Magiczny Kraków

METRO - EXHIBITION

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The word ‘metro’ derives from French abbreviation of *chemin de fer métropolitain* which, in turn, is a direct translation of the earlier English term ‘Metropolitan Railway’, but the French shortened it to a single word, *metro*, which has since been adopted by many other languages worldwide.

PANEL ONE

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PANEL TWO

There are now over 180 metro systems in 178 cities across 56 countries, with new ones being planned every year!

The first underground railway opened in London in **1863**. Initially, it had only seven stations, but today, a century and a half later, the network boasts **270 stations** and **402 km** of tracks. In 2015, a world record was set for visiting all of them in the shortest time: despite rushing, it took 15 hours, 45 minutes, and 38 seconds.

London, Notting Hill Gate Station © *Thierry Milherou Pixabay*

While London’s Tube has age on its side, it falls short in terms of length. That record has long belonged to Beijing. The Chinese capital’s subway stretches **690.5 km**, with Line 10 alone spanning over **57 km**!

In contrast, the world’s shortest metro was launched 40 years ago in the Austrian town of Serfaus. It consists of just one line, which is only **1,280 meters** long.

Although metros usually run underground, this is not necessarily always the case. In Oslo, for example, of **101 stations**, only **17** are below ground level!

Oslo, Overground Holmenkollen Railway Station © *Łukasz Zalasiński*

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And what is it like in Kraków’s twin cities?

One of the stations in Kyiv—Arsenalna—is the deepest metro station in the world, located 105 meters below ground level. This depth was dictated by the high banks of the Dnipro River.

Kyiv, Zoloti Vorota Station © *Kyiv - Station Golden Gate - AMY Wikimedia Commons*

Milan boasts the largest metro network in Italy—larger even than Rome’s!

We are also twinned with Budapest, home to the oldest metro system in mainland Europe (and the second in the world) and at the same time the first fully electrified one. Its opening in **1896** celebrated the millennium of the Hungarian state. It is the only underground railway to be listed as a UNESCO World Heritage Site.

Budapest, Keleti Railway Station © *Ralf Roletschek - Fahrradtechnik und Fotografie, GFDL 1.2; Wikimedia Commons*

HISTORICAL LINE—THE KRAKÓW METRO

PANEL THREE

Stations:

REDUCING TRAFFIC CONGESTION—GRAND PLAN—VISIT—CONFERENCE—MAIN RAILWAY STATION—TUNNEL—REFERENDUM—STUDY—COUNCIL

Station 1: As early as 1967, Kraków’s general spatial development plan envisaged the construction of a premetro tunnel between the Mogilskie Roundabout—Main Railway Station—Karmelicka Street to reduce overcrowding on tramlines on the East-West axis during the construction of large residential districts on the then city outskirts.

Station 2: In 1974, work began on a 180-meter section of a premetro tunnel under the Main Railway Station, initially intended for an express tramway. The spatial plan for the tunnel route was expanded to include an express tram section connecting Karmelicka with Dietla streets. At that time, planners envisioned Kraków’s transport system as being based on integrated metro and rapid urban rail system networks.

Station 3: In the 1980s, international specialists from Nuremberg, Minsk, Moscow, and Budapest visited Kraków. Reports based on the cities’ experiences confirmed the feasibility and advisability of introducing tunnelled metro routes in the city centre. Recommendations from German experts included even construction methods, suggesting shallow tunnels built using hydraulic shield technology.

Station 4: In 1987, following the famous scientific and technical ‘Metro in Kraków’ conference, pre-design and preparatory work for the construction of Line 1 began. For the first time, the possibility of implementing a complete metro line in Kraków was seriously considered, with the plan to secure funding from the state budget. The 1988 Kraków General Plan identified the metro as the most important element of the transport system.

Station 5: In 1990, after the tunnel under the Main Railway Station was completed, further construction and funding for pre-design works were halted due to the turbulent period of ">PANEL FOUR

ROCK-SOLID FACTS AND METRO MYTHS UNEARTHED

Myth: Metro construction is very fast

Fact: Metro construction is complex and time-consuming, especially in densely built-up cities. It requires precise geological analyses, years of planning, and extensive construction work. For example, in Warsaw, the first plans were made in the 1920s, but the first section wasn’t completed until 1995, and the last station of the first line opened only in 2008!

Warsaw, test drilling for the construction of the underground in Żoliborz in 1939 © *Narodowe Archiwum Cyfrowe*

Myth: Metros are always underground

Fact: While many metro lines run underground, some sections are built at ground level or even on elevated tracks. This is true not only in Oslo but also in cities like New York, London, and Berlin.

Myth: Metro is just an extra mode of transport—buses and trams are sufficient

Fact: Metro plays a key role in large cities with congested streets. With its fast underground rail system, it can significantly reduce road traffic and pollution emissions. In many major cities, the metro is the backbone of public transportation, not just an addition.

Myth: Metro is expensive to operate and not very cost-effective

Fact: Although building and maintaining a metro system requires substantial investment, it can be more cost-effective than expanding roads or purchasing buses and trams. Metro systems transport thousands of passengers per hour, easing the strain on road infrastructure. They also benefit the economy by reducing commute times.

Myth: Metro construction damages buildings and surface infrastructure

Fact: Modern tunnelling technologies, such as Tunnel Boring Machines (TBMs), minimise the impact of construction on the surface. Engineers employ advanced methods to prevent damage to buildings and limit disturbances to the surrounding area.

Myth: Metro construction is harmful to the environment

Fact: In the long run, metro systems have a positive ecological impact. They help reduce CO_2 emissions, noise, and fuel consumption. Many cities are investing in eco-friendly, energy-efficient

technologies to minimise the carbon footprint of both construction and operation.

Myth: Metro is unnecessary if more roads can be built
Fact: Road expansion has its limits, particularly in densely populated urban areas. Building new roads often leads to increased traffic congestion and pollution, making metro systems a more sustainable solution.

Myth: Building a metro in Kraków is impossible due to historical landmarks
Fact: While constructing a metro in a city with rich historical heritage requires exceptional care, it is not impossible. Cities like Rome, Paris, and Prague have successfully integrated metro systems into their historical landscapes using advanced technologies, meticulous planning, and adequate financial resources.

Myth: Metro is too expensive for Kraków and will never pay off
Fact: While building a metro system is a costly investment, a well-designed underground network could yield significant benefits. Improved traffic flow is advantageous for residents, tourists, and the local economy.

Myth: Metro is noisy and will disturb residents
Fact: Modern technologies, such as shock absorbers and specialized track systems, significantly reduce noise in tunnels. Metro systems can be quieter than trams and buses operating on the surface, and the depth of tunnels further minimises vibrations and noise felt by residents.

Myth: Building a metro causes damage to buildings and overground infrastructure
Fact: Modern tunnelling technologies, such as Tunnel Boring Machines (TBMs), significantly reduce the impact on surface structures. Engineers use advanced methods to safeguard buildings and minimize disruption to the surrounding areas.

Myth: Metro construction is harmful to the environment
Fact: In the long term, metro systems are environmentally beneficial. They lower CO_2 emissions, noise pollution, and fuel usage. Many cities rely on green, energy-efficient technologies that minimise the carbon footprint of the construction and operation itself.

Myth: Metro is unnecessary when more roads can be built
Fact: Road expansion has its limits—especially in large, densely populated cities. Building new roads often leads to more congestion and pollution.

Myth: Building a metro in Kraków is impossible because of the historical monuments
Fact: Although extraordinary care is needed when building a metro in a city with a rich history, it is not impossible. Cities such as Rome, Paris, and Prague have successfully integrated metro systems into their historical landscapes using advanced technology, meticulous planning, and sufficient funding.

Paris, construction of the underground in 1926 (National Digital Archives) © *Narodowe Archiwum Cyfrowe*

Magiczny Kraków

Myth: Metro is too expensive for Kraków and will never pay for itself
Fact: Building a metro is an expensive investment, but a well-planned underground system could bring tangible benefits. Improved traffic flow is good for residents, tourists and the local economy.

Myth: Metro is noisy and will disturb residents
Fact: Modern systems, including shock absorbers and specialized tracks, minimize noise and vibrations. Metro systems can be quieter than trams or buses, and tunnel depth further reduces disturbances to residents.

PANEL FIVE

KEEP CALM AND TUNNEL!

The tunnel will be excavated using a closed shield tunnel boring machine (TBM). The shield method ensures efficient tunnelling in virtually all soil and water conditions, a high level of safety, protection of the environment and existing buildings.

The average tunnelling progress will be **10-15 metres/day!**

German Tunnel Boring Machine Elodie - 82 metres long and 9 metres in diameter, weighing 1,400 tonnes (Yann Caradec, CC BY-SA 2.0; Wikimedia Commons) © *Yann Caradec, CC BY-SA 2.0; Wikimedia Commons*

The tunnels will be situated 15 to 25.5 meters below ground level. In the deepest section (between the Stare Miasto and Dworzec Główny stations), the tunnel ceiling will be 17 meters below ground level.

Łódź, Tunnel Boring Machine Katarzyna, digging the tunnel connecting the Dworzec Fabryczny station with Łódź Kaliska and Łódź Żabieniec stations
© *Krzysztof Szymczak, Dziennik Łódzki*

The stations will be designed to allow for easy maintenance, servicing, cleanliness and will be resistant to vandalism and equipped with an anti-graffiti system. All stations will be fully accessible to people with limited mobility.

EVERY STATION IS AN INSPIRATION!

Unlike railway systems, there is no universal blueprint for a metro. Each system is designed based on the specific needs and financial capabilities of the city. In Kraków, we will draw inspiration from cities such as:

Porto

The metro resembles a light urban railway, with rolling stock consisting of low-floor Bombardier