UITP ADVANCING PUBLIC TRANSPORT

STATISTICS BRIEF

THE GLOBAL TRAM AND LIGHT RAIL LANDSCAPE 2019-21

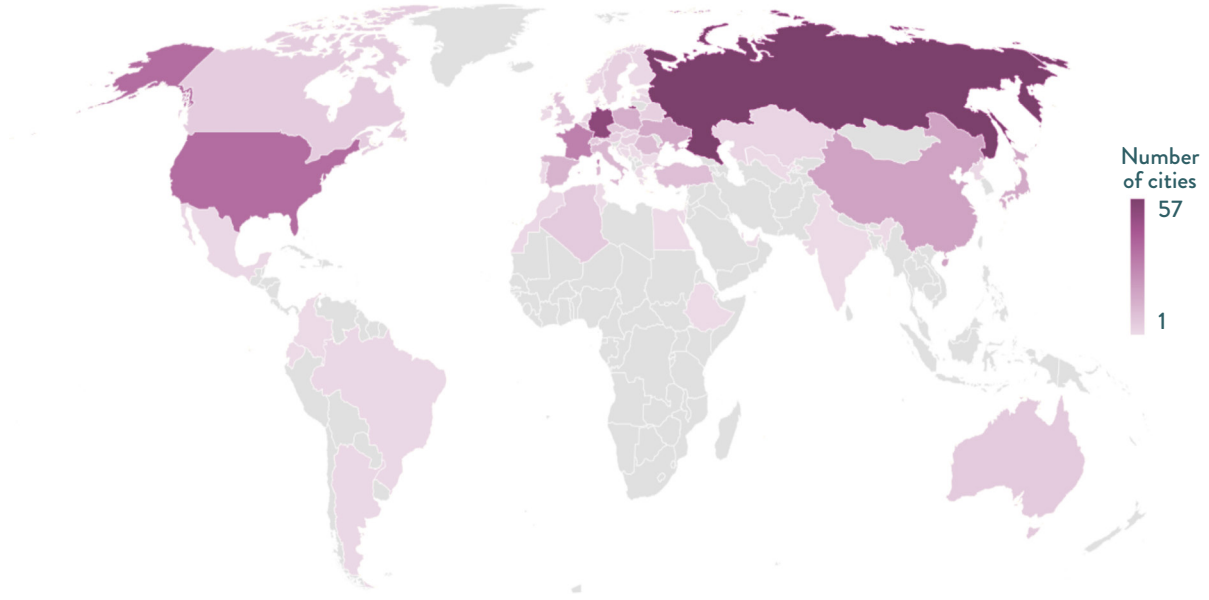
MAY | 2023

INTRODUCTION

Tram and light rail systems (both defined as Light Rail Transit or LRT, in this Brief) represent the most-widely used rail-guided solution for urban mobility at the global level. LRT systems can have different purposes dependent to the situation, providing the backbone of the public transport system in small and medium-sized towns, or acting as additional lines in support of the metro system in larger cities.

In this publication, exhaustive worldwide data for a list of indicators covering operational and infrastructural aspects of LRT have been collected at city level and aggregated per region. This Statistics Brief aims to follow up on the Global Tram and Light Rail UITP statistics published in 2019, showing how the LRT worldwide panorama has changed over the last three years and, in particular, how COVID-19 had impacted this mode of public transport.

Figure 1: Distribution of cities operating LRT systems around the world



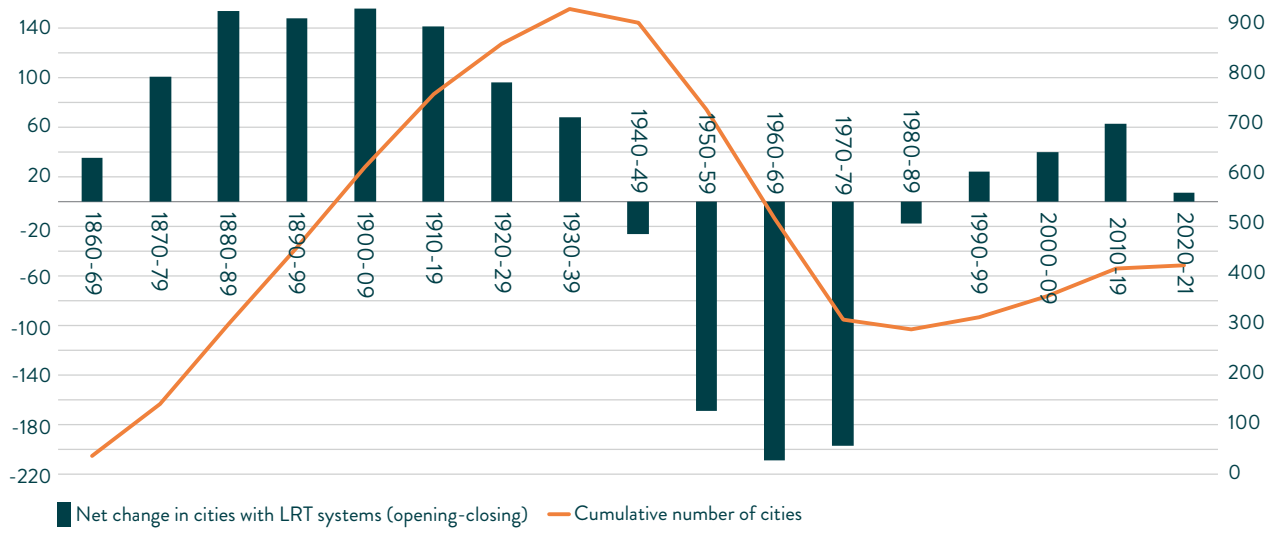
LRT GLOBAL DEVELOPMENT

The LRT solutions are continuing a so-called 'renaissance phase', one which started around 30 years ago. In the three-year period 2019-2021, 15 LRT systems were inaugurated, while only one was decommissioned. During the peak of LRT development in the 1930s, nearly 900 cities around the world were operating light rail systems. During the second half of the 20th century, LRT suffered a major recession, due to competition from the growing private mobility, leading to the decommissioning of two-thirds of existing systems. In 2021, for the first time since the start of the renaissance phase, the number of cities with an operational tram or light rail system has exceeded 400. Since UITP started collecting this data in 2015, an average of 6.5 new systems have been opened every year.

Table 1: Key indicators per region as of end 2021

Region	Number of cities	Length of infrastructure (km)	Number of stops	Number of vehicles	Number of low-entry vehicles	2019 ridership (million)
Africa	2	47	50	59	59	37
Asia-Pacific	48	1,183	2,392	2,408	1,003	778
Eurasia	83	3,449	6,178	9,923	1,537	1,983
Europe	210	9,129	17,183	20,426	11,906	10,667
Latin America	8	100	161	154	92	123
MENA	12	245	495	619	435	355
North America	40	1,659	3,275	3,314	1,388	705
TOTAL	**403**	**15,812**	**28,593**	**36,864**	**16,420**	**14,651**

Figure 2: Number of cities with LRT systems per decade, 1860-2021



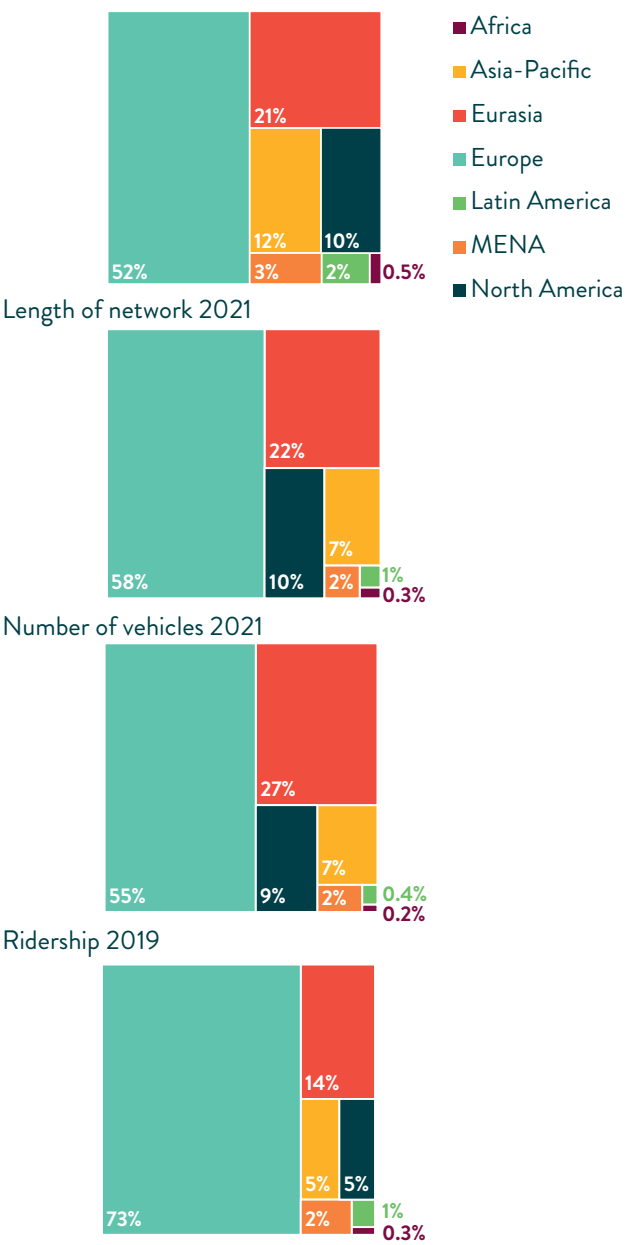
1 Data refers to 2019 to avoid COVID-19 effect.

STATE-OF-THE-ART AS OF 2021

As of 31 December 2021, there were 403 cities worldwide with at least one operational LRT system (different LRT systems or multiple operators in the same city are counted as a single system). In total, there were almost 16,000km of LRT lines in operation.

Europe stands out in all the indicators collected due to the well-established and widespread network of systems. Even if the region has 58% of the kilometre of network and 55% of the vehicles operating, it generates almost 75% of the total ridership[1]. In comparison, Eurasia is the second region for length of network and rolling stock capacity but with proportionally much lower annual ridership. See Figure 3.

Figure 3: Main indicators by regional distribution



INFRASTRUCTURE

The infrastructure indicator considers double-track and single-track sections separately[2]. The length of the network shown in the following charts is the sum of double-track sections plus the single-track portion of the network for those cities with different configurations.

As of 2021, there were 15,812km of LRT network in operation, mainly distributed between Europe (58%) and Eurasia (22%). At a global level, the length of infrastructure has been increasing by 1% per year on average since 2015, considering also the LRT systems that have been decommissioned during the same period. As Figures 4 shows, Eurasia is the only region where the total length of network has decreased (a closure in North America in 2020 was due to temporary maintenance work). The contraction of the Eurasian infrastructure was due to the closure of nine LRT systems; in Ukraine (4), Russia (3), Kazakhstan (1) and Uzbekistan (1).

In the last six years, 1,340km have been opened; almost half of them are in Europe and 26% are in the Asia-Pacific region (Figure 5). Although Mainland China does not have the same dominant role in LRT development as it does in metro development, it has been steadily increasing the number of systems year-on-year. Between 2015-2021, Mainland China opened 12 LRT systems, accounting for 21.6% of the total new infrastructure.

2 A double-track railway usually involves running one track in each direction, compared to a single-track railway where LRT run in one direction or in both directions and share the same track.

Figure 4: Annual length variation in km per region (km)

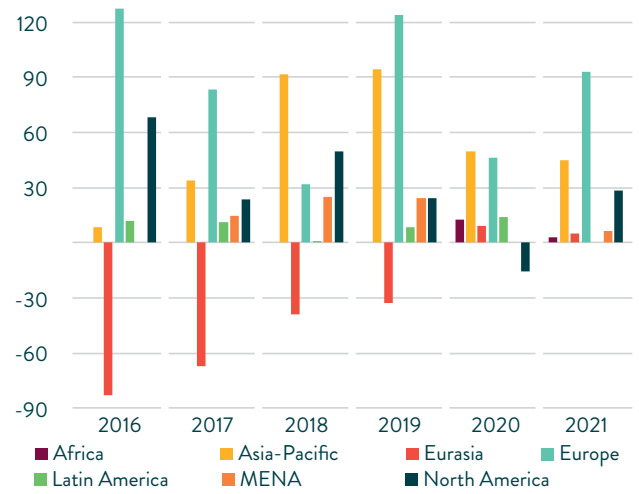


Figure 5: Length of LRT network opened, 2016-2021 (km)

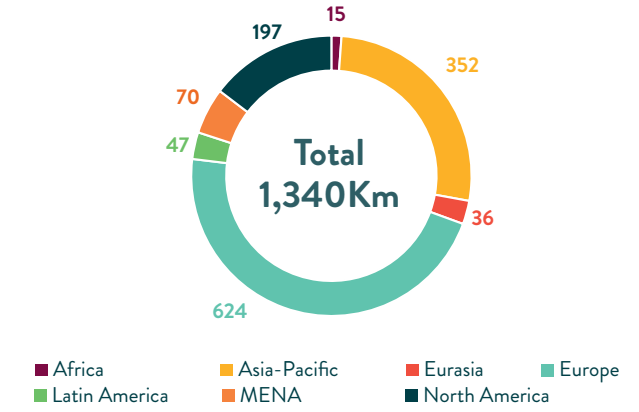
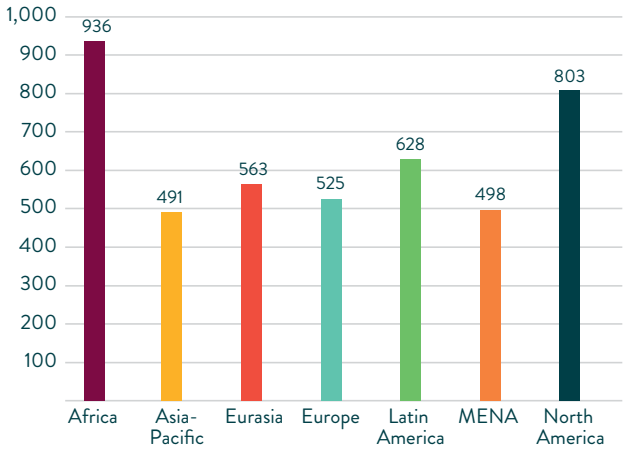


Figure 6: Average distance between stop markers by region, 2021 (Metres)



Figures 6 shows that African and North American networks are those with the longest distance between stops, almost double the average of the other regions. In the cases of Eurasia and Europe, an explanation for this characteristic can be traced to the older age of the systems, while in newer systems such as those in Latin America, the lines tend to be longer.

Looking deeper into the LRT length distribution by country and city, Figures 7 and 8 show that Germany and Russia have the largest number of kilometres, corresponding to 34% of the total length worldwide. In Germany the average length per city with LRT systems is 56 km, and in Russia the average is 39 km. Among the top 10 countries with the longest LRT infrastructure, Belgium has the largest average network length, with its five networks averaging 76km in length. In the top 10 cities with the largest LRT systems, all of them have more than 150km. Since the last publication in 2019, Melbourne remains the city with the longest network, totalling 250km. However, it is the only city in the Asia-Pacific region in the top 10. Almost all the longest systems (8 out of 10) are concentrated in Europe or Eurasia: two are in Russia, two in Germany, two in Poland, one in Austria and one in Hungary. Dallas is the only LRT system in North America longer than 150km.

Figure 7: Top 10 longest LRT networks worldwide, 2021 (km)

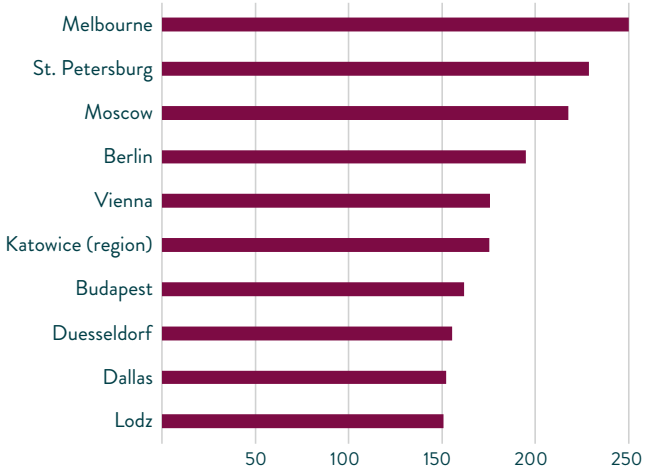
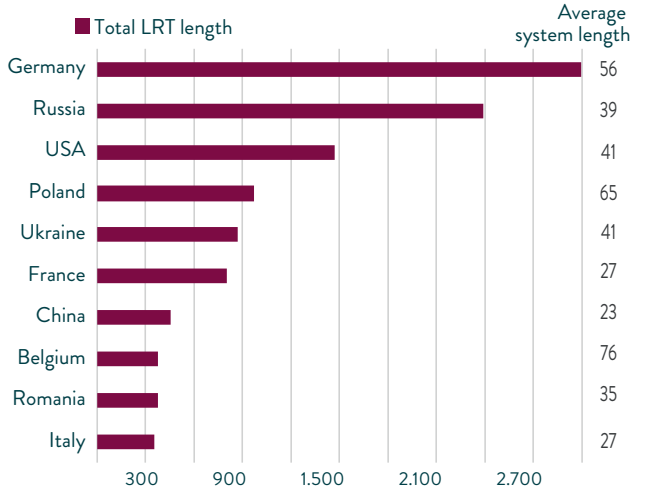


Figure 8: Top 10 countries by length of infrastructure and average system length per city, 2021 (km)



RIDERSHIP

Pandemic restrictions on personal movements led to a drastic contraction of ridership at the global level without exemptions. As with other public transport modes, LRT systems were not spared the impact of COVID-19 in 2020 and 2021. In 2019, the volume of ridership was around 14.8 billion trips; globally, this decreased by 37% on average in the following year (Figure 10).

The regions most affected were MENA and North America, where the decline in ridership exeeded 50%. In 2021 ridership began to recover in most of the world, but it remained at only 66% of the pre-COVID-19 levels globally. It should be noted that, in the same period, nine networks were inaugurated (one in Africa, four in Asia-Pacific, two in Europe and one in Latin America) so the ridership figure for 2021 has been sustained in part by the new LRT systems that have opened.

As Figure 9 shows, Africa and MENA were the two regions with the highest positive ridership variation between 2020 and 2021. They are the only two cases which had recovered at least 80% of their ridership in 2021 compared with 2019. In contrast, North America is the only region where 2021 ridership was even lower than in 2020, and only reached 42% of pre-COVID-19 levels.

Figure 9: Ridership change per region compared to 2019

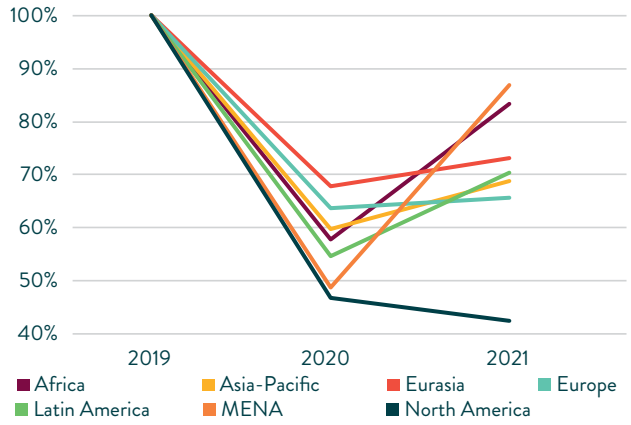


Figure 10: Ridership evolution by region (million)

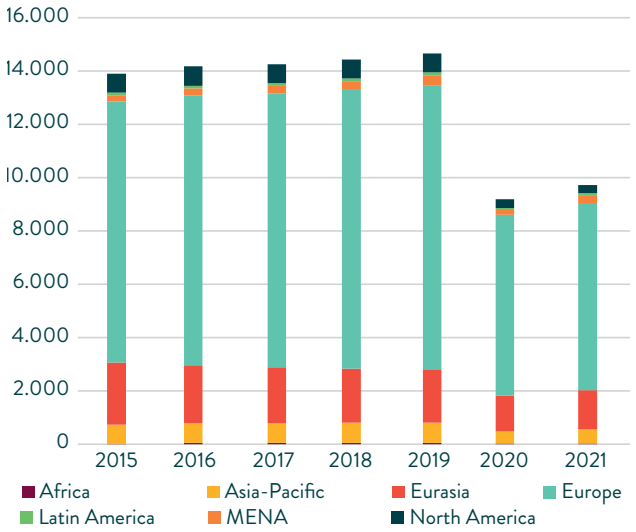


Figure 11: Average ridership per year per inhabitant in cities with LRT systems, 2019 and 2021

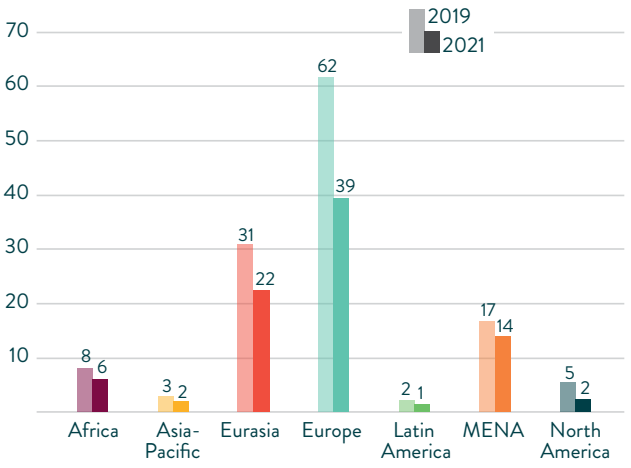
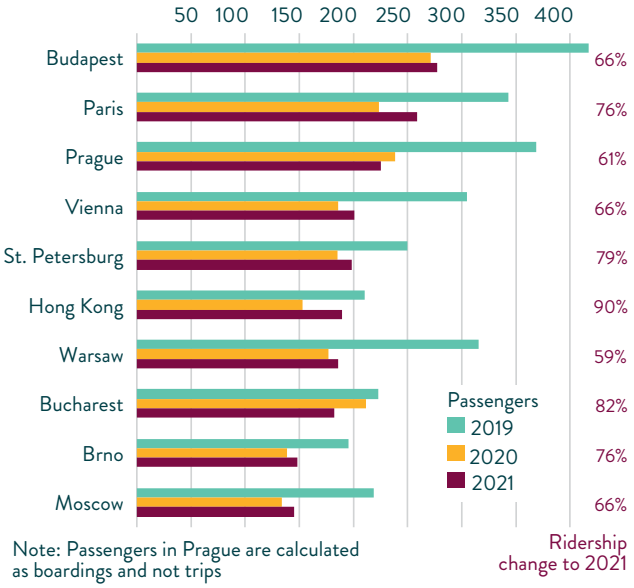


Figure 11 shows the volume of LRT ridership per inhabitant for cities with LRT systems, comparing 2019 with 2021. This indicator is useful to measure the usage of available services before and after the COVID-19 pan-

demic, showing how the intensity of ridership per region changed. Europe and Eurasia show the highest ratio of ridership to population, both before and after the COVID-19 outbreak. The global average annual ridership per capita in LRT cities was 13.2 trips in 2021.

Looking at city level, Figure 12 presents the top 10 cities per volume of ridership in 2021. The chart also includes the values for 2019 and 2020, in order to show how much passenger numbers decreased over the last two years and the percentage of recovery in 2021 compared to 2019. Budapest retained its position as the city with the highest number of LRT passengers in 2021, just as it was in 2019. Hong Kong was the city registering the best recovery rate in terms of passengers, with a ridership of 90% compared to pre-COVID-19 level in 2021. In contrast, Warsaw lost several positions in this ranking because passenger recovery was only 59% compared to 2019.

Figure 12: Top-10 busiest LRT systems. Volume of ridership in million and percentage of rideship in 2021 compared to 2019

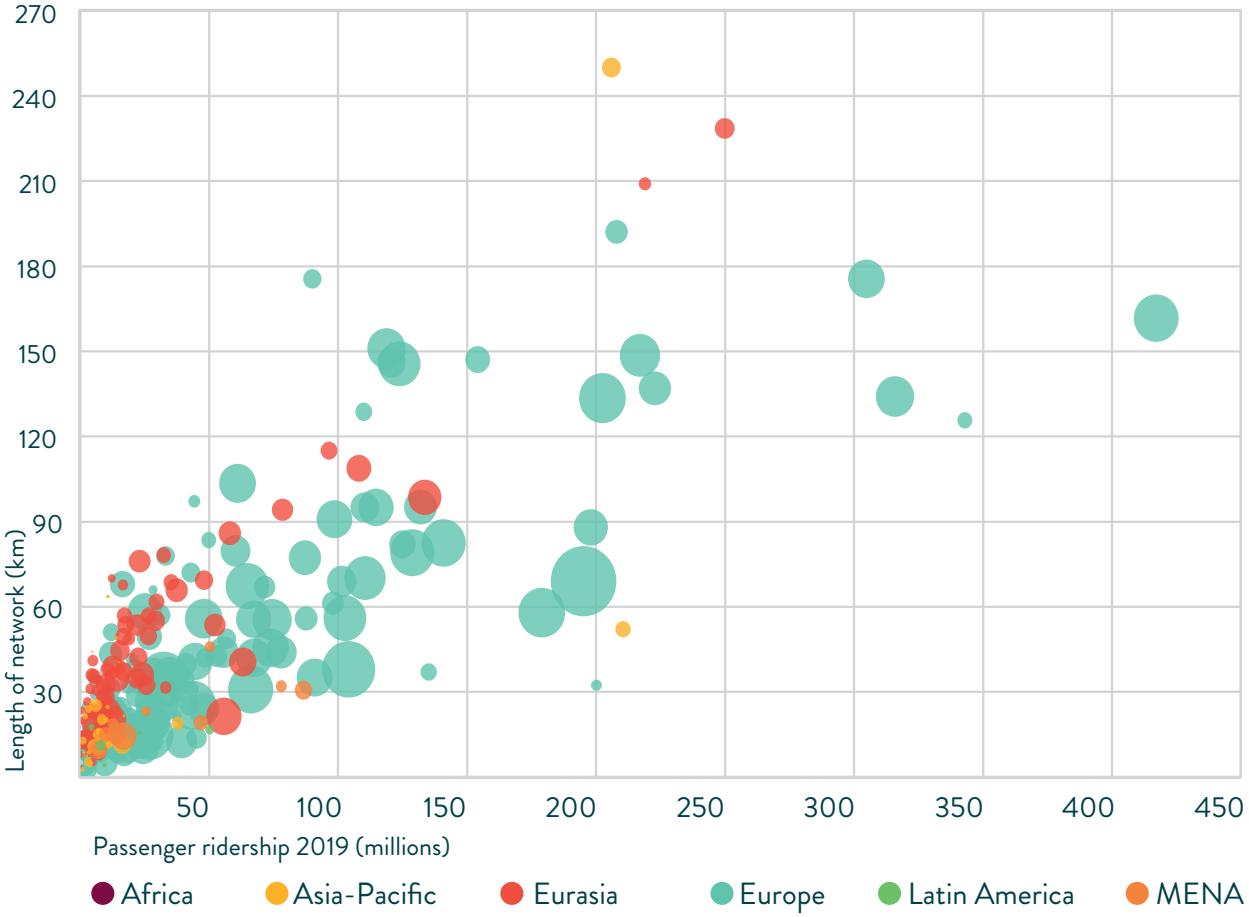


Note: Passengers in Prague are calculated as boardings and not trips

LRT DEMAND

Figure 13 shows the correlation between the length of the network, the number of passengers per city in 2019, and the ridership per capita (surface of bubble). The Budapest system, which had the largest volume of ridership, recorded 236 trips per inhabitant. In terms of regional averages, Europe had the highest with 62 ridership per capita in 2019, whereas the global average was 20 trips per capita.

Figure 13: Correlation between length of network, passengers and ridership per capita in 2019



Note: US systems and Prague are not included in this chart because ridership are calculated as boardings

FLEET

The global number of LRT vehicles has remained stable in recent years at around 37,000 (Figure 14). However, the fleet renovation process has not stopped, with the replacement of old vehicles with new cars offering better accessibility. The share of low-entry vehicles increased from 32% in 2015 to 45% in 2021. According to UITP's definition, low-entry vehicles are those in which at least one section of the vehicle has a low-floor entrance. High-floor vehicles, even if they have step-free entrances provided with high platforms, are not considered as low-entry vehicles in this brief.

On average, the number of low-entry vehicles per region has increased by 37% since 2015. Regions such as Africa, MENA and Latin America, which are opening new LRT systems, tend to adopt low-entry vehicles from the outset, resulting in the highest variation between 2015-2019 (Figure 15). In terms of fleet size, Eurasia is the region with the most vehicles per million inhabitants, while Europe is the region with the most low-entry vehicles per capita of cities with LRT systems.

Figure 16 shows the indicator fleet network density (number of LRT vehicles per km of infrastructure), which is useful for evaluating the fleet size required to provide urban LRT service. The global average is 1.2 vehicles per km. The highest value is in Eurasia with 1.4 vehicles per km, mainly due to the large volume of rolling stock accumulated during the last century. While the average in MENA (1.3 veh/km), this is probably due to the common usage of double-traction operation with two LRT vehicles per train set.

Figure 15: Number of vehicles per million inhabitant by region, 2015 and 2021

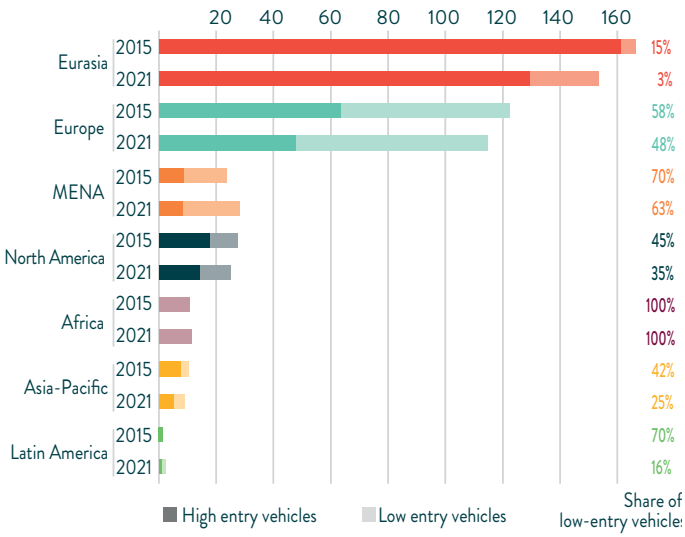


Figure 14: Total number of vehicles and low-entry vehicles

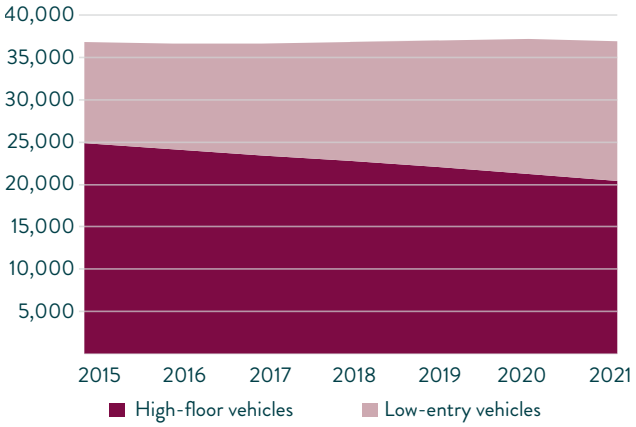
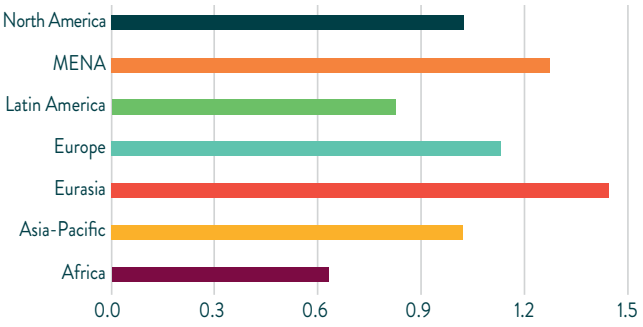


Figure 16: Number of vehicles per kilometre of infrastructure by region, 2021



DEFINITION AND METHODOLOGY

The data presented in this statistics brief was extracted from a database compiled by UITP, which contains official data from operators, transport authorities (gathered from their websites or annual reports) or other authoritative sources (such as national statistics office and national associations), covering the vast majority of cities. Other sources such as trade press and generalist press were consulted when data were not available from official sources.

According to the UITP definition, LRT and trams are urban rail-guided systems powered with electricity and operated at least partly on line-of-sight, on infrastructure shared with other users and partly on their own infrastructure (Right-of-Way type 2). Systems operated on guided rubber-tyred multi-articulated vehicles are included; for tram-trains, only tram section included.

ACKNOWLEDGEMENTS

The comprehensive public reports from different national and regional associations have been invaluable for data collection: American Public Transportation Association (APTA), Chinese Association of Metros (CAMET), French national technical agency for ropeway and guided transport safety (STRMRG) and the Association of German Transport Companies (VDV). UITP would also like to thank all those operators and transport authorities that helped by answering specific questions.

The dataset including the data per city for all the main indicators mentioned in this report is available free of charge for Premium UITP members on MyLibrary, for a discounted fee for other UITP members and for a full fee for non UITP members. If you are interested in this dataset, please contact **data.uitp@uitp.org**.

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UITP ADVANCING PUBLIC TRANSPORT

Rue Sainte-Marie 6, B-1080 Brussels, Belgium | Tel +32 (0)2 673 61 00 | Fax +32 (0)2 660 10 72 | info@uitp.org | **www.uitp.org**