ADVANCING PUBLIC TRANSPORT

OCTOBER 2015

WORLD METRO FIGURES

STATISTICS BRIEF

2014 OUTLOOK AND FOCUS ON AUTOMATED LINES

In 2014, 157 cities around the world had a metro system in operation. Nearly two thirds of these networks are located in Asia and Europe (54 and 46 respectively). There are 18 systems in Latin America, 16 in both Eurasia and North America, and 7 in the Middle East and North Africa (MENA) region.

The last 15 years have seen a considerable expansion in terms of metro systems and infrastructure. A total of 194 metro lines pertaining to both existing and new networks, accounting for approximately 40% of the length of metro infrastructure worldwide, have been inaugurated in this period. In total, 53 new metro systems were built and put into operation since the turn of the millennium.

In 2014 alone, 513 km of new metro infrastructure and 355 new metro stations were put into service. New metro systems were inaugurated in Salvador (Brazil), Changsha, Ningbo and Wuxi (China), Mumbai (India), Shiraz (Iran) and Panama City (Panama).

METRO NETWORKS WORLDWIDE 2014

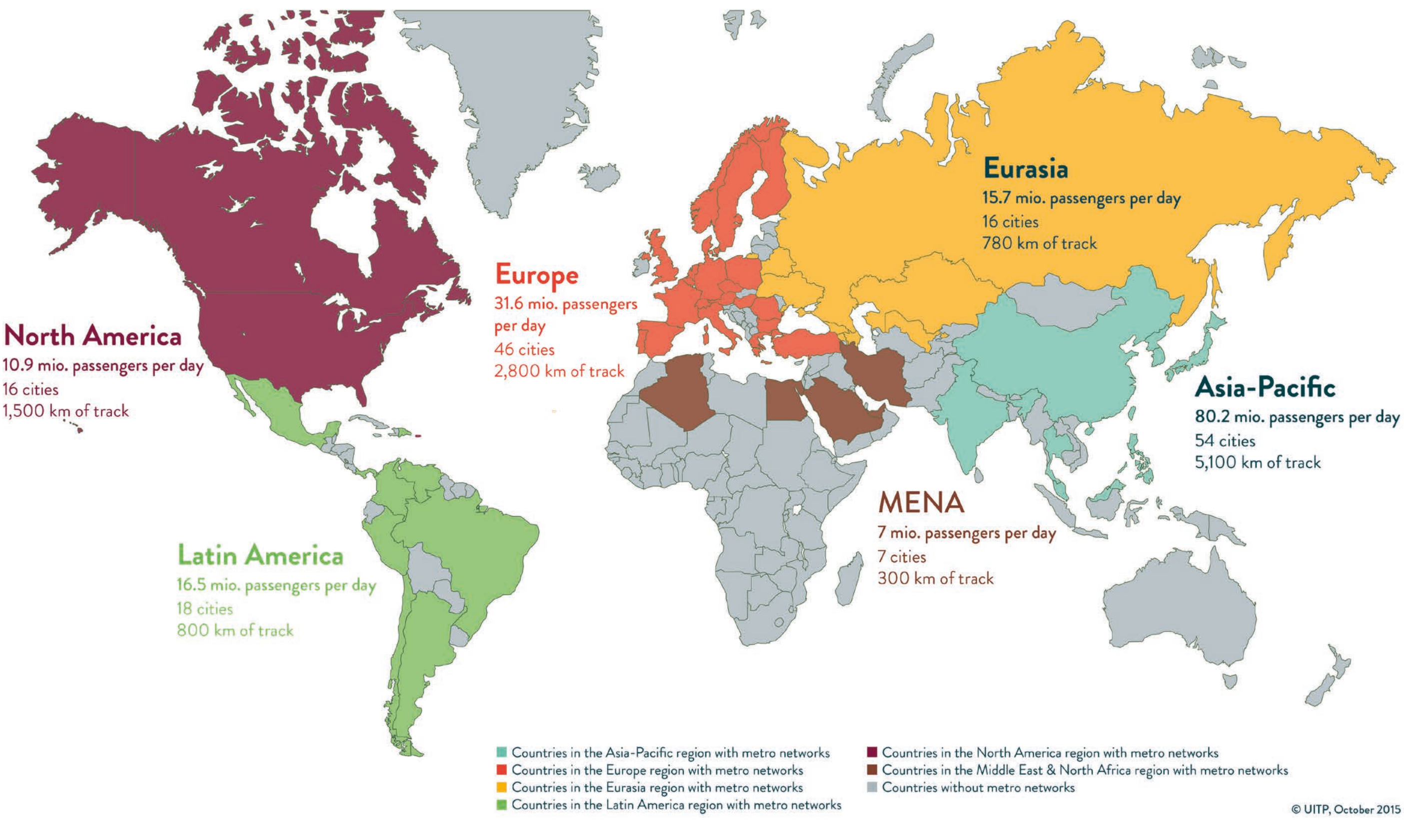

Fig. 1: Map of countries which have metro networks, according to world region, with average daily ridership, the number of cities in each region with metros and total length of metro infrastructure

PATRONAGE

Metro systems carry over 160 million passengers per day (50 billion per year), a 7.9% increase compared with 2012, representing 11% of public transport journeys worldwide.

The busiest metro network in the world is Tokyo (see figure 2), with close to 3.6 billion passenger journeys per year, and a 10% increase compared with 2012. Chinese metro systems, have experienced even more significant passenger growth, with Beijing (+39%) and Shanghai (+25%) rising to 2nd and 3rd busiest networks. Taken together, metro systems in Asia carry over 80 million passengers per day, nearly half the world total (see map).

Outside Asia, Moscow Metro remains the busiest network, with over 2.4 billion passengers per year. In North America, New York City has the highest ridership (1.8 bn). Mexico City is the busiest network in Latin America (1.6 bn, world's 8th). Paris metro has the highest ridership in Europe, with over 1.5 bn passengers per year. London (1.3 bn), São Paulo (1.3 bn) and Cairo (1.1 bn) complete the list of metro networks carrying over 1 billion passengers per year. Together, the top 13 networks carry 54% of the world's metro passengers.

City		Annual journeys (million)	Change from 2012 (%)	Ranking variation (2012-2014)	City		Annual journeys (million)	Change from 2012 (%)	Ranking variation (2012-2014)
	Tokyo Metropolitan area*	3,636	+10%	=		Guangzhou	2,280	+6%	=
	Beijing	3,410	+39%	+2		New York metropolitan area	1,785	+7%	=
	Shanghai	2,830	+25%	+2		Mexico City	1,614	0%	=
	Seoul*	2,661	+ 8%	-2		Hong Kong	1,548	+3%	+1
	Moscow	2,451	-1%	-2		Paris	1,526	0%	-1

*Fig. 2: 10 busiest metro networks (2014) *Tokyo and Seoul have multiple operator networks.*
Ridership figures refer to the complete network; the logos correspond to UITP member companies in the city.

INFRASTRUCTURE

In 2014 there were 549 metro lines in operation, totalling over 11,300 kilometres of infrastructure and 9,200 stations. The average line length is approximately 21 kilometres, with an interstation distance of 1.2 km.

The highest share (45%) of the metro infrastructure is in Asia, the continent also being home to five of the ten longest networks in the world. Shanghai and Beijing are the world's longest networks, both surpassing 500 km. London is the longest network outside Asia, followed by New York, Moscow, Madrid and Mexico. Paris and Chongqing complete the list of cities with over 200 km of metro infrastructure each.

TOP 10 LONGEST METRO NETWORKS

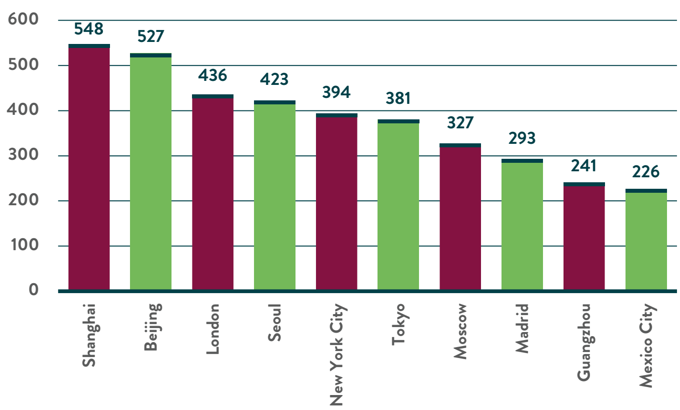

Fig. 3: Cities with the longest metro infrastructure (km)

METRO NETWORK CHARACTERISTICS

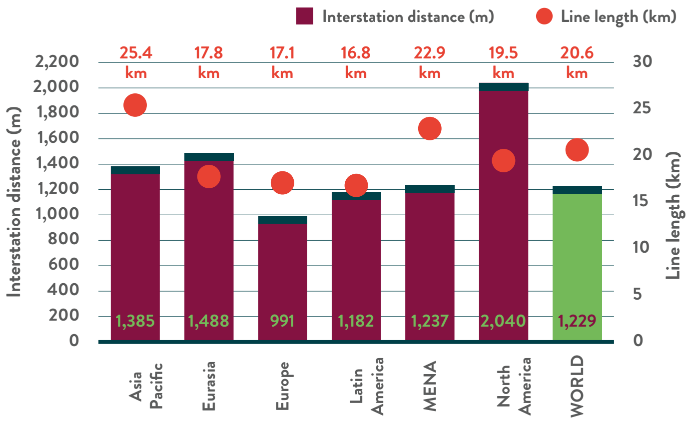

Fig. 4: Average metro line length and interstation distance, per continent

LOOKING AHEAD: METRO AUTOMATION

Fully automated lines can be operated without staff on-board of trains. Technical progress has made train control systems capable of supervising, operating and controlling the entire operational process. A defining characteristic for automated metro lines is the absence of a driver's cabin on the trains. This type of operation is also known as Unattended Train Operation (UTO), or Grade of Automation 4.

Automation brings many operational advantages, in particular, increased safety and flexibility in operation, unrivalled reliability, and more attractive job profiles for the staff on the line. Building on these strengths, metro operating companies can seize on automation as a lever for change at all company levels: operational, maintenance and customer service.

Grade of Automation	Type of train operation	Setting train in motion	Stopping train	Door closure	Operation in event of disruption
GoA1	ATP* with driver	Driver	Driver	Driver	Driver
GoA2	ATP and ATO* with driver	Automatic	Automatic	Driver	Driver
GoA3	Driverless	Automatic	Automatic	Train attendant	Train attendant
GoA4	UTO	Automatic	Automatic	Automatic	Automatic

*Fig. 5: Grades of automation. *ATP – Automatic Train Protection, ATO – Automatic Train Operation*

METRO AUTOMATION IN 2014

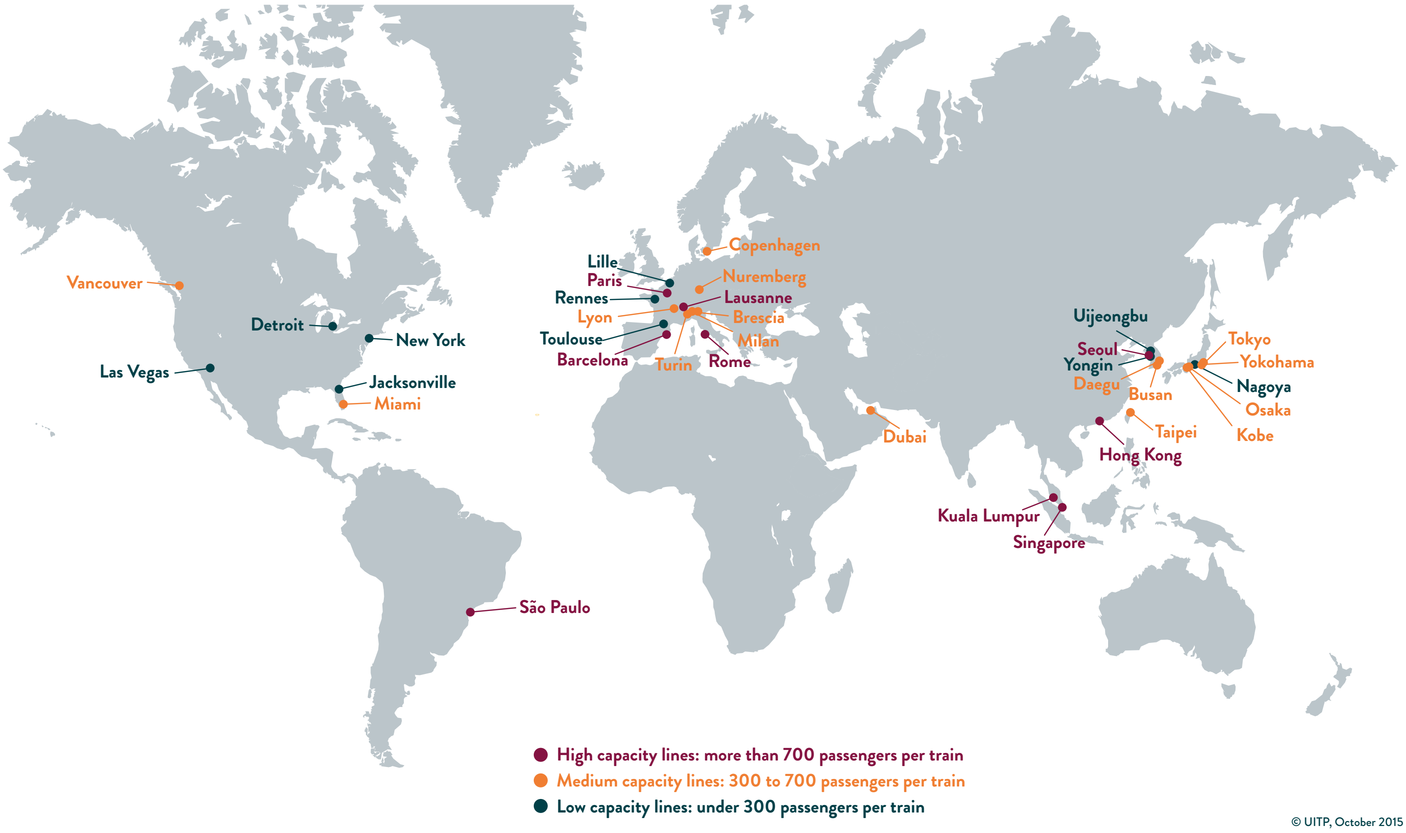

Fig. 6: Cities with automated metro lines, as of 2014

Nearly a quarter of the world's metro systems exploit at least one line in UTO mode. There are in total 732 km of automated metro lines, spread over 52 lines in 35 cities across the world.

Automation has a global standing – Asia and Europe account for two thirds of the world's automated lines, but automated lines are present in all the world's metro regions – with North America playing a pioneering role. In the last decade, both Latin America and MENA have developed automated lines, with MENA showcasing one of the higher rates of growth.

At the country level, France has the highest share of the world's UTO km with 17%, followed by South Korea (15%), and the UAE – which, in spite of opening its first UTO line only in 2009, accumulates now 11% of the world's UTO km in particularly long lines. Dubai is actually the longest automated metro network in the world with 80km, followed by Vancouver (68 km) and Singapore (65 km); Asian cities take up 5 of the 10 longest automated metro networks, the remaining 3 cities being all French: Lille, Paris and Toulouse.

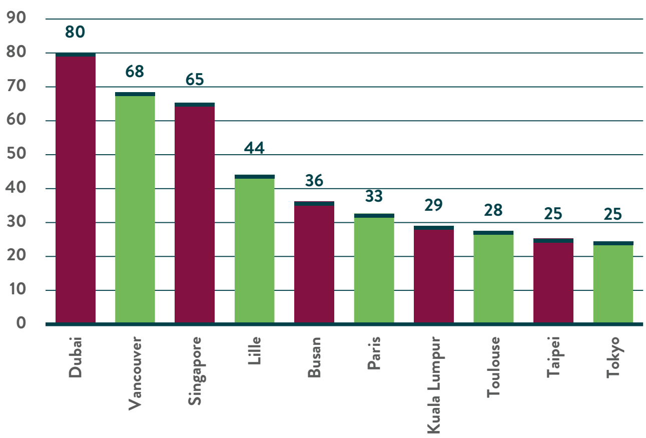

Fig. 7: 10 longest automated metro systems in the world

TRENDS AND CHARACTERISTICS

Unattended train operation is possible thanks to the technological evolution on two key areas: signalling (allowing trains to run safely at shorter intervals) and track protection systems (substituting the driver in detecting possible obstacles on the track).

SIGNALLING

The introduction of Communications-based train control (CBTC) systems has marked a turning point. Currently 72% of automated lines are based on CBTC (either inductive, radio or microwave technology). This share is set to increase, as all suppliers increasingly adopt CBTC as their technology of choice for automation.

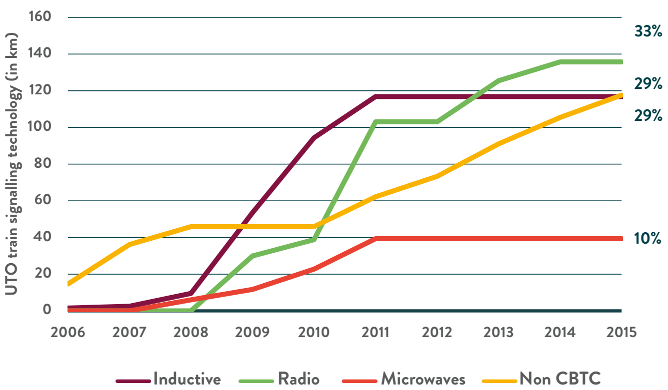

Fig. 8: Automated metro systems opened since 2006 according to signalling technology used

PLATFORM/TRACK PROTECTION SYSTEMS

Ensuring the safety of the interface between the platform and the track is a compulsory requirement for fully automated operation. Two different approaches exist, the installation of Platform screen doors (PSD), or the use of intrusion detection systems, which detect objects or persons on the track and signal any incoming trains to stop. Platform Screen Doors is the dominant solution (see graph), since they prevent passengers/objects from falling on the track, improving the performance and regularity of the line

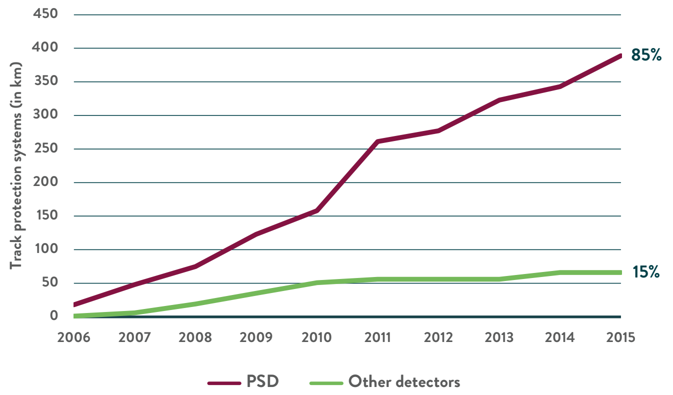

Fig.9: Automated metro systems opened since 2006 according to protection system used

CAPACITY

Full automation was initially developed for lower capacity lines (under 300 passengers/train), as running trains at shorter intervals made up for the design of lines with shorter trains and smaller stations. While they represent 28% of the total number of automated lines worldwide, only 10% of the lines opened since 2006 are low capacity. As full automation is becoming a trusted solution for key lines, higher capacity automated lines are being introduced: mid-capacity lines (300-700 passengers/train) make up 46% of the worldwide total but 61% of the newly opened systems; high capacity lines (over 700 passengers/train) make up 26% of the total and 29% of the systems opened in the last decade.

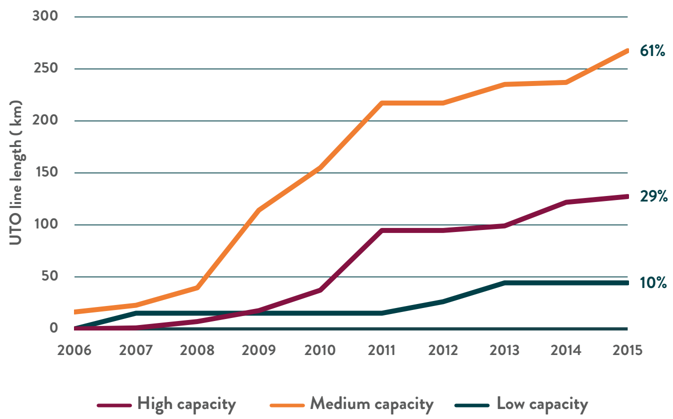

Fig. 10: Automated metro systems opened since 2006 according to train capacity

GROWTH

In the 40 years since the implementation of the first fully automated metro line, the growth rate for automation has accelerated exponentially with every decade – the current forecasts estimating the total length of automated metro lines to over 2,200 km by 2025.

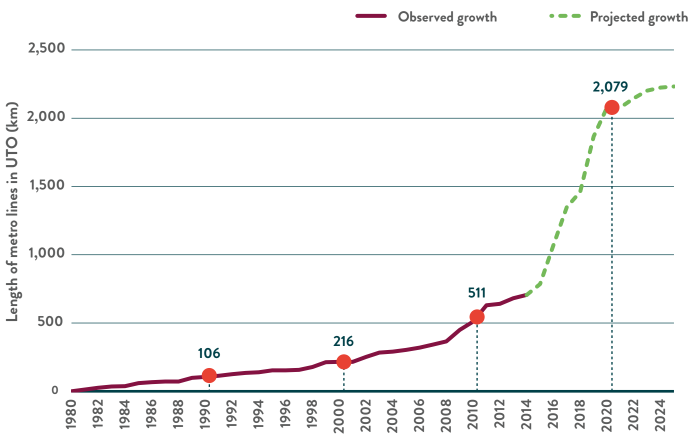

Fig. 11: Total growth in automated metros (km of line length)

The MENA region and Asia will spearhead this growth. By 2025, the Middle East will account for 24% of the world's km of automated metro. Asia will maintain its leader position. It is significant to note that mainland China has yet to announce its first UTO project.

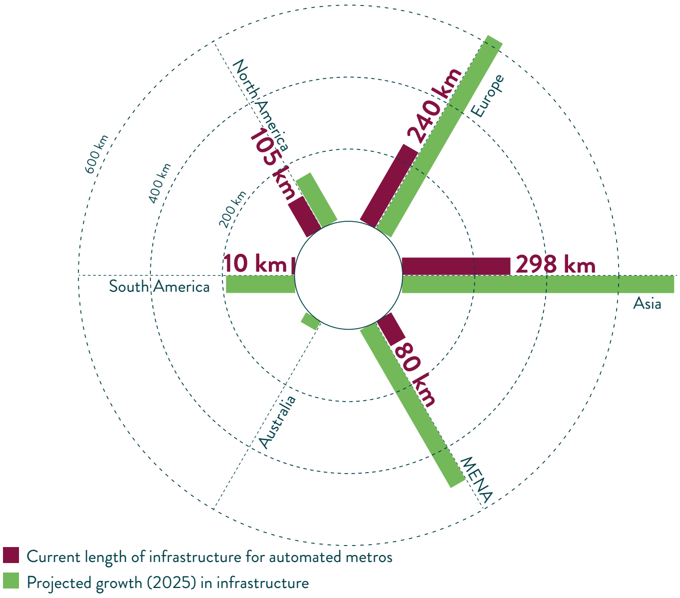

Fig. 12: Current length of automated metro lines and projected growth for the next decade, per continent

METHODOLOGY

The data on which this report is based was extracted from a database compiled by UITP using official company, or other authoritative sources. Please visit www.uitp.org for more information on access conditions.

Metros are high capacity urban guided transport systems, mostly on rails, running on an exclusive right-of-way without any interference from other traffic or level crossings and mostly with some degree of drive automation and train protection. These design features allow high capacity trains to run with short headways and high commercial speed. Metros are therefore suitable for the carriage of high passenger flows, and as such constitute the backbone of many public transport systems. Metro lines included in the above statistics run with trains composed of minimum two cars and with a total capacity of at least 100 passengers. Suburban railways (such as the Paris RER, the Berlin S-Bahn and the Kuala Lumpur International Airport express line) are not included. Systems that are based on light rail, monorail or magnetic levitation technology are included if they meet all other criteria. Suspended systems are not included. Automation criteria – asides from the criteria applicable to all metros, the metro automation data reflected in the statistics correspond exclusively to metro lines without staff on board (GoA4 as considered in standard IEC 62267). All data on Automated Metro lines is sourced on the work of the Observatory of Automated Metros.

The **UITP OBSERVATORY OF AUTOMATED METROS** gathers the world's leading operators with experience in UTO. It exchanges best practices in key issues affecting automated metro operation and monitors the global evolution and trends on this field. For more information, consult the Observatory website: www.metroautomation.org

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