

Tunnel Projects	Country	Period	Tunnelling Technology	System	Geology	Prediction Targets
BOVINO ORSARA PROJECT - LINEA FERROVIARIA NAPOLI-BARI	Italy	2024 - ongoing	2 Single Shield TBMs, Ø 9.92m, CREG	SCAN	mixed ground, sandstones, clay	fault/fracture zones, weak zones, aquifer risk
MESSINA-CATANIA RAILWAY LINE LOT SOUTH	Italy	2024 - ongoing	1 DUAL MODE TBM, Ø 9,16 m, CREG	SCAN	metamorphics, limestones, mixed ground	fault zones, weak zones, aquifer risk
MESSINA-CATANIA RAILWAY LINE LOT NORTH	Italy	2024 - ongoing	2 DUAL MODE TBMs, Ø 9,16 m, CREG 1 EPB TBM, Ø 9.36 m, CRCHI	SCAN, INTEGRAL	metamorphics, limestones, mixed ground	fault zones, weak zones, aquifer risk
CROSS ISLAND LINE - CR202	Singapore	Start in 2024	1 EPB TBM, Ø 12.78 m, HERRENKNECHT	INTEGRAL	mixed ground	weak zones with potential water risk
OMACHI DAM PROJECT	Japan	Start in 2024	1 Gripper TBM, Ø 3.8 m, HERRENKNECHT	INTEGRAL	granodiorite, chalk, karst, limestone, sandstones, chert	water-bearing fault and fracture zones
DELHI METRO - DMRC DC05	India	2023 - ongoing	4 EPB-TBMs, each Ø 6.6 m, HERRENKNECHT + ROBBINS	INTEGRAL	soft ground	weak zones, clay/gravel lenses
MWA PLAN 9 TUNNEL PROJECT G-TN-9D	Thailand	2023 - 2024	4 EPB-TBMs, each Ø 3.9 m, HERRENKNECHT	INTEGRAL	soft ground	potential large metal objects
ROCCHETTA, GROTTAMINARDA & MELITO TUNNEL	Italy	2023 - ongoing	2 EPB-TBMs, Ø 12.20 m, Ø 12.50 m, CREG	INTEGRAL	mixed ground, sand stones, clay	fracture/fault zones
PATNA METRO	India	2023 - ongoing	2 EPB-TBMs, each Ø 6.63 m, CRCHI	INTEGRAL	soft ground	weak zones, clay/gravel lenses
C853-2 WAKRAH & WUKAIR TUNNEL	Qatar	2022 - 2024	2 EPB-TBMs, each Ø 5.8 m, CREG	INTEGRAL	limestones, shales, chalky salty groundwater	karst and water-bearing cavities, fault zones, water salinity, zones of increased porosity

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OMOIGAWA WATER TUNNEL	Japan	2021 - ongoing	3 Slurry TBMs, each \varnothing 2.8 m, MITSUBISHI	INTEGRAL	granodiorite, chalk, karst, limestone, sandstones	water-bearing fault and fracture zones
METRO PARIS - LIGNE 16 LOT 2	France	2020 - 2024	2 EPB-TBMs, each \varnothing 9.86 m, CREG	INTEGRAL	marlstones, limestones, gypsum, sand, gravel	karst zones, karst cavities, and fault zones
METRO NAPOLI LINEA 1	Italy	2020 - 2024	1 EPB-TBM, \varnothing 6.7 m, HERRENKNECHT	INTEGRAL	ignimbrite	cavities and fault zones
METRO PARIS - LIGNE 16 LOT 1	France	2020 - 2022	3 EPB-TBMs, \varnothing 9.87 m, \varnothing 8.92 m, \varnothing 9.87 m, HERRENKNECHT	INTEGRAL	marlstones, limestones, gypsum, sand, gravel	karst zones, karst cavities, and fault zones
METRO PARIS - LIGNE 14 SUD GC02	France	2020 - 2021	1 EPB-TBM, \varnothing 8.83 m, HERRENKNECHT	INTEGRAL	marlstones, limestones, gypsum, sand, gravel	karst zones, karst cavities, and fault zones
AV/AC "TERZO VALICO DEI GIOVI" - LOTTO RADIMERO	Italy	2020 - 2023	1 Mixshield TBM, \varnothing 9.77 m, HERRENKNECHT	INTEGRAL	metamorphics	water-bearing fault zones
METRO PARIS - LIGNE 14 SUD GC04	France	2019 - 2020	1 EPB-TBM, \varnothing 8.83 m, HERRENKNECHT	INTEGRAL	marlstones, limestones, gypsum, sand, gravel	karst zones, karst cavities and fault zones
METRO PARIS - LIGNE 14 SUD GC03	France	2019 - 2020	1 EPB-TBM, \varnothing 9.92 m, HERRENKNECHT	INTEGRAL	marlstones, limestones, gypsum, sand, gravel	karst zones, karst cavities, and fault zones
MUSAIMEER PUMPING STATION AND OUTFALL PROJECT	Qatar	2019 - 2021	1 EPB-TBM, \varnothing 3.7 m, CREG	INTEGRAL	limestones, shales, chalky salty groundwater	karst and water-bearing cavities, fault zones, water salinity, zones of increased porosity
DUBAI DEEP STORMWATER TUNNEL	United Arab Emirates (UAE)	2019 - 2020	2 EPB-TBM, \varnothing 11.08 m, CREG	INTEGRAL	sandstones, mudstones	air and water-bearing fault and fracture zones with potentially increased permeability, cavities, clayey softground zones

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BRENNER BASE TUNNEL, LOT MULES 2-3	Italy	2018 - 2021	1 DS-TBM, Ø 6.85 m, HERRENKNECHT	INTEGRAL	granite, gneisses, schistes	fault zones, nappe structures, potential water-bearing zones
METRO ROMA GALLERIA TRATTA T3	Italy	2018 - 2020	2 EPB-TBM, Ø 6.7 m, HERRENKNECHT	INTEGRAL	silt, clay, sand, gravel	cavities
Galleria Santa Lucia Lotto 2	Italy	2017 - 2020	1 EPB-TBM, Ø 15.87m, HERRENKNECHT	INTEGRAL	carbonate sequences	karst zones, karst cavities, and fault zones
GALERIE DES JANOTS	France	2017 - 2019	1 Gripper TBM, Ø 3.50 m, ROBBINS	INTEGRAL	limestones and dolomites	karst cavities
METRO TEHRAN LINE 6	Iran	2017	1 EPB-TBM, Ø 9.15 m, HERRENKNECHT	INTEGRAL	sand, gravel, clay	construction objects like shafts and steel structures
IDRIS MTS-01 SEWERAGE TUNNEL	Qatar	2017 - 2018	2 EPB-TBMs, Ø 3.85 m, HERRENKNECHT	INTEGRAL	limestones, shales, chalky limestones, Evaporites, Karst, silty clayey material	karst and water-bearing cavities, fault zones, water salinity, zones of increased porosity
5TH WATER SUPPLY SYSTEM TO JERUSALEM	Israel	2016 - 2017	1 Hard Rock TBM, Ø 3.90 m, ZUEBLIN	INTEGRAL	limestones	karst zones, Karst cavities, and fault zones
METRO ATHENS LINE 3 EXTENSION	Greece	2016 - 2017	EPB TBM, Ø 9.5m, LOVAT	INTEGRAL	siltstones, serpentinites, limestones	karst zones including large cavities
UMA OYA MULTIPURPOSE DEVELOPMENT PROJECT	Sri Lanka	2016	1 Double Shield TBM, Ø 4.3m, HERRENKNECHT	INTEGRAL	gneisses	fault zones, potential water-inflow and gas-inflow zones, characterization of relative fracturing
SS1 NUOVA AURELIA HIGHWAY TUNNEL	Italy	2015 - 2018	Single Shield TBM, Ø 13.72m, HERRENKNECHT	INTEGRAL	gneisses, amphibolites	fault zones, fracture zones, water-bearing zones

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METRO PARIS LINE 14 LOT T01	France	2015 - 2018	2 EPB-TBMs, Ø 8.9 m, HERRENKNECHT	INTEGRAL	marlstones, limestones, gypsum, sand, gravel	karst zones, karst cavities, and fault zones
METRO PARIS LINE 14 LOT T02	France	2015 - 2018	1 EPB-TBMs, Ø 8.96 m, NFM TECHNOLOGIES	INTEGRAL	marlstones, limestones, gypsum, sand, gravel	karst zones, karst cavities, and fault zones
METRO RIYADH LINE 5	Saudi Arabia	2015 - 2016	2 EPB-TBMs, Ø 9.73 m, HERRENKNECHT	SCAN	limestone formation of different karstification grades partly brecciated	karst zones, air-filled/water-bearing cavities, fault zones, zones of increased porosity
METRO RIYADH LINE 3	Saudi Arabia	2015 - 2017	1 EPB-TBM, Ø 10.16 m, NFM TECHNOLOGIES	INTEGRAL	limestone formation of different karstification grades partly brecciated	karst zones, air-filled/water-bearing cavities, fault zones, zones of increased porosity
AZAD WATER CONVEYANCE TUNNEL	Iran	2015 - 2018	1 EPB-TBM, Ø 3.71 m, HERRENKNECHT	INTEGRAL	conglomerates, sandstones and mudstones, limestones, shales	fault and fracture zones
METRO DOHA - GOLD LINE	Qatar	2014 - 2016	6 EPB-TBMs, Ø 7.05 m, HERRENKNECHT	SCAN	limestones, shales, chalky limestones, Evaporites, Karst, silty clayey material	karst and water-bearing cavities, fault zones, zones of increased porosity
METRO DOHA - RED LINE NORTH	Qatar	2014 - 2016	4 EPB-TBMs, Ø 7.05 m, HERRENKNECHT	INTEGRAL/ SCAN	limestones, shales, chalky limestones, Evaporites, Karst, silty clayey material	karst and water-bearing cavities, fault zones, zones of increased porosity
METRO DOHA - GREEN LINE	Qatar	2014 - 2016	6 EPB-TBMs, Ø 7.05 m, HERRENKNECHT	SCAN	limestones, shales, chalky limestones, Evaporites, Karst, silty clayey material	karst and water-bearing cavities, fault zones, zones of increased porosity
HEADRACE TUNNEL PROJECTS PANDO	Panama	2014 - 2015	EPB-TBMs, Ø 3.78 m, LOVAT	INTEGRAL	lahars formation, pyroclastis	differentiation between clay and debris, fault zones and water-bearing zones
ABU HAMOUR DRAINAGE TUNNEL	Qatar	2014 - 2015	2 EPB-TBMs, Ø 4.52 m, HERRENKNECHT	INTEGRAL	limestones, shales, chalky limestones, Evaporites, Karst, silty clayey material	karst and water-bearing cavities, fault zones, zones of increased permeability

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STEP DEEP TUNNEL SEWER - T03	United Arab Emirates (UAE)	2012	2 EPB-TBMs, Ø 6.34 m, HERRENKNECHT	INTEGRAL	dolomitic claystones and siltstones, gypsum, clay, silt	water-bearing cavities, zones of increased permeability
GALLERIA MACUGNAGA, HIGHWAY PILOTTUNNEL, ALPS	Italy	2012	Hard Rock GripperTBM, Ø 3.60 m	INTEGRAL	mica schists	fault zones, weathered mica schists
GALLERIA SPARVO - HIGHWAY BOLOGNA-FLORENCE	Italy	2011 - 2012	EPB-TBM, Ø 15.55 m, HERRENKNECHT	SCAN	unconsolidated weathered complex ophiolitic geology	fault zones, differentiation between arenitic and argillitic/pelitic lithology
STEP DEEP TUNNEL SEWER - T02	United Arab Emirates (UAE)	2011 - 2012	3 EPB-TBMs, Ø 6.34 m, HERRENKNECHT	SCAN	dolomitic claystones and siltstones, gypsum, clay, silt	water-bearing cavities, zones of increased permeability
METRO ROMA LINEA C, T4	Italy	2010 - 2011	2 EPB-TBMs, Ø 6.7 m, HERRENKNECHT	SCAN	gravel, clay, silt, silty clay, pyroclastics	cavities and archeological remains ahead and around of face
GASTAU GASPIPE PROJECT	Brazil	2009 - 2011	DS-GRIPPER TBM, Ø 6.3 m, WIRTH	INTEGRAL	gneisses, granites, diabas dykes	subhorizontal and subvertical water-bearing fault and fracture zones
TARRASA UTE Railway Project	Spain	2009	EPB-TBM, Ø 6.4 m, LOVAT	INTEGRAL	clay/silt, silty gravel sand/gravel, clayey carbonates, karst structures	(reinforced) concrete structures of old foundations and water wells linings, structures of Karst and old piles
METRO ROMA LINEA C, T5	Italy	2009 - 2010	2 EPB-TBMs, Ø 6.7 m, HERRENKNECHT	SCAN	gravel, clay, silt, silty clay, pyroclastics	cavities and archeological remains ahead and around of face
BRENNER BASE TUNNEL	Austria - Italy	2008 - 2010	DS-TBM, Ø 6.3 m, WIRTH	INTEGRAL	granites, gneisses	fault zones
METRO ROMA LINEA C, T6A	Italy	2008 - 2009	2 EPB-TBMs, Ø 6.7 m, HERRENKNECHT	SCAN	gravel, clay, silt, silty clay, pyroclastics	cavities and archeological remains ahead and around of face

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BLESSBERG TUNNEL - ERFURT-NUREMBERG	Germany	2008	Perimeter exploration in an existing tunnel	PERIMETER	limestones	karst cavities, open air-filled and filled with sand, gravel
METRO NAPOLI LINEA 1,	Italy	2008	S-TBM, Ø 6.7 m, HERRENKNECHT	INTEGRAL	tuff	old-mine cavities
TÚNEL DE LA CABRERA - VALENCIA-MADRID	Spain	2007 - 2008	DS-TBM, Ø 9.5 m, HERRENKNECHT	SCAN, INTEGRAL	limestones and dolomites	water-bearing fault/ karst zones and cavities
METRO NAPOLI LINEA 1	Italy	2007	S-TBM, Ø 6.7 m, HERRENKNECHT	INTEGRAL	tuff	old-mine cavities
VAL PASSIRIA PROJECT	Italy	2007 - 2008	DS-TBM, Ø 3.7 m, WIRTH	INTEGRAL	gneisses	water-bearing fault zones
PROYECTO DEL EMISARION SUBMARINO DE BERRIA	Spain	2006 - 2007	Micro-TBM AVN2000D, Ø 2.0 m, HERRENKNECHT	INTEGRAL	limestones	karst cavities
BELES MULTIPURPOSE PROJECT	Ethiopia	2006 - 2008	DSU-EPB-TBM, Ø 8.1 m, SELI	INTEGRAL	volcanic rock, pyroclastics, various kind of basalt, lacustrine sediments	water-bearing fault zones, disintegrated weathering zones, silty areas
CANADA LINE - VANCOUVER-AIRPORT VANCOUVER	Canada	2006-2007	EPB-TBM, Ø 6.1 m, LOVAT	INTEGRAL	sandstone, till, clayey sandy silt, coarse sand, siltstone	transition zones between sandstone and till, water-bearing formations
WATER SUPPLY TUNNEL	China	2006	2 Gripper TBM, Ø 8.3 m, ROBBINS	INTEGRAL	volcanics, metamorphics, marbles	karst cavities and fault zones with potential water-inrush zones
PAJARES TUNNELS LOT 1 LEÓN-ASTURIAS	Spain	2006	2 DS-TBM, Ø 9.9 m, HERRENKNECHT and NFM	INTEGRAL	folded and faulted schistes, grey waxes and karstic limestones	water-bearing fault/ karst zones and cavities

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HEADRACE TUNNEL	China	2006	Boring jumbo Drill + Blast	D+B- SCAN	volcanics, metamorphics, marbles	karst cavities and fault zones with potential water-inrush zones
JIN PING II HYDROPOWER PROJECT	China	2006	Boring jumbo Drill + Blast	D+B- SCAN	marbles, schistes	water- and air-/gas-filled caverns
ABDALAJIS TUNNEL WEST - MALAGA-CORDOBA	Spain	2004 - 2005	Double-shield TBM, Ø 10.2 m, MITSUBISHI/ ROBBINS	INTEGRAL	clay-/siltstones, limestones, marls, dolomites	weak claystones, karst structures, water- and gas-filled cavities and fault zones
METRO BARCELONA LINEA 9	Spain	2004 - 2005	Dual Rock-Soil TBM, Ø 11.95 m, WIRTH/ NFM	INTEGRAL	granite, discomposed granite (sand, gravel and boulders)	fault and fracture zones, (thermal) water-bearing zones
PRISNIG TUNNEL	Italy	2004 - 2005	Open type TBM, Ø 5.80 m, JARVA	INTEGRAL	calcareous and anhydrite/ gypsum formations	fault/ karst zones and caverns
GUADARRAMA NORTH-TUNNEL - MADRID-SEGOVIA	Spain	2004	Double-shield TBM, Ø 9.51 m, HERRENKNECHT	INTEGRAL	gneisses and intrusive rocks of granitoid type	finegrained (mylonitic) shear zones
GOTTHARD BASE TUNNEL SOUTH PORTAL	Switzerland	2003 - 2004	2 Gripper TBMs, Ø 9.51 m, HERRENKNECHT	INTEGRAL	gneisses	subhorizontal and subvertical water- bearing fault and fracture zones
GOTTHARD BASE TUNNEL SECTION SEDRUN	Switzerland	2003	Drill & Blast	D+B- SCAN	schists and gneisses	water-bearing fault zones
STAMMHAM TUNNEL - NUREMBERG-INGOLSTADT	Germany	2002 - 2003	Perimeter exploration in existing tunnel	PERIMETER	limestones and dolomite	karst cavities, open air-filled and filled with sand, gravel
GEISBERG TUNNEL - NUREMBERG-INGOLSTADT	Germany	2002 - 2003	Perimeter exploration in existing tunnel	PERIMETER	limestones and dolomite	karst cavities, open air-filled and filled with sand, gravel

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GINORI TUNNEL - FLORENCE-BOLOGNA	Italy	2000 - 2003	Telescopic-shield TBM, Ø 6.3 m, WIRTH	SCAN	limestones	high water-bearing and high permeability subvertical karst and fault zones
IRLAHUELL TUNNEL - NUREMBERG-INGOLSTADT	Germany	2000 - 2003	Perimeter exploration in existing tunnel	PERIMETER	limestones and dolomite	karst cavities, open air-filled and filled with sand, gravel
LOETSCHBERG BASE TUNNEL	Switzerland	2000	Drill & Blast Boring jumbo	D+B-SCAN	schists, marls and limestone	karst-structures and clayey schist shear zones