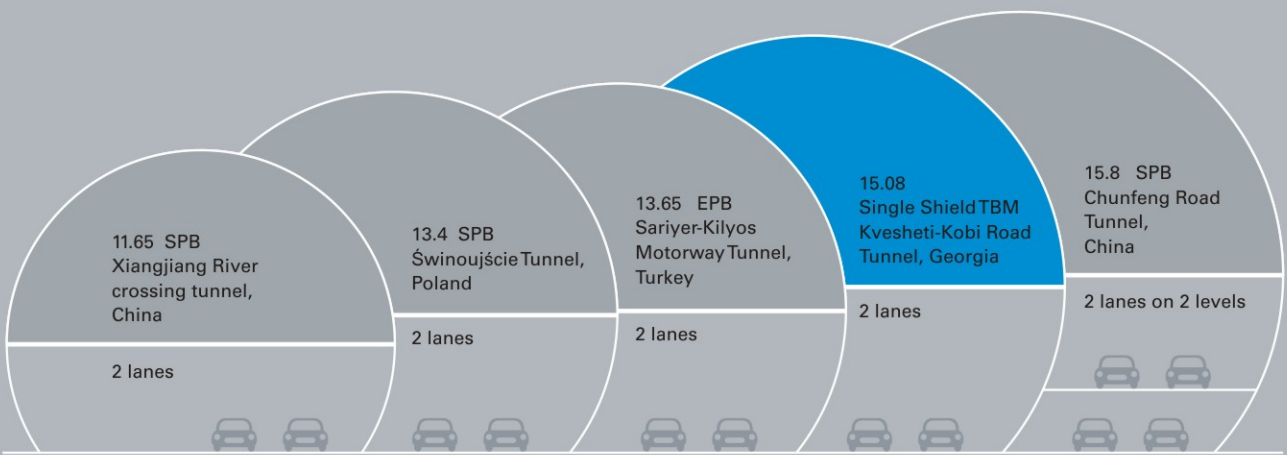
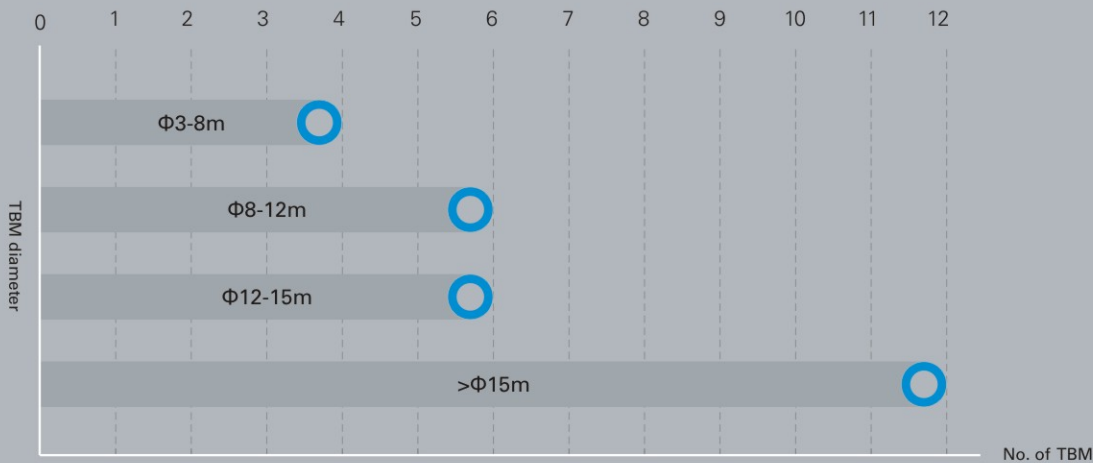
Twin TBMs CREC-1088 and CREC-1099 has completed 2.93 km long tunneling respectively under sea in southern China's Zhuhai road tunnel.

Cover photo:
Advanced tunnel construction
technology helps road to extend
across mountain and sea.

With diameter of up to

15.8m

CREG tunnel boring machines excavate road tunnels through various geological conditions.



Record diameter of CREG TBMs worldwide



Leading technology and expertise worldwide guarantee safety and efficiency of tunnel construction

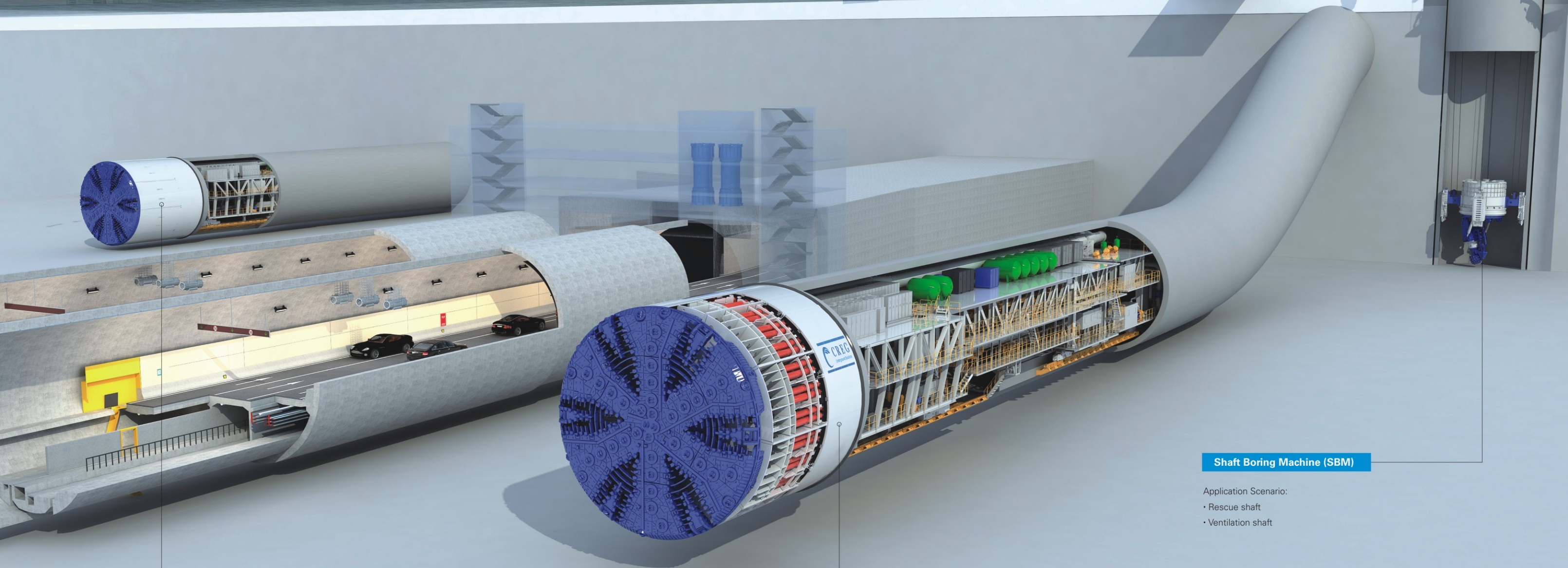
Based on solid professional knowledge and rich experience, CREG works closely with customers to develop tailor-made technical solutions to overcome all challenges and build robust tunnel structures while maximizing the safety of personnel and the urban environment, as well as controlling budgets and schedules.

As the world's largest TBM supplier, CREG provides customers with products and services of the highest standards of technology and quality, combined with fast and comprehensive service. CREG pays special attention to teamwork and works hand in hand with all parties involved throughout the project.

CREG has completed more than 1,200 projects around the world in the fields of metro, road, railway, utility, hydropower and mines. CREG's tunnel boring technology is adaptable to all types of tunnels, pipelines and shafts in all geological conditions, with diameters ranging from 1 meter to 19 meters. Advanced technologies from CREG are used to build new infrastructure and help improve people's lives.

ROAD TUNNELLING

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Earth Pressure Balance (EPB) TBM

Application Scenario:

- Road tunnel

Slurry Pressure Balance (SPB) TBM

Application Scenario:

- Road tunnel (especially those under water)

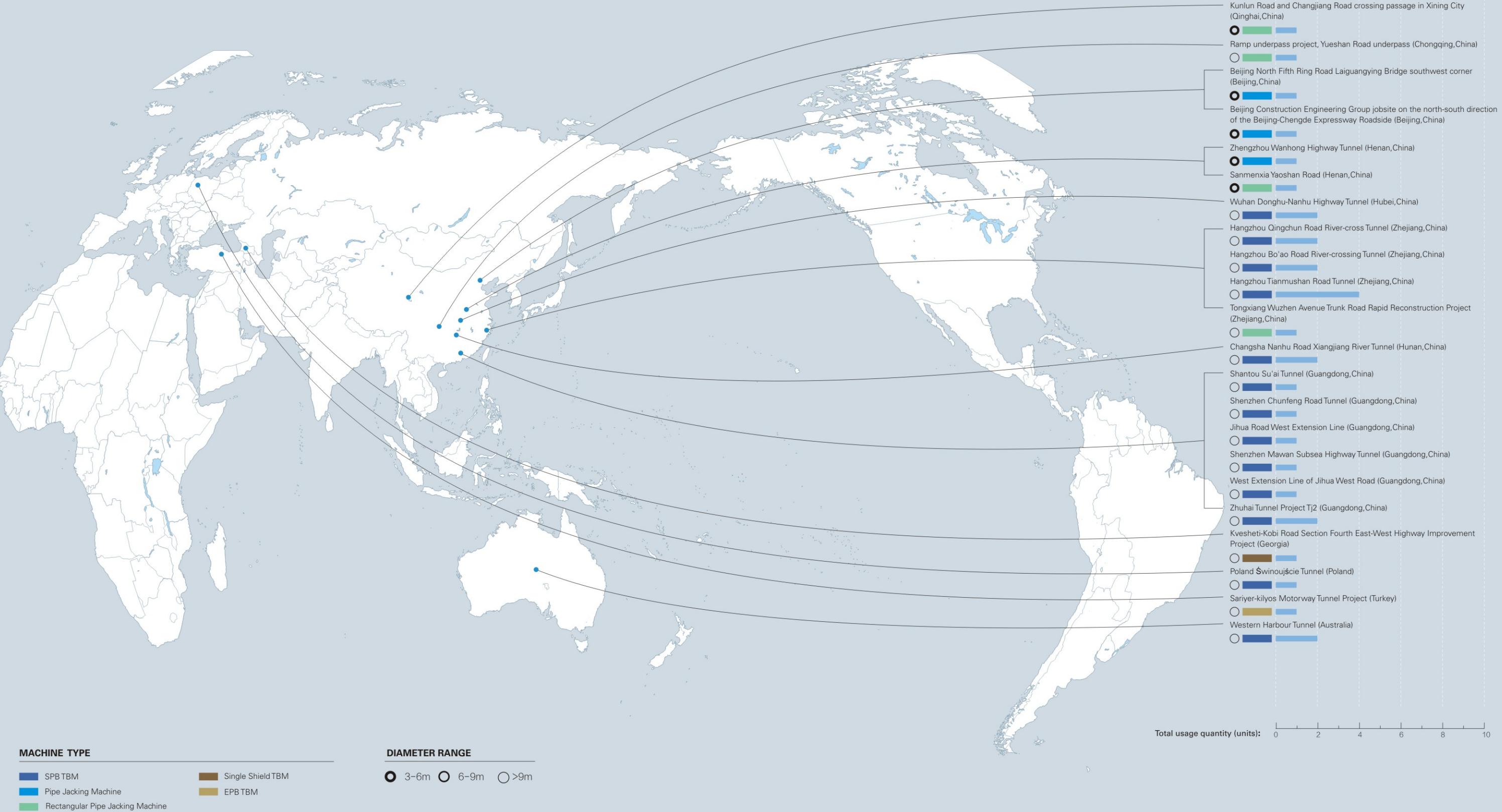
Shaft Boring Machine (SBM)

Application Scenario:

- Rescue shaft
- Ventilation shaft

GLOBAL VISION

To provide high-quality products for the world
Underground engineering equipment and services



Western Harbour Tunnel Project

Largest-diameter tunnel in Australia

The Western Harbour Tunnel project is located in Sydney. The tunnel is designed as a twin-tube, two-way road tunnel and is one of the three core components of the Western Harbour Tunnel and Beaches Link (WHTBL) project. The tunnel is 1.56km long, which is bored by a slurry TBM with an excavation diameter of 15.7m. The maximum overburden reaches 52m below sea level, and the minimum

curve radius is 960m. The alignment follows an S-shaped curve. The tunnel passes through highly variable strata including sandstone, silt, and silt with silty clay layers. The UCS (uniaxial compressive strength) can reach up to 30MPa, and in some areas even up to 80MPa, making construction particularly challenging.

Project Information

- › Tunnelling length: 1,560 m
- › Geology: Sandstone, silt, and silt with silty clay layers
- › Contractor: ACCIONA Australia

TBM Parameter

- › TBM type: Super-large diameter slurry TBM
- › TBM S/N: CREC1458/1459
- › Boring Dia.: 15.7 m
- › Main drive power: 7,000 kW
- › FAT date: CREC1459: April 12, 2025
CREC1458: August 1, 2025

Project Background

The Western Harbour Tunnel in Australia is currently the largest-diameter tunnel in Australia and is scheduled to open in 2028. As Sydney's first newly built harbor-crossing road in over 30 years, the tunnel will offer significant time savings for drivers, cutting travel time by approximately 20 minutes from North Sydney to Sydney Olympic Park or Leichhardt. The completion of this major infrastructure project will also transform the way Sydneysiders travel, providing local residents with a more convenient, efficient and safe transportation option, while strongly promoting the city's traffic efficiency and economic development.



Western Harbour Tunnel Route

The "Barangaroo" TBM completed factory acceptance test.



The "Patyegarang" TBM completed factory acceptance test.



Shenzhen Mawan Tunnel

Ultra-large TBM used in Shenzhen’s large diameter cross-sea tunnel

The Mawan Cross-sea Passage is a key demonstration project for the interconnected transportation construction in the Guangdong-Hong Kong-Macao Greater Bay Area. It is also Shenzhen's first large-diameter cross-sea shield tunnel.

The passage is about 8.05 kilometers long, and the part crossing the Qianhai Bay waters is about 2.06 kilometers long. It is a two-way six-lane urban expressway with a design speed of 80 km/h.

Project Information

- › Tunnelling length: 2,063 m
- › Geology: Travels through silt, clay,mucky clay, etc
- › Contractor: China Railway Tunnel Group Co., Ltd

Project Characteristics

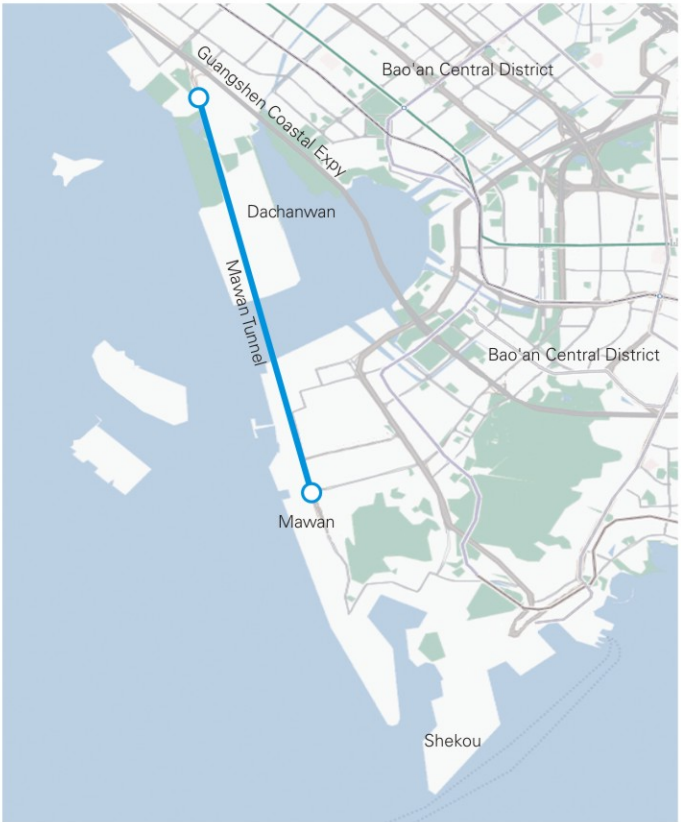
- › Tunnelling in upper-soft lower-hard strata
- › Excavation in silty silt and muddy clay strata
- › Shallow overburden stratum tunneling
- › High water and soil pressure in the marine tunnel excavation section

TBM Parameter

- › TBM type: SPB TBM with accessible cutterhead
- › TBM S/N: CREC 808
- › Boring Dia.: 15.53 m
- › Main drive power: 5,600 kW
- › FAT date: January, 2021
- › Best performance: 172 m per month

Project Background

After the completion of the project, it will effectively relieve the traffic pressure in the Qianhai area and strengthen the transportation connections between regions. It closely connects Mawan in Nanshan and Dachanwan in Bao'an making cargo transportation more convenient and efficient and promoting collaborative operations between ports. At the same time, it also facilitates the travel of surrounding residents and improves the regional transportation accessibility.



Shenzhen Mawan Tunnel Route



CREG slurry collection technology helps to create a clean tunnel environment.



The TBM(CREC 808) has created a national record of 10 meters per day for large sub-sea TBM.

Zhuhai Tunnel Project

The twin TBMs facilitate infrastructure construction in Zhuhai

The TBM travels through more than 800 meters of upper-soft and lower-hard composite strata, making it the project with the longest length of bedrock in underwater shield tunnels in China. The top of the TBM tunnel is relatively close to the bottom of the water supply pipeline to Macao,

and the area around the pipeline is a soil structure lacking supporting capacity, resulting in high construction risks. The two TBMs are customized according to the unique silt strata in Zhuhai. All technical specifications have reached the world's leading level.

Project Information	Project Characteristics
› Tunnelling length: 2,930 m › Geology: Silty clayey soil, medium-coarse sand layer and strongly weathered granite › Contractor: China Railway Tunnel Group Co., Ltd	› Tunnelling in upper-soft lower-hard strata › Construction with shallow overburden, traversing multiple surface structures and risk sources › Long-distance traversal through soft strata such as muddy silty clay › High water and soil pressure during excavation

TBM Parameter	Project Background
› TBM type: SPB TBM › TBM S/N: CREC 1088 & 1099 › Boring Dia.: 15.01 m › Main drive power: 4,200 kW › FAT date: March, 2022 › Best performance: 392 m per month	The Zhuhai Tunnel is parallel to Zhuhai Bridge. It is about 5 kilometers long and is designed with two-way, six lanes and a design speed of 80 km/h. After completion, it will jointly form a composite passage in the east-west direction of Zhuhai City with the existing Zhuhai Bridge. It will effectively relieve the traffic pressure of the Zhuhai Bridge and become an all-weather lifeline connecting the east and west areas of Zhuhai, ensuring normal passage under severe weather such as typhoons.



Zhuhai Tunnel Project Route



High automation of TBM saves labor.

Box culverts are installed simultaneously as TBM advances.



Świnoujście Tunnel

TBM helps the local residents realize the century-long traveling dream in Poland

The tunnel under the Swinariver, has a length of 1,440m and a minimum curve radius of 300m. CREG has supplied a 13.46m slurry TBM designed with anoptimized cutterhead structure, continuous cutter wear

detection,environmentally friendly pipe extension system and special articulation system for ease of steering. The TBM completed the breakthrough of the swine Tunnel on the 17th of September 2021.

Project Information	TBM Parameter
› Tunnelling length: 1,483 m › Geology: Fine-medium sand with gravel,sandy clay with gravel and chalk › Contractor: Porr-Gulermak JV	› TBM type: SPB TBM › TBM S/N: CREC 797 › Boring Dia.: 13.46 m › Main drive power: 4,200 kW › FAT date: June, 2020 › Best performance: 338 m per month, 18 m per day

Project Background

The tunnel is located between Uznam and Wolin of Świnoujście on the northwest coast of Poland. It is the longest underwater highway tunnel in Poland. Local people have commuted by ferry, which takes 40 minutes, for a hundred years, although the two small islands are only 1 kilometer apart. With the completion of the tunnel, the cross-river commuting time has been shortened to 4 minutes, bringing great convenience to the daily life and travel of local residents and promoting the economic development on both sides of the Świna River, which has a profound impact and great significance. On the occasion of the tunnel's completion, the president of the Republic of Poland, Andrzej Duda, came to the site and boarded the TBM to watch the tunneling and building of the last ring of segments. He pointed out: "The completion of this tunnel is of epoch-making significance (for Poland)."



Świnoujście Tunnel Route

The large diameter TBM has overcome the challenge of 300 m radius curve.



The cutterhead is being lowered down to the launching shaft



Kvesheti-Kobi Road Tunnel

The world’s record breaking hard rock TBM

The "Caucasus" TBM excavation length of the tunnel in this project is 8,860meters, with a maximum overburden of 1,121 meters, generally above 600 meters. The rock types are mainly tuff and mudstone. In response to the construction difficulties caused by the long distance, large overburden, and strong rock hardness of the project, CREG adopted many targeted designs such as the large diameter single shield TBM active articulation system,

assembly system, bidirectional rotating synchronous cutterhead, dual speed reducer system, box culvert synchronous assembly, etc., achieving precise adjustment of the TBM posture and strong breakout function of the large overburden TBM, and improving the efficient matching ability of the entire machine of the large diameter hard rock TBM.

Project Information

- › Tunnelling length: 8,860 m
- › Geology: Tuff and mudstone
- › Contractor: China Railway Tunnel Group Co., Ltd

Project Background

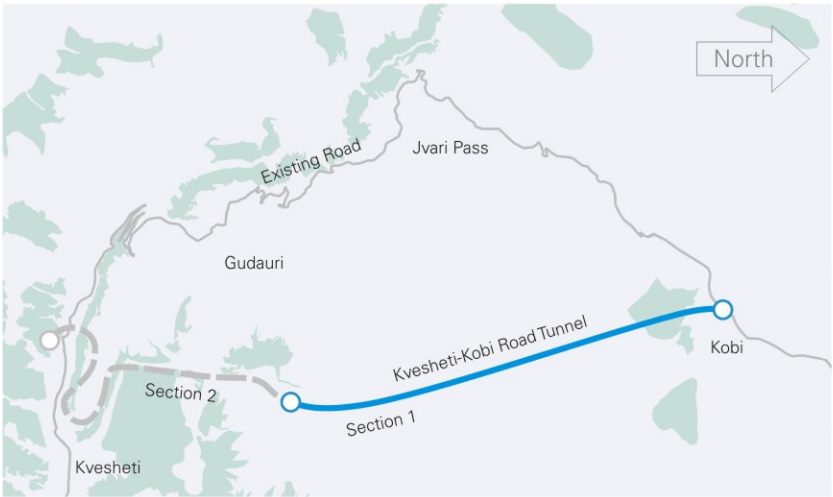
The Kvesheti-Kobi Road of North-South Corridor is located in Mtskheta-Mtianeti Region in northern Georgia. It is an important passage connecting Georgia with neighboring countries such as Russia, Armenia and Azerbaijan. In the Gudauri mountain area in the middle of the line, it is snowy in winter, and the annual average temperature is lower than 5 degrees Celsius. The mountain roads are rugged and hard to travel due to frequent avalanches. Snowfall often causes continuous traffic interruptions for up to twenty days, causing great inconvenience to regional transportation. The new Kvesheti-Kobi road tunnel travels through the bottom of the Gudauri mountain ridge. After completion, it will completely solve the problem of traffic interruption in the Gudauri mountain area in winter and can effectively guarantee the transportation of local production and daily necessities.

TBM Parameter

- › TBM type: Single shield TBM
- › TBM S/N: CREC 859
- › Boring Dia.: 15.08 m
- › Main drive power: 6,300 kW
- › FAT date: Semtemper, 2020
- › Best performance: 426 m per month, 20 m per day

Project Characteristics

- › Ultra-large diameter and long-distance excavation
- › Large overburden leads to high risk of machine jamming
- › Difficulties in road transportation
- › Short delivery cycle



Kvesheti-Kobi Road Tunnel Route



The "Caucasus" TBM completed tunnelling 30 days ahead of schedule.

The TBM is ready to bore.

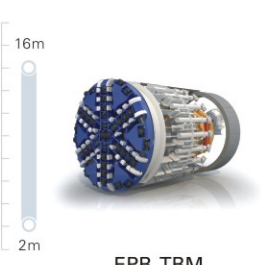
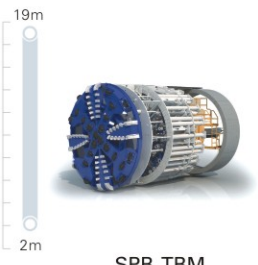
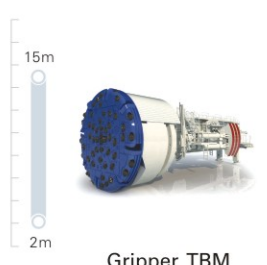
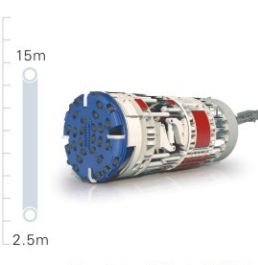
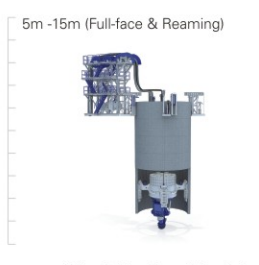
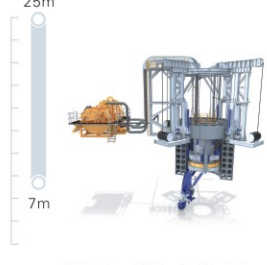
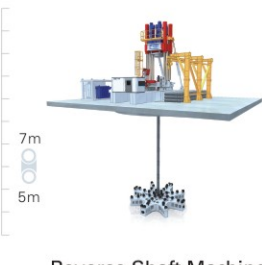
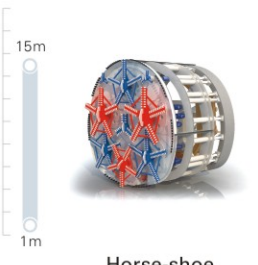


Product portfolio for road tunnel

Tunneling technology suitable for various geological conditions and diameters

CREG is the only underground solutions provider that offers a comprehensive range of tunneling technologies suitable for various diameters and geological conditions. Furthermore, each CREG TBM or machine is specifically customised according to the geological, hydrological and other parameters of the project. Consequently, our products are recognized for their durability, reliability and performance. We are dedicated to providing exceptional customer service, and we constantly strive to exceed customer expectations.

Product Portfolio

 EPB TBM	 SPB TBM	 Dual-mode TBM	 Gripper TBM
 Single Shield TBM	 Double Shield TBM	 Shaft Boring Machine	 Vertical Shaft Sinking Machine
 Reverse Shaft Machine	 Horse-shoe Shaped TBM	 Cross Passage Machine	 Rectangular Pipe Jacking Machine

For more information of CREG, please refer to contacts at back cover.

TBM tunnelling in curved section.



CREG headquarters

CREG

Underground Solutions Provider

China Railway Engineering Equipment Group Co., Ltd. (referred to as "CREG") is a worldwide underground solutions provider for a full spectrum of mechanized tunnelling technology and services. The company's headquarters is located in Zhengzhou, the capital city of Henan province. We draw together more than 4,500 employees including over 700 designers to design and manufacture TBMs and associated equipment. As the largest TBM supplier in the world, CREG boasts outstanding

productivity, performance, safety and geological adaptability, impressive R&D competence, a number of invention patents, as well as excellent after-sales service and support.

CREG has 16 production bases with an annual production of more than 300 TBMs. We have supplied TBMs ranging from ϕ 2m to ϕ 18m used in all kinds of ground conditions, including hard rock, soft soil and complex geology. Our

products consist of Single/Double Shield Open-type TBM, Gripper TBM, Earth Pressure Balance TBM, Rectangular TBM, Slurry TBM, Horseshoe-shaped EPB TBM, U-shaped Open-type TBM, Pipe Jacking Machine, Shaft Boring Machine, Reamer TBM and Inclined Shaft TBM. CREG is committed to every client as an efficient and reliable partner in the tunnel construction field. Until now, CREG has exported more than 140 TBMs to 34 countries and regions including Doha, Singapore, France, Italy, Australia, Lebanon, Poland, Denmark, South Korea and Austria etc.

With our extensive research and practical experience, CREG offers a series of auxiliary mechanized tunnelling equipment and service packages. In addition to various types of TBMs, CREG also designs and manufactures Shaft Boring Machines, Cutters, Rolling Stock, Roadheaders, Three-boom Drill Jumbos, and Wet Shotcrete Machines etc. We provide a full range of tunnelling equipment and all-around solutions.

Overseas Business and R&D institutions

- CREG TBM Germany GmbH
- China Railway Engineering Equipment Group Co., Ltd. Singapore Branch
- CREG Co., Ltd. South Korea Branch
- CREG Co., Ltd. Italy Branch
- カレグ・テクノロジー日本株式会社

Full Range Services

CREG also provides high value-added customized services, including design, consultancy, tunnelling service, maintenance, remanufacturing, mechanical & electrical installation, technical service, spare parts, etc. CREG establishes remote support system for delivered TBMs to facilitate CREG rendering quick troubleshooting and real-time monitoring during tunnelling.

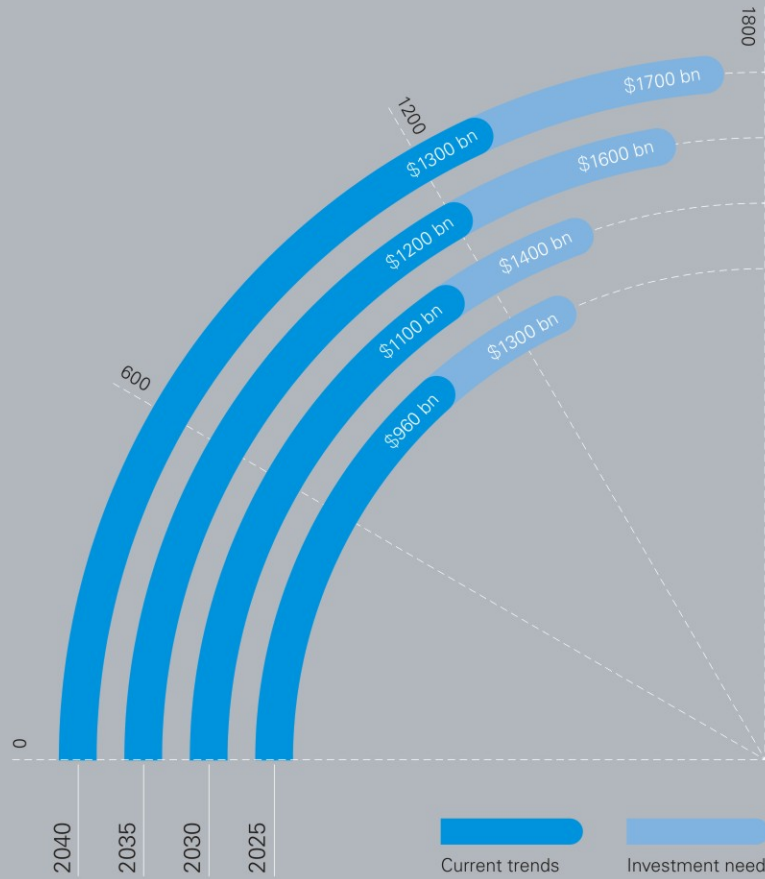


CREG has established an international service team for TBMs delivered worldwide.



Trend

Infrastructure investment at current trends and need



Sources: Global Infrastructure Hub (2021)

Cover photo: The world's largest hard rock TBM achieved breakthrough in Georgia.

