UITP ADVANCING PUBLIC TRANSPORT

KNOWLEDGE BRIEF

METROS: THE BACKBONE OF MOBILE COMMUNITIES AND SUSTAINABLE CITIES

OCTOBER | 2019

Collective mobility is delivered through many forms of transport, ranging from the traditional rail and road vehicles in all designs and sizes, so-called unconventional systems (cable, monorails…), and more personalised shared mobility like taxis, car-sharing etc., each with its own operating features and performance levels.

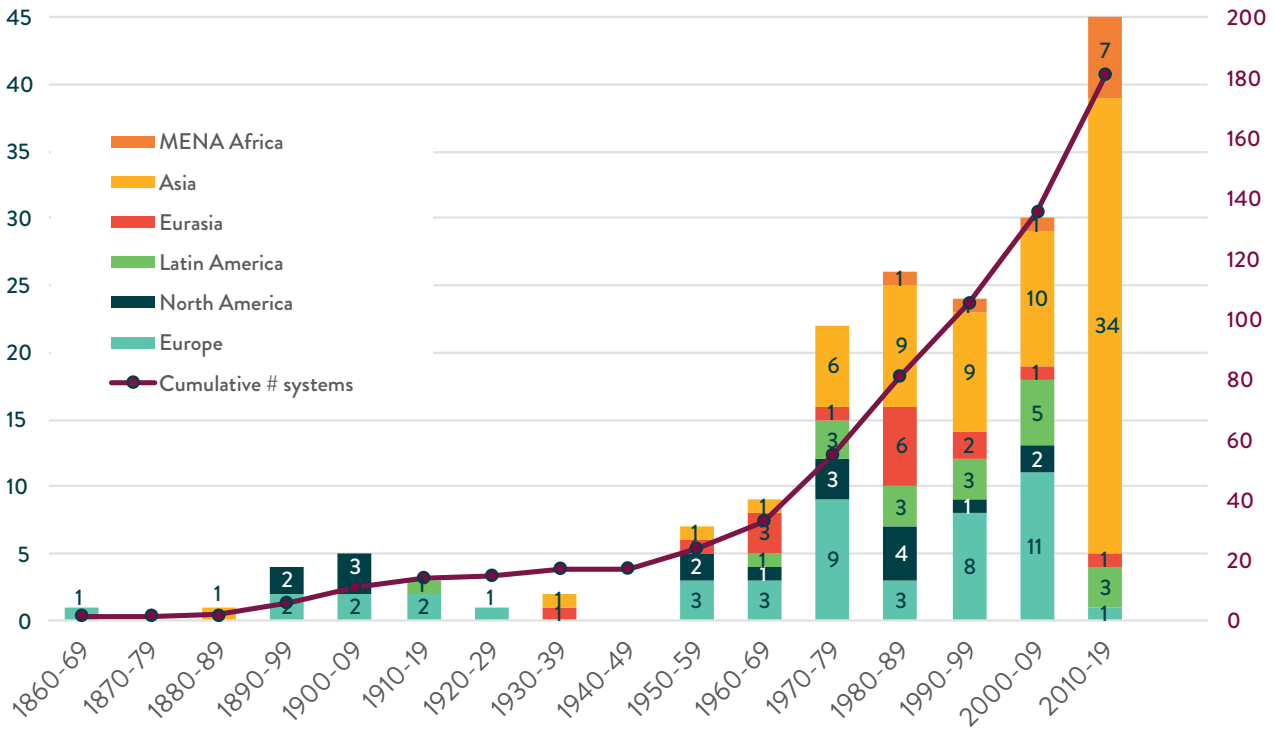
UITP recognises that all types of collective and shared transport have a role to play in cities and regions in combination with active modes like cycling and walking. Only well-designed and seamless integration of all complementary modes suited to the local requirements will offer citizens quality options to choose public or shared transport over individual mobility.

INTRODUCTION

Originally designed to combat congestion in crowded cities, metro systems have confirmed their powerful attraction for politicians, the business community and even the travelling public. Metros have demonstrated their remarkable ability to help accommodate population growth with minimum negative externalities, foster economic development and enhance quality of life. Metros are an effective long-term commitment and investment to deliver sustainable, resilient and smart cities.

EVOLUTION

The first ever metro high-capacity electrically-guided urban rail systems with exclusive right-of-way, fully protected from disruption by third parties, dates back to 1863 in London. Metros developed mainly in the Western World, the Soviet Union, parts of Asia and South America in the second half of the 20th century. Since the new millennium, metro development has been massive, with 79 new cities joining the club by December 2018, mainly in Asia, but also in Africa and the Middle East, reflecting global urbanisation and economic development trends.



Opening of metros, 1860-2018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With forecasts of the global demand for urban mobility set to double by 2050[1], the development potential of metros is considerable. From 2019 to 2024, global metro infrastructure is expected to grow by 40%, with 25 more cities opening their first line (Doha, Sydney, Macau, Quito, Riyad, Hanoï, Thessaloniki etc...) and a further 60 new lines opening in existing networks.

In 2017, metro carried approximately 53 billion passengers in 178 cities, helping to alleviate transport's negative externalities.

Considering an average occupancy of 1.3 passengers per car, metros remove the equivalent of 133 million cars from city streets every day.

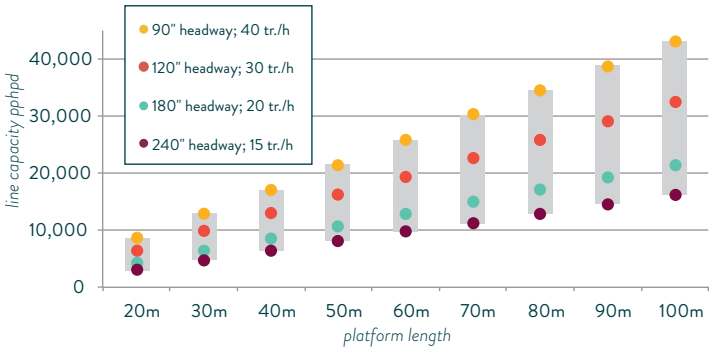
By this measure alone, the economic and social importance of metro networks cannot be denied.

1 Arthur D. Little & UITP, Future of Urban Mobility 3.0, 2018

MY METRO: A DAILY HERO!

Metros are among the most critical, complex and valuable infrastructures for cities to perform successfully in the global competition to attract people, talent and business.

With their large trains and short headways, metros offer transport capacity in excess of 60,000 passengers per hour per direction (pphpd) and are ideally suited for the most heavily used transport corridors. Metros are the pulsing arteries of bustling cities.



Line capacity (pphpd) for various operation scenarios

Their construction and operation mobilise vast expertise, know-how and financial means. However, they deliver high economic, social and environmental value through a set of unrivalled positive externalities. The benefits are incommensurable and recurrent not over years or decades, but over generations.

TRAVELLING PUBLIC

For the travelling public, metros make daily life easier and maximise opportunities to access jobs, education, healthcare, culture and entertainment.

A time saver: Metros are fast, with commercial speed ranging typically between 30-45 km/h, even in rush-hour when cars are unable to drive over 15-20 km/h. In congested cities, the introduction of a new metro line translates in hundreds of commuting hours saved every year, one of the most valued impacts reported by users.

In January 2019, Metro de Santiago inaugurated Line 3, serving over 1 million citizens in 6 municipalities.

For these citizens, it meant:

REDUCED TRAVEL TIME BY 50% = SAVING 220 HOURS PER YEAR

A life saver: Metros are 50 times safer than cars in urban areas[2]. Accidents like derailment or collision are extremely rare events and so are injuries and casualties: for the last 20 years, the global average of metro accident casualties was below seven per year.

A stress-saver: Legible and easy to understand routes, high frequency, high reliability and travel time predictability offer passengers quality time to read, interact (in "real" or "virtual" reality) or simply take a rest. Operators make customer care one of their prime missions to ensure quality of service even in crowded and disrupted situations.

A life-style marker: A series of emotional attributes confer metros a high potential to induce modal shift: for a similar level of service, urban rail attracts up to 20% additional passengers in comparison to other modes[3]. Next to this "rail effect", metros also trigger a sense of belonging with iconic features such as visual identity (London, Tokyo...), landmark station entrances (Paris, Bilbao..) or station decoration and art display (Brussels, Dubai, Stockholm, Moscow...). Metros contribute to high quality place-making and stations are seen as places to stay and relax; an integral part of urban life, hosting shops, services, events, permanent art display, exhibitions, concerts or other social or cultural activities.

2 UITP, Ready for MaaS? Easier mobility for citizens and better data for cities, 2019. Available at: https://www.uitp.org/ready-maas-easier-mobility-citizens-and-better-data-cities

3 UITP, Assessing the benefits of public transport, 2009. Available at: https://www.uitp.org/assessing-benefits-public-transport

CITY AUTHORITIES

For city authorities, their inhabitants and their decision-makers, metros mitigate 21st century challenges and are a sound long-term investment.

A congestion-solver: Commuter trips by metro remove millions of cars from streets and roads every day and avoid significant additional time losses affecting people and the economy. Metros help save billions of euros in congestion losses which impacts the GDP each year.

A strong enabler of economic development: Good and reliable metro service supports efficient economies. The 50 largest metropolitan areas by GDP in the world are all supported by urban rail systems – the majority (76%) have metros. Major metro service disruptions are rare events but occasionally offer a blatant evidence that, without metro, cities almost come to a grinding halt.

A contributor to climate-change mitigation: Metros can boast today an energy efficiency performance that no other mode will probably ever reach. Metros emit 40 times less CO2 per passenger than cars, and in the last decade, many metros are procuring renewable energy, on the way to becoming true zero carbon emitters. Metros are therefore an instrument to help achieve carbon reductions agreed in the Paris Climate agreement.

In addition, metros have run exclusively on electricity for more than a century, producing no exhaust emissions in sensitive metropolitan areas. This, combined with their impact in reducing car trips, this helps improve air quality and reduces harmful emissions blameable for respiratory diseases, premature deaths and damage to buildings and city heritage.

A space (re)creator: Space is a precious commodity in dense metropolitan areas. With very limited space requirements, metros are the most space-efficient transport system. In addition, dense and high-rise development (retail, office, housing) above and around metro stations allows for additional space, value and convenience in dense areas, thereby contributing significantly to high quality of urban environment and life.

A mobility-integrator: With digitalisation and automation, new opportunities appear for radical changes to mobility, easing a transition from an asset business to a service business. This would be where the end-users do not own their 'mobility assets' but conveniently choose from a portfolio of services called "Mobility as a Service", designed around the most sustainable transport options[4]. As the backbone of the mobility system on the busiest corridors, metros are the ideal structure around which other modes can be efficiently organised. Metro stations are the main hubs/nodes for convenient connectivity and perfectly fulfil the role of integration leader in the transport and land use policy of a given territory.

There is no MaaS without mass transport, hence without metros!

4 UITP, Ready for MaaS? Easier mobility for citizens and better data for cities, 2019. Available at: https://www.uitp.org/ready-maas-easier-mobility-citizens-and-better-data-cities

BUSINESSES AND INVESTORS

For businesses and investors, metros offer long-term confidence, accessibility gains and significant market benefits.

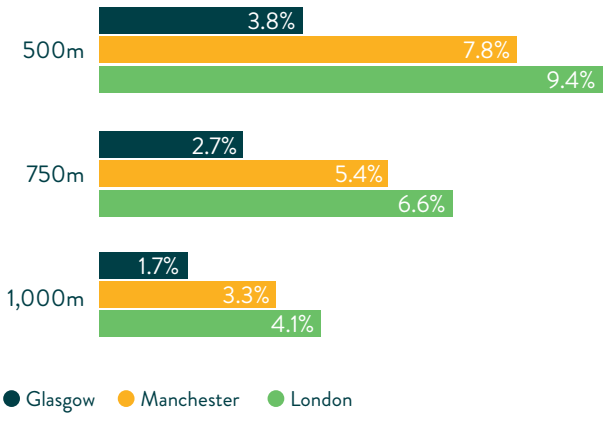
An economic development-enabler: Cities need size and density to achieve their full potential and be exciting places that bring ambitions, energetic and creative people together to generate growth and wealth. Metros support the concentration of people and ideas that spark innovation and urban economies and reduce the plague of traffic congestion.

In addition to the accessibility and connectivity benefits, socio-economic research in the past decade has identified a series of so-called wider economic benefits[5] such as the agglomeration effect that provides additional justification for high investment requirements.

A confidence-building location factor and a land value booster: Metros are a permanent infrastructure that signals a strong commitment of decision-makers to sustainable mobility and spatial accessibility for customers, visitors and employees. They offer investors strong confidence and ease investment opportunity decisions.

Numerous studies also demonstrate that businesses and real-estate within the vicinity of metros are universally seen as a premium location. Hence, the market value of land and property in vicinity of metros increases, as the accessibility and connectivity attributes of metros are highly prized by real-estate developers.

Premium compared to property located 1,500m from station



Source: Nationwide

A competitive edge to attract talents: Of the various measures available to employers to attract talents, convenient accessibility and fast commutes are key. Work places in the direct vicinity of metro stops bring tangible advantages to gain and keep the work force by making it an easy and rewarding place to work without the hassle of traffic and searching for parking places.

A showcase for innovation, clean, energy-efficient, fully automatic and digital mobility: Modern metros are the most advanced technologies. Fully automated metros are nowadays state-of-the-art with over 1,000 km of lines in service[6]. A combination of technologies and operation tactics allow for maximum safety and flexibility while also reducing energy consumption and operation costs. Metros are the showcase of railway manufacturers and a testimony of their innovation capability and excellence. Fully automated metros are state-of-the-art and are the fore-runners of tomorrow's digital mobility.

A FEW POINTS TO KEEP AN EYE ON...

In addition to the many benefits, it must be recognised that implementing metro systems is complex and presents challenges:

High capital intensity: Besides initial construction investment in greenfield projects, maintaining their value and functionality along the full lifecycle, in a pro-active asset management discipline. A sound and robust economic and business model needs proper consideration to deploy its full benefits.

A long-term planning process: In built-up mature cities, it is not rare to see 10-20 years elapse between the emergence of the first idea to the opening of a line. This long time to market requires political stability and continued efforts to generate a high level of convergence and consensus among stakeholders.

5 UITP, Assessing the benefits of public transport, 2009. Available at: https://www.uitp.org/assessing-benefits-public-transport

6 UITP, World report on Metro Automation 2018, UITP Observatory of Automated metros, 2019. Available at: https://www.uitp.org/world-report-metro-automation-2018

CONCLUSION

Metros have many positive attributes and can reduce the dependence on private car. Their development has been very successful over the last three decades, and it will go on. It is obvious, however, that a minimum ridership (above 15,000-20,000 pphpd) is necessary to ensure cost-effectiveness. Metros are good for people, business and society. They deliver technical, economic, political, social and environmental benefits. They help create liveable and smart cities. Most advantages can even be further amplified with fully automated metros (GOA4).[7]

RECOMMENDATIONS

Metros can only be implemented successfully if they are integrated with other public transport modes. This is beyond the responsibility of operators alone. Authorities are also involved, and it is necessary to create a good partnership between all stakeholders. This includes a clear and solid urban development strategy to:

- Build coherent transport policies, by using the benefits of each mode, developing network hubs, and focusing on the complementary elements of each mode.
- Ensure that the project is suited for long-term development.
- Take advantage of metro construction to carry out urban regeneration schemes and to fuel housing, job and public equipment developments along the line[8].
- Exploit innovative financial instruments[9] which take the future benefit of metro into account to provide part of the initial capital, including Land Value Capture[10].

Metros require cyclical major (re)investments to ensure that safety, reliability and performance can be maintained over time. With 50 metros and over 120 lines opened in the 70s-80s, time for such major asset replacement is coming and deserve at least as much attention as new developments. Operators and authorities should:

- Ensure that sufficient resources (money and expertise) are available and earmarked to keep assets in a 'state of good repair'4. Don't wait for assets to fail and stall the travelling public.

Metros need to prepare for and embrace the digital transformation: digitalisation can bring major efficiency gains to metro planning, design, construction, operation and maintenance, whereas Mobility as a Service is transforming the urban mobility landscape. This double transformation is also an opportunity to reposition various stakeholders on the added-value chain and:

- Proactively explore partnerships or develop Mobility as a Service initiatives that reinforce metro as the backbone of modern urban mobility
- Analyse new delivery and O&M models beyond the traditional approach; the relationship with suppliers is likely to change with more partnership relations in the field of predictive maintenance.

7 UITP, Benefits of Metro Automation, 2019 • 8 UITP, Public Transport as an Instrument for Urban Regeneration, 2018. Available at: https://www.uitp.org/public-transport-instrument-urban-regeneration • 9 UITP, Financing Toolbox, 2019. Available at: http://www.uitp.org/financing-toolbox • 10 UITP, The Value of Public Transport. How to implement Land Value Capture, 2019

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