“SHARED AMBITION”

The potential for bike sharing in Europe: Benchmarking 148 cities

Cycling Industries Europe

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Acknowledgements

Contributors

Cycling Industries Europe is the voice of cycling business, actively promoting the sector in Europe and worldwide. Our ambition is to reach out beyond the traditional definition of the industry as a bicycle and parts industry and to make sure we align all business and commercial actors in a common mission. This report was written by CIE staff; Kevin Mayne (CEO), Lauha Fried (Policy Director), Matteo Candelari (Programme Coordinator), Camille Ducellier (Policy Trainee), and Andrea Giusti (Policy Trainee).

CIE's Bike Share Expert Group

CIE's Expert Group on Bike Share represents the leading European Bike Share Operators and Service Providers making sure bike sharing has a prominent role in the EU's policies, measures and funding. The expert group members include: nextbike by Tier, Dott, Fifteen, Donkey Republic, PBSC, InUrba, Beryl, B-Cycle, Cargoroo, Urban Sharing, Qucit, Fluctuo, MobilityData, Abimota, Bikmo, Blubrake, Shared Micromobility, Smart Serial Number, Zukunft Fahrrad, Phylion.

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Special thanks to Fluctuo for providing the data used in this report. Fluctuo is Europe's leading aggregator of shared mobility data, including hundreds of bike-sharing services, aggregated in quarterly European Shared Mobility Index. Since 2020, Fluctuo has collected, aggregated, and shared data on the entire European shared mobility market, providing key stakeholders with exhaustive, accurate data on the market to accelerate the growth of shared mobility.

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Cycling Industries Europe

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The objectives of this report: Shared Ambition

The EU has ambitious goals for change in Urban Mobility, set out in its Sustainable Urban Mobility Framework. As part of this ambition an important role is identified for active mobility (cycling and walking) as well as shared mobility as part of the public transport ecosystem. The aim of this report is to give cities and policy makers the means to identify the potential for bike sharing to make a much-increased contribution to the EU's mobility, climate and cycling policies, and to highlight key performance indicators for successful deployment of bike sharing.

In February 2023 the EU Parliament also adopted a cycling resolution, calling on the EU Commission and Member States to develop a comprehensive set of cycling actions including "integrate affordable e-bike and bike sharing schemes into mobility plans network, and reflecting cycling as vital solution for last mile solutions in urban nodes" and to "ensure accessibility to cycling for persons with reduced mobility as well as affordability for vulnerable groups; ….help those who are most affected by "transport poverty" by supporting the purchase of bikes or the access to bike sharing services." Member States and the EU Commission are expected to respond to the Parliament's call by the end of 2023 with an inter-institutional Cycling Declaration.

Therefore, the first purpose of this report is to provide a tool that supports the EU's aims for active and shared transport. The EU, Member States, regions and cities can see what could be delivered if comprehensive bike sharing schemes were adopted and considered a fully integrated mode of public transport in all EU cities over 100,000 population and in the Trans-European Transport Network (T-ENT) urban nodes, in line with Cycling Industries Europe's (CIE) policy position on bike sharing[1].

For cities, regions, and governments this analysis is a valuable guide to achieving the full potential of their bike sharing schemes. The emphasis on trips delivered integrates the results with Sustainable Urban Mobility Plans (SUMPS). It is possible to analyse practical indicators of performance and make comparisons so that every city can set ambitious targets for growing and commissioning bike sharing. CIE's Bike Sharing Expert Group is an industry-wide centre of excellence which exists to support policy makers with advice on how to deliver these changes and develop much more ambitious commissioning for bike share. In this study the experts have contributed advice on how to interpret the benchmarking results and improve performance.

Finally, this report wants to lift the ambition of all stakeholders in measuring and setting targets for mobility. CIE represents the cycling business sector in the EU's Expert Group for Urban Mobility which among other tasks advises the Commission and Member States on SUMP monitoring and implementation. We note that awareness of what is possible in terms of measurement of mobility indicators is lagging behind the state of the art in data capture and analysis, particularly tools being developed by the private sector. We hope this report itself sets a new benchmark in using date to achieve a step change in Sustainable Urban Mobility. CIE is a member of the MegaBITs project (Mobilizing Europe's Green Ambition through Bicycles and Intelligent Transport Systems)[2] which includes an aim to raise the standard of data capture, sharing and analysis in the EU and this benchmarking approach is an important demonstration of this potential.

[1] https://cyclingindustries.com/bikeshare4all
[2] https://www.interregnorthsea.eu/megabits

Executive Summary

CIE's European Bike Sharing Expert Group represents the leading service providers in the bike sharing sector. With the support of this group CIE has carried out benchmarking analysis of bike sharing in 148 cities identified by the EU as leading the transitions in urban mobility and climate change.

CIE's 2023 benchmarking study on bike share covers 148 European cities, 100 from the EU's Climate-Neutral Cities Mission plus the 48 biggest urban nodes in the Trans-European transport Network (TEN-T), which are not included in the climate cities program.[3]

The 148 cities represent about 2/3 of the population of the 400 TEN-T Urban Nodes. From the data received, bike sharing fleets[4] are actively operating in 128 cities. The number of daily trips generated by bike sharing fleets has been measured in 79 cities, which is indexed to the population of the city creating the main indicator of the contribution of bike sharing to the mobility ecosystem. This indicator is trips per 1000 head of population per day.

With this indicator and other measures, benchmarking is a powerful tool, because it is based entirely on what is achievable now, with existing technologies and governance, in existing ecosystems. Within this large sample size every city can find comparisons to improve the impact of their bike sharing on mobility and climate change. As well as the headline indicator of trips generated other indicators give guidance on specific aspects of bike sharing deployment. For example, operators of schemes place significant importance on the utilisation of bikes within fleets as this is an important measure of commercial viability and return on investment. The highly ranked performers on any indicator can enable others to identify both the achievable levels and to encourage further study into how the high results were achieved. [5]

The top performing city in the study (Paris) achieves almost 40 bike sharing trips per 1000 head of population per day, the top 5 performers average 28 trips per 1000 head per day while the top ten all achieve more than 13 trips for this indicator. By contrast the bottom 20 performers only achieve an average 0.5 trips per 1000 head per day, less than 2% of the top benchmark performers. Additionally, 3 million citizens of these benchmarked cities have no bike sharing scheme available at all.

These benchmarks can be compared with city's Sustainable Mobility Indicators in their Sustainable Urban Mobility Plans (SUMPS), demonstrating whether they are achieving active and shared mobility outcomes. It is a strong recommendation from this benchmarking study that all bike share schemes in Europe should make benchmarkable data available which can be aggregated to city, region, and possibly national level.

The available data is also compared to the population of the city, the size and composition of the fleets and the utilisation of the bikes to identify the factors which influence the relative success of bike sharing in the cities.

Here the data shows that all the top 10 performing cities have a fleet size in excess of 35 bikes per 10,000 population, and it is not possible to be a top ranked city with a smaller fleet density. The data shows 33 cities having below 7 bikes per 10,000 population, which does not offer any possibility of even medium-level trip generation at a city population level. The benchmarks for bike utilisation were much more varied and show that cities can use differing approaches to get high trip levels. Paris bikes were used over 6 times

[3] The study uses the EU city list, leading to separate entries such as Helsinki/Espoo, although they use a common bike sharing scheme.

[4] By "fleet" we refer to the collective set of bikes available through bike sharing in a city, including those operated or licensed by the city and privately operated fleets.

[5] This data was collected in Q3 2022 (July, August and Sep 2022), which also means city performance may have changed with new investments or changes in operations.)

per day, while Helsinki bikes are only used 3 times per day, but both are in the top 10 benchmarked cities for the indicator trips per 1000 head per day. Some city fleets had utilisation as low as 1 trip per bike per day, which questions the policy and infrastructure conditions for bike sharing in those cities.

The benchmarking also makes it possible to break down results based on fleet composition, with bike, e-bike, docked and non-docked data. This did not provide clear conclusions but is made available to enable cities to see the strategies applied by other cities and build on the results.

We also used our benchmark to extrapolate the potential for bike sharing growth in those key European cities. Among the cities studied, if all those below our benchmark would reach the threshold, we estimate a total of 1.7 million trips per day, around 600 million per year. To enable this number in terms of trips, we would need just over 200,000 additional shared bikes, bringing the total fleet to 423,000 bikes. This will require capital investment from €240 million depending on the mix of the fleet, a small fraction of the €240 billion estimated for alternative technologies like electric vehicle charging.[6] In terms of CO2 savings alone this could eliminate 250,000 tons per year, conservatively based on a trip length of 2km per trip. [7]

Benchmarking bike sharing in 148 key EU cities

The European Commission has identified two groups of cities that are playing a leading role in the transition of urban mobility.

The EU Mission on Climate Neutral and Smart Cities is part of Horizon Europe Research and innovation programme for the years 2021-2027, and it involves local authorities, citizens, businesses, investors as well as regional and national authorities. The aim is to deliver 100 climate neutral and smart cities, including an overall plan for climate neutrality across sectors such as transport, energy, buildings and waste management by 2030. These cities are expected to act as experimentation and innovation hubs to enable all European cities to follow suit by 2050.[8]

The Trans-European Transport Network (TEN-T) comprises the TEN-T policy, which is a key instrument for the development of coherent, efficient, multimodal, and high-quality transport infrastructure across the EU. This policy includes railways, inland waterways, short sea shipping routes and roads linking urban nodes, maritime and inland ports, airports and terminals. Urban nodes include cities, industrial areas, agglomerations or metropolitan areas where the TEN-T network is linking various modal hubs and integrated with the transportation and traffic infrastructure at both regional and local levels. 424 urban nodes have been identified within the TEN-T network.[9]

These two groups of cities will receive targeted funding and technical support from the EU and Member States to carry out significant measures to change mobility and are required to use a range of key performance indicators to track their progress. Therefore, this group of cities provides a valuable benchmarking group for the potential of bike sharing and makes a strong case for further investment in bike sharing to decarbonise mobility and provide accessible access to cycling across the EU.

CIE 2023 benchmarking study on bike share covers 148 European cities, considering 100 Climate-Neutral cities plus the biggest 48 TEN-T nodes[10], which are not included in the climate cities program.

[6] Europe's EV opportunity—and the charging infrastructure needed to meet it. McKinsey & Co.
[7] CIE illustrative calculation based on various publicly available sources.
[8] Climate-neutral and smart cities (europa.eu)
[9] Trans-European Transport Network (TEN-T) (europa.eu)
[10] All the TEN-T nodes above 300.000 inhabitants are included in our sample.

The 148 cities represent about 2/3 of the population of the 400 TEN-T Urban Nodes. From the data received, bike sharing fleets are actively operating in 128 cities. Comparable data sets were not available in every city, therefore some indicators only give partial comparisons, however this was of sufficient scale to make benchmarking comparisons from the data.

Independent consultancy Fluctuo was commissioned by CIE to provide data on fleet size, number of daily trips, breakdown electric vs. mechanical, docked vs free floating, and fleet size. CIE staff then applied benchmarking techniques to analyse current bike share usage and the potential growth rate in terms of fleet and trips. Other key data sets were compared to provide benchmarking insights for cities, regions and fleet operators.

How to use this benchmarking study

Benchmarking is a tool for comparing performance within a group of allied entities such as businesses or governments. In this study the unit of study is cities and the approach we recommend is allied to cities performance on Sustainable Urban Mobility Plans (SUMPS), soon to be a mandatory requirement for the identified Urban Nodes on the TEN-T network. Benchmarking is very powerful, because it is based entirely on what is achievable now, with existing technologies and governance, in existing ecosystems.

A common series of performance indicators is developed across the studied entities with the purpose of highlighting high performing systems – so called benchmarks. The identified benchmark performers enable others to identify both the achievable levels which can be used as targets and to encourage further study into how the high results were achieved. In this study there is one leading indicator (trips per head of population) which is the most important for understanding whether a bike sharing system delivers results for its citizens and contributes to reductions in emissions, congestion or noise. The secondary indicators show elements of performance which can show how high results are achieved or prompt discussion and further study where results are less conclusive.

Therefore, the creation of a benchmarking study is not to produce a performance table or ranking, it is to encourage ambition, study and further measurement. High performers are strongly encouraged to share their “secrets of success” to develop the whole ecosystem.

As no one entity (in this case cities) is the top performer in all indicators the study is also an encouragement for those with a higher score to improve their performance. With this large sample size every city can find examples of other cities that can help improve the impact of their bike sharing on mobility and climate change. It may not be appropriate to focus just on the top city in the benchmarking, we strongly recommend focussing on the group of top performing cities in each indicator to set a reference and looking at their different approaches to identify opportunities for performance improvement.

For example, a city with a small bike fleet relative to the size of its population will find many other cities of similar size with bigger fleets and investigate how those fleets are funded and deployed. Alternatively, in the case of bicycle utilisation (trips per bike per day) we see that differing approaches can be used to increase overall trip numbers within the city, offering differing routes for improvement. This indicator can be essential for understanding commercial viability and aid in negotiations with operators on expected revenues from fleets.

The focus of the benchmarking approach is on achieving high performance, however this study does show that some cities may require a more fundamental rethink of bike sharing. At the bottom of the ranking, we find cities that have no bike sharing, have inadequate fleet sizes or do not enable transparent evaluation of bike sharing’s contribution to public goals. We hope these cities will take the opportunity to

use this data to carry out such reviews, and through CIE's membership of the European Union's Expert Group for Urban Mobility we aim to open a debate about how these cities can be supported.

In addition to the individual cities improving their bike sharing performance it is also possible to use this benchmarking study to extrapolate the impacts if the studied cities were to increase their performance to the level of the top performing cities. This is an extremely useful guide for policy makers looking for fast-track and implementable solutions for sustainable urban mobility and decarbonisation of transport, because of the principle that benchmarking highlights proven results in real situations. This study has a high-level extrapolation of what could be achieved if every city in the study group would reach the benchmarks of the leading five cites, an estimated total of 1.7 million trips per day, around 600 million per year. However, this can be treated as a baseline for ambition, and the CIE Expert Group on Bike Sharing wishes to highlight that every city in Europe can use this and other approaches to not only reach the upper levels of impact shown in this report, but also to identify further ambitious targets.

Performance indicators

CIE identified the headline performance indicator for bike sharing in these city networks to be trips relative to population. Historically bike sharing success has been measured by fleet size or trips generated per bike, which have value in assessing some aspects of performance, however CIE believes the fast-emerging ability to access trip data provided the most valuable insights to cities in terms of bike sharing's role on the mobility system. 64 of the studied cities had comprehensive trip data available, others had partial data, and some had none.

This indicator provides a direct comparison with other modes of transport such as public transport trips and it enables cities to ask the most important questions about how bike sharing serves all citizens. A low trips per capita figure for bike sharing can lead to examination of bike and parking availability, geographic coverage, density of population served, affordability, access to e-bikes, geofencing and efficient operations.

Cities can use other benchmarks of bike sharing success to identify where their city can improve to reach the very highest performance in the sector, especially to make bike sharing accessible to all citizens and help Europe's transport poverty challenge. Some of these evaluations are available from this study and where available they are described; however, the most important purpose of this study is to encourage cities to evaluate and take action on their own performance to achieve the highest impact for bike sharing in every Strategic Urban Mobility Plan.

Access to data and measurement of KPIs

Fluctuo has provided CIE with data on bike-sharing services in 150 cities (including the 100 'Climate-Neutral and Smart Cities by 2030', which make up the largest of the 424 Trans-European Transport Network (TEN-T) Urban Nodes. This data has been collected via direct data sharing partnerships with bike sharing operators, and through the aggregation and analysis of open data sources. This data was collected in Q3 2022 (July, August and Sep 2022).

The most extensive dataset in this study is the number of bikes in a city's bike-share fleet (if present). This information was available for 148 cities allowing for the benchmarking of fleet size per capita. However, information on the usage (ridership) of the bikes was limited to 77 cities: 60% of the above cities with a bike sharing fleet. In some cases, the data is partial, because one or more operators have not made the data available. Trip length was available in 34 cities.

This data on bike sharing has been collected via different sources such as open data made available by cities and data aggregation and analysis using General Bike Share Feed Standard (GBFS) and Mobility Data Services (MDS). In some cities and for some operators, no data is accessible: it is not an issue of data standards, it is a matter of whether the operator makes their information available through open data sources.

Dozens of operators do not make any trip data available for one or more of their schemes. In some cases, this is a conscious decision by the operator or the license holder for a given city. For example, the city may receive data from operators but not authorize public availability. In other cases, the scheme may not use an open API as the scheme is restricted to certain users in a closed group. There can also be variations in terms of data quality which may have some effect on the results.

It is a strong recommendation from this benchmarking study that all bike share schemes in Europe should make benchmarkable data available which can be aggregated to city, region, and possibly national level. This is essential to show progress on bike sharing within the EU's Urban Mobility Framework and as a contributor to the SUMP for each of the cities in the 100 Climate Neutral Cities Mission and 400 TEN-T nodes.

Renewal of licensing agreements and contracts should include clauses to enable the release of open-source data for benchmarking and establishment of KPIs. Other shared mobility sectors should use comparable approaches to enable cross-sectoral comparison.

In support of better data collection in cycling, the MegaBITS project is putting in place several initiatives. An integral part of the MegaBITS project is to embed cycling ITS in mobility governance on a local, regional, and EU level to improve the safety, comfort, and convenience of cyclists. To achieve this, MegaBITS is pioneering innovative digital pilots across seven cities/regions that will test and provide key data on integrating cycling into the digital layer of transport and mobility. Data collected from this will provide a rare but essential level of insight on cycling to enable improved infrastructure planning and investment for example.

The on-going development of the CyclingDataHub (CDH) will strengthen the foundations for greater data visibility on metrics such as cycle infrastructure, safety, health, environment/emissions, and business performance that have been developed in the predecessor project to MegaBITS, BITS. This data is essential in improving the visibility cyclists in statistics, analyses, and policy and will be integrated with EU initiatives such as the Mobility Data Space. CIE, via the EU's NAPCORE initiative, is also working to standardise cycling data in the areas of infrastructure, bike parking, counting and real time GPS data, all of which would be fortify the sectors efforts to gain transparency and developed key indicators on cycling.

Anonymity and commercial sensitivity

CIE operates as a trade association for the whole cycling ecosystem and is highly sensitive to the need for compliance with competition and anti-trust laws and policies.

In preparing this study we are aware that bike sharing is a highly competitive business sector, with business success based not only on companies and brands but also commercially sensitive relationships with government bodies such as cities and regions. Within individual cities differing operators and business models may contribute to the overall city performance.

In preparing this study we note that some cities studied for this performance analysis may only have data for one company, or have one dominant operator in terms of fleet size, which could imply a commentary on the performance of that company,

To avoid this risk, we have set the following limits on this study:

1. We will not publish data sets that might allow individual operations to be compared. We acknowledge that experts with deep knowledge of each city and fleet may be able to extract some limited additional information from this analysis, but we are reassured that this will not compromise competitiveness.
2. We have not given any companies access to the raw data sets, they only see the draft versions of this aggregated report. Companies, cities, and researchers can purchase data from Fluctuo, but this is subject to Fluctuo's terms for release.
3. We publish benchmarked performance indicators that can be used to compare city performances and allow cities to see where there are opportunities to increase bike share use in their jurisdiction. This will allow those cities to discuss their performance with providers of bike sharing systems and consider shared strategies for increased use of shared bikes. Even those cities where we don't have access to data will be able to use these benchmarks as performance indicators for their internal analysis.
4. We acknowledge in this study the limitations of availability of data which does give an incomplete impression of the performance indicators for some cities. We strongly believe that the competitiveness of this industry sector is improved if cities contribute to open data availability, and we hope future versions of this report will have much more comprehensive data sets. We are also sharing this report with the EU Commission to encourage wider use of transparent performance indicators in mobility policy.
5. We do not amalgamate any data by company, only by city.
6. We have not gathered any financial information about the systems in each city.
7. We are open to feedback on compliance with the limits of our work and if any company (CIE member or not) wishes to comment on our report they are encouraged to contact CIE at info@cyclingindustries.com at any time.

Headline indicator: How many daily trips can bike sharing provide?

We ranked cities where we had data of daily trips per 1000 population, thereby identifying as a benchmark the top 5: Paris, Bordeaux, Antwerp**,** Toulouse, and Lyon. The threshold to enter the top-performing cities is about 19 trips per 1000 inhabitants.

City	Trips/1000 head/day
Paris	39.9
Bordeaux	30.7
Antwerp	28.0
Toulouse	21.2
Lyon	18.9

Table 1

There is a second group of 7 cities achieving between 12 and 18 trips per 1000 inhabitants per day which are successful on a number of indicators. For the purpose of benchmarking this report uses the leading 10 generators of population level trips as setting the standard for benchmarking comparisons and to aid visualisation of other benchmarks.[11] The ranked position of all cities where trip data is available is shown in Annex 1.

Top Cities for Indicator 1 (Trips per 1000 head/day)	Rank
Paris	1
Bordeaux	2
Antwerp	3
Toulouse	4
Lyon	5
Espoo	6
Helsinki	7
Valencia	8
Wroclaw	9
Milan	10

Table 2

To visualise the results the cities performance in trips per day per 1000 head of population is shown in Chart 1 on the next page. As with all charts in this report the top 10 performers in trips per head per day are shown in red.

[11] In all charts in this report the top 10 performers in trips per head per day are shown in red.

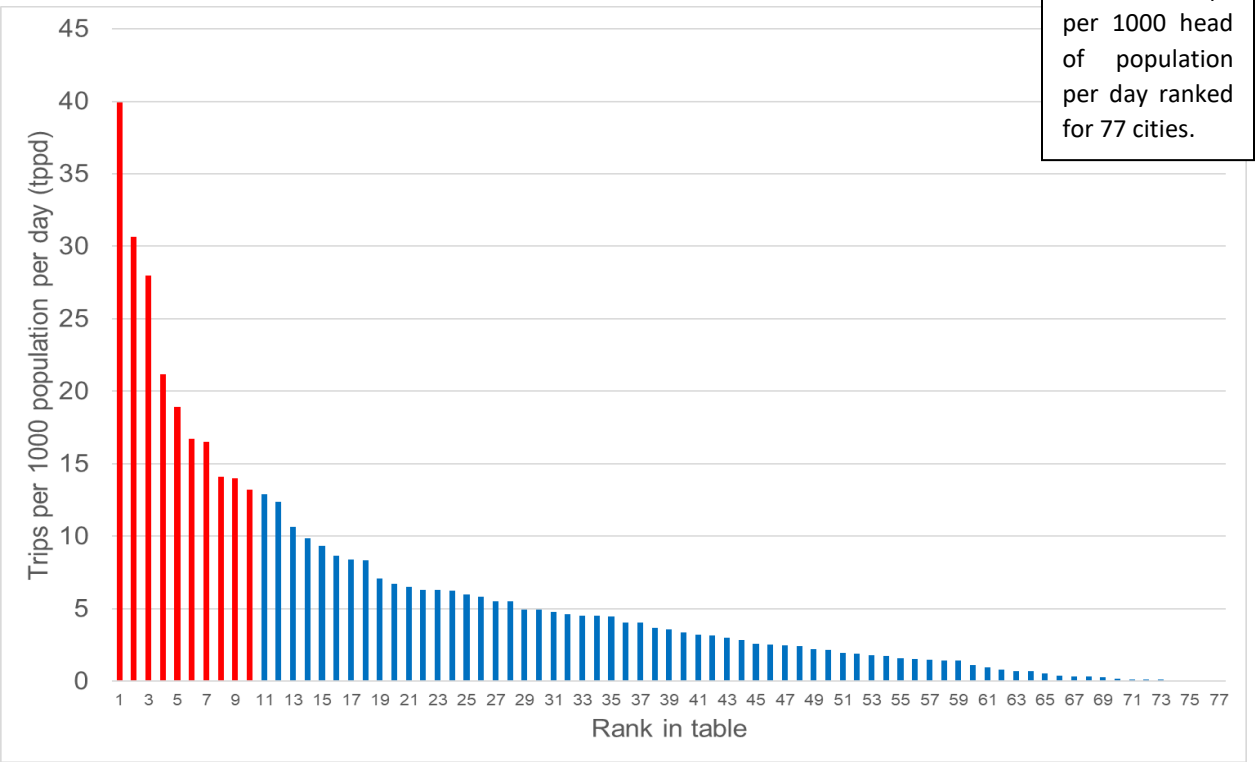


Chart 1. Trips per 1000 head of population per day ranked for 77 cities.

The gradient on this chart shows just how far ahead the leading cities are in using bike sharing as an everyday mode of transport for the whole of their populations. Even the 10th ranked city could triple the number of trips provided by bike sharing if it achieved the performance of Paris.

The power of the benchmarking approach is that it shows how even leading cities can also significantly improve their own performance, no single city is top in all indicators. Paris for example is only 7th in terms of fleet availability and the existing fleet is highly used, potentially pointing to significant growth with more bikes. The middle and lower cities in the table have extraordinary potential for growth, with 300% increase to reach the current performance of any of the cities in the top 10.

Extrapolated results: The potential for bike sharing in Europe.

We used our benchmark to calculate the room for bike sharing growth in those key European cities. Among the cities studied, if all those below our benchmark would reach the threshold, we estimate a total of 1.7 million trips per day, around 600 million per year. To enable this number in terms of trips, we would need just over 200,000 additional shared bikes, bringing the total fleet to 423,000 bikes[12]. In terms of CO2 savings alone this could save 250,000 tons per year of emissions, conservatively based on a trip length of 2km per trip.

Using the example of an independent study by the Dutch government, an extra 200,000 shared bikes will require at least €240 million investment, depending on the type of bike and whether fixed capital such as docking stations is needed. The annual operating cost per bike will be approximately €1200 per year, again

[12] The number of additional bikes has been calculated considering the average of trip/bike of the cities above the threshold.

depending on the equipment and business model mix.[13] The funding of these costs will depend on the public-private or commercial model of each city and operator, however as part of the public transport mix it is not expected that bike-sharing will be independent of public financial support. In evaluating the top performing cities with industry and mobility experts some other interesting trends were identified.

In particular we note: 9 of the top 10 bike sharing cities also have significant levels of other shared mobility options, in particular shared e-scooters. This data cannot identify if there is any causal effect, but it presents an opportunity for local evaluation of the different modes as a package. Does good infrastructure aid all modes? Or is there complementary value in establishing a shared mobility culture which replaces car ownership or complements crowded public transport. Is there a benefit from operators offering combined fleets or Mobility as Service platforms?

Antwerp was also noted as a very interesting inclusion in the top 5. There is a high number of trips per capita even though there is a high level of bike ownership and high mode share in the city and region. Historically it was believed that these factors make bike sharing less viable in high mode share cities, particularly in the Netherlands and Denmark. The figures from Antwerp may provide a valuable case study to re-evaluate these assumptions.

Having established trips per capita as the headline benchmark for bike sharing CIE's research then tracked other indicators from the data available, and their correlation with high trips per capita.

Fleet size: bikes per capita

Fleet size benchmarking can be linked to demand, geographic coverage, investment in fleets and commercial viability of bike sharing schemes. The indicator also shows ranges of what size of bike fleet will be needed to grow trips to high levels and by correlation with trips can show what additional trips can be expected if a city invests in increasing fleet size, giving a basis to calculate return on investment.

Top Cities for Indicator 2 (Number of bikes per 10,000 inhabitants)	Rank
Bordeaux	1
Grenoble	2
Antwerp	3
Florence	4
Brussels	5
Utrecht	6
Paris	7
Milan	8
Frankfurt	9
Toulouse	10

Table 3

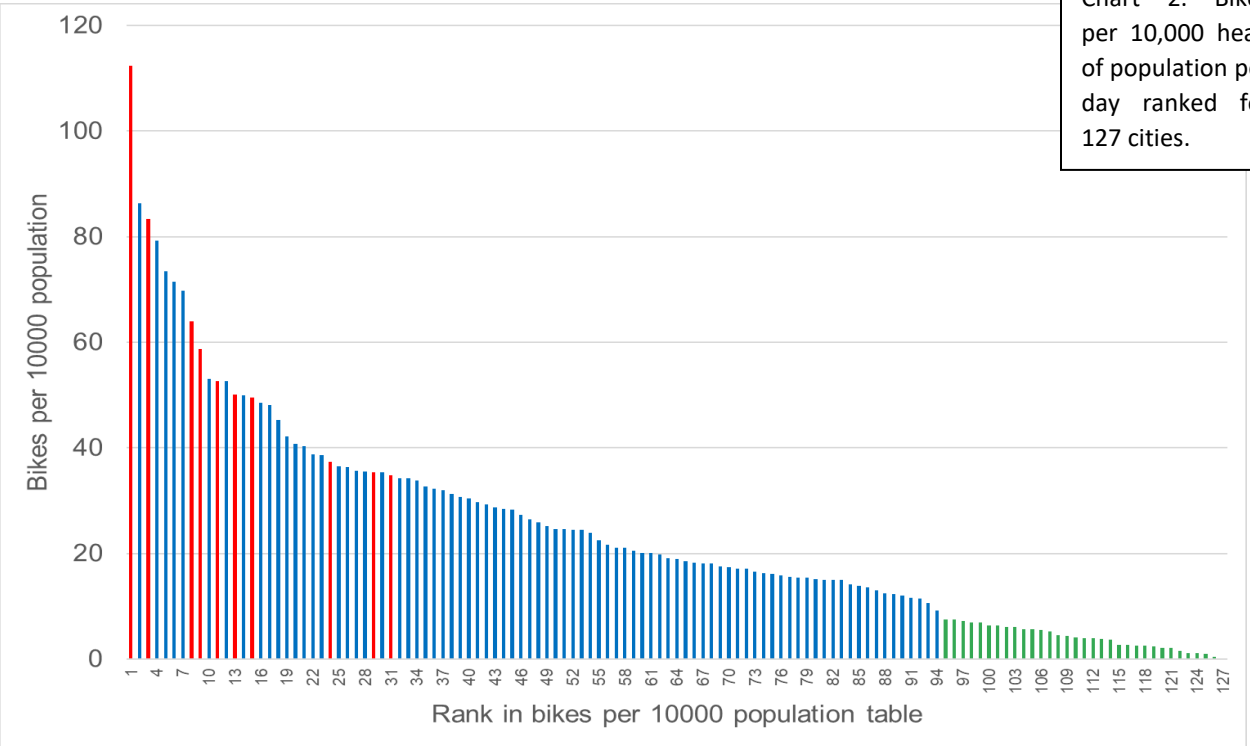
[13] Fact sheet Bike sharing systems - Rijkswaterstaat Environment (rwsenvironment.eu)

CIE analysis emphasises:

Fleet size compared to population: Other cities appear in the top 10 benchmark cities for this indicator that are not in the top 10 for the main indicator of trips generated. Therefore, it is clear that a large fleet is not an automatic guarantee of trips generated, other factors must be taken into account. The visualisation of these results is shown in Chart 2.

Minimum fleet size: The top 10 performing cities in generating bike sharing trips have a minimum level of 35,4 bikes per 10,000 inhabitants. This gives a clear benchmark of the minimum size of fleet needed to give high impact from bike sharing and it is a very easy comparison for cities and regions to apply to their local situation.

Chart 2. Bikes per 10,000 head of population per day ranked for 127 cities.



Fleet size threshold: This visualisation not only shows the minimum fleet size needed to be a high performing bike sharing city. CIE's analysis also showed a group of 33 cities (below rank 94, highlighted in green columns) where the graph curve drops still further to fleets of less than 8 bikes per 10,000 population. This is less than 20% of the threshold of a high performing bike share scheme.

Some of these are highly concentrated schemes limited to the city core, but no scheme at this level is producing high numbers of trips for the whole city population. The highest performer in this group only achieves 5 trips per 1000 population per day, less than 25% of the leading cities. Even if these bikes are intensively used the cities are not providing bike sharing as a widespread mode of transport for its population.

Fleet size ranking: The ranking on fleet size is a powerful tool for benchmarking when compared to the headline indicator on number of trips generated and the next data set on bike utilisation.

How can some cities with smaller fleet sizes generate a top 10 performance in generating trips? Why do some cities with very large fleets not get the expected utilisation, and what should they do to achieve a high performance from their fleet?

This analysis is best visualised using the scatter graph in Chart 3. Here the headline indicator for number of trips relative to population is cross compared to the fleets size. Again, the leading cities are shown in red.

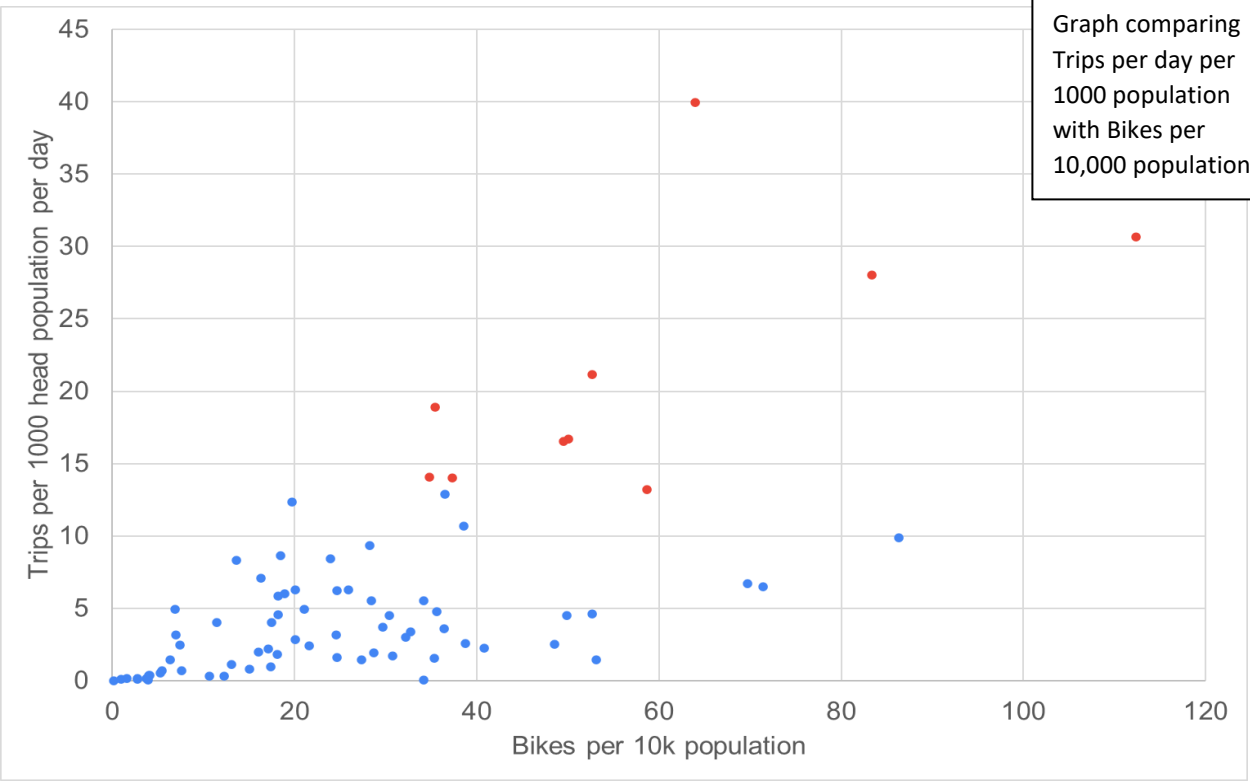


Chart 3. Scatter Graph comparing Trips per day per 1000 population with Bikes per 10,000 population.

A benchmarking approach highlights areas of this graph by quadrants. The upper right and lower left data points need little explanation – the very highest performing cities have ensured that citizens have access to a relatively large number of bikes, the very lowest performing cities simply do not have enough bikes to deliver bike sharing as a viable mode of public transport and mobility.

Cities should study how these larger fleets in Paris, Bordeaux and Antwerp are distributed, operated, and funded and how their own fleets can be increased towards high performing levels.

The cities to the bottom right of the graph clearly have large and dense fleets, but should use this benchmarking approach to find out why these fleets do not deliver levels of trips such as those generated by leading cities, Grenoble, Utrecht, Brussels, Frankfurt are all top 10 cities for fleet size, but none is higher than 14th in the headline ranking, with one as low as 54th.

By contrast Lyon, Valencia and Wroclaw are top 10 performing cities with smaller per fleet sizes relative to their populations, other cities can study their performance to understand how to get more out of their fleet.

Experts suggest that factors such as pricing, coverage, availability of bikes and quality of infrastructure could be studied to understand the differences in usage. Urban density and integration with the public transport network should also be considered. The availability of e-bikes could be another factor in cities that are large, hilly or hot.

Cities without bike sharing: 20 cities have no bike sharing at all, including 10 cities with over 100,000 population, leaving 3.3 million people without a bike sharing offer.

City	Population	Fleet size
Vitoria-Gasteiz	253,093	0
Miskolc	150,695	0
Prato	188,011	0
Suceava	105,796	0
Varna	395,488	0
Plovdiv	333,206	0
Wuppertal	355,004	0
Tricity Gdańsk-Gdynia-Sopot	748,986	0
Tarragona-Reus	485,315	0
Alicante	337,304	0

Table 4

Smaller cities: Some of the smallest cities in the study do have bike sharing, although some fleets are very small. Only one of the 10 small cities with bike sharing makes trip information available, so it is not possible to determine a trip-based performance benchmark for these cities as a group.

City	Population	Fleet size
Tartu	94,663	750
Kalamata	57,620	15
Kozani	70,420	45
Trikala	61,653	95
Lappeenranta	72,266	222
Helsingborg	97,122	467
Lund	94,378	193
Kranj	37,605	170
Velenje	25,396	86

Table 5

Bike use: trips per bike

When widespread bike sharing schemes came to market over 20 years ago trips per bike per day was often used as a benchmark for bike sharing operations and it remains a key performance indicator for the sector. It has been linked the viability of the bike fleet and the accessibility of the business model, for example the ability to hire through public transport cards or comparing subscription schemes to “pay as you go”.

In this analysis CIE benchmarked the trips per bike as a KPI and also correlated it against the total trips per capita achieved by the cities. The top 10 performing cities in this ranking achieve between 7 and 4 trips per bike per day.

Trip data is available for 77 cities, but in only 58 of the cities is the data complete for every operator (see recommendations on data in the methodology section). For the 19 cities with partial data the trips per bike figure is only for that part of the fleet where data is available. It is likely that the overall city score will be adjusted when data is available, however we concluded that the trips per bike benchmark is essential for understanding what is possible with schemes that get intensive use from their assets.

Top Cities for Indicator 3 (Trips per bike per day)	Rank
Bilbao	1
Karlsruhe	2
Paris	3
Dresden	4
Lyon	5
Barcelona	6
Lisbon	7
Mannheim	8
Valencia	9
Toulouse	10

Table 6

Chart 4 shows the visualisation of the trips per bike per day, with the top 10 cities for trip generation as red columns. No city appears in the top of the per capita trips table with less than 2.3 trips per bike per day. The visualisation also highlights that over half of the cities have bike share operations that generate less than 2 trips per bike per day (or less than one outbound and return trip per day) and 25 cities have fleets where the bikes are being used less than once per day, raising questions of viability, operational conditions and return on investment for these fleets.

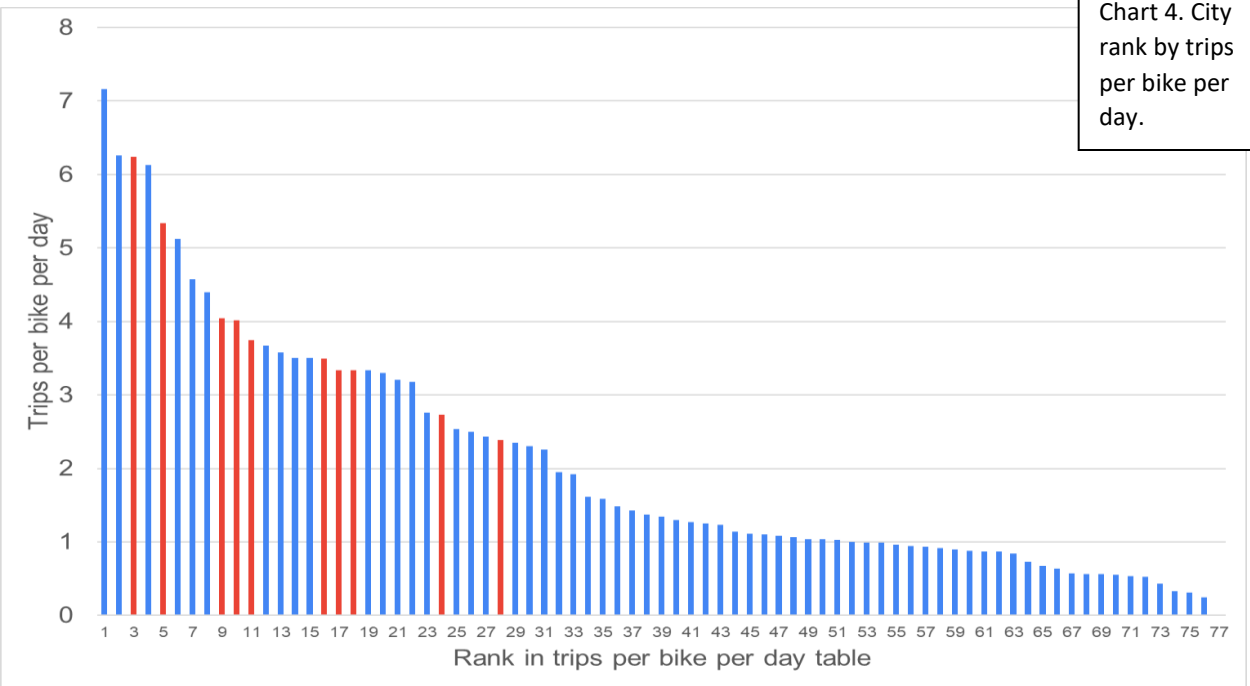


Chart 4. City rank by trips per bike per day.

A scatter graph (Chart 5) can again be used to visualise the differences and aid benchmarking. As with the previous scatter graph a benchmarking approach looks at this chart by quadrants. Top right cities have high bike utilisation and achieve high trips for the whole population, so these cities can be studied for widespread performance improvement.

Lower right cities are getting high usage from their fleets, but this is insufficient to generate population level benefits. This can be a question of fleet size and in particular the geographical coverage of the fleet, each city should be studied individually. Bilbao, Karlsruhe, and Dresden are examples in this quadrant which have high utilisation, therefore could potentially generate many more trips with bigger fleets.

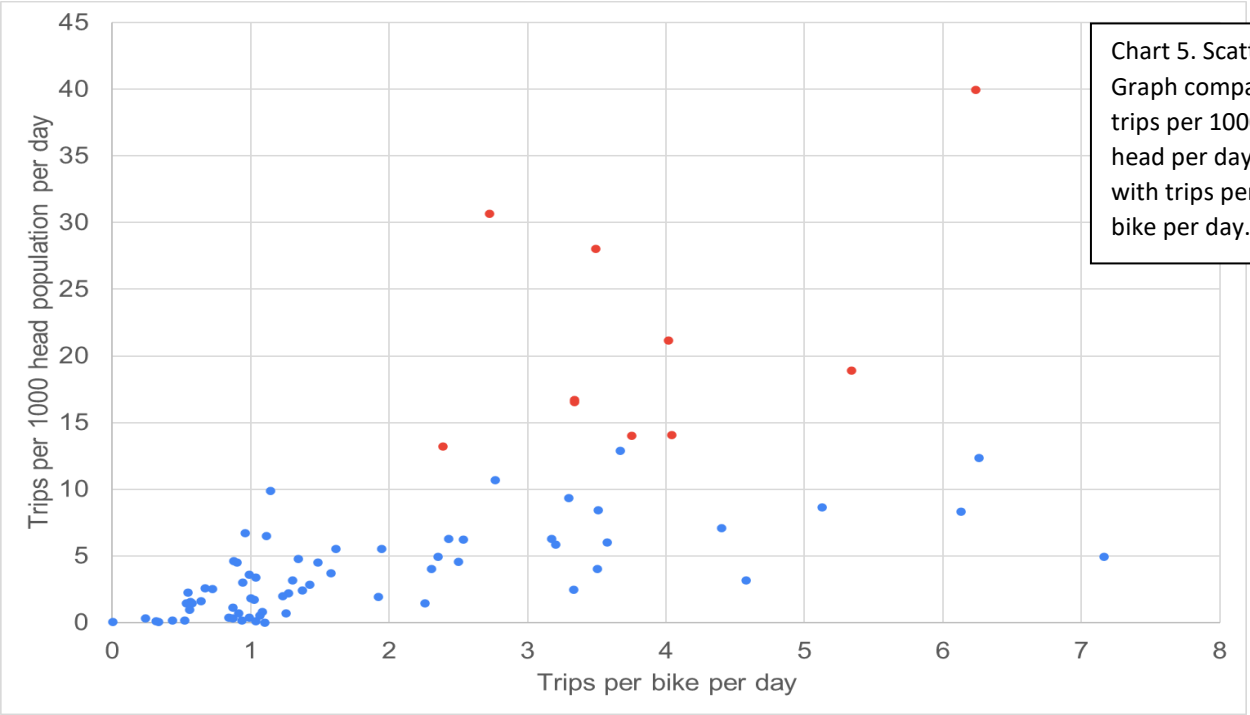


Chart 5. Scatter Graph comparing trips per 1000 head per day with trips per bike per day.

Studies could also focus on Bordeaux and Milan which are top 10 performing cities in the upper left quadrant, relatively low utilisation perhaps reflecting their large fleet sizes.

Industry experts recognise that benchmarking usage per bike should also consider a number of other factors. There may be a minimum commercial level of use to justify the capital investment per bike (and docking station if required). Providing bikes to all citizens in all neighbourhoods may result in lower usage per bike. Bike availability is also a factor in utilisation, fleets with high uptime and effective rebalancing should see each bike achieve higher utilization. Some models of e-bikes may achieve lower uptime availability due to recharging.

Is it necessary to have e-bikes to get high bike share usage?

Not according to the data provided for this study. High performing cities include those with 100% e-bikes and no e-bikes. In Chart 6 (below) any city in the top ten performing cities is shown in red. Valencia, Toulouse, Helsinki, and Espoo have no e-bikes so no column is visible for them. Only Milan, Bordeaux and Paris have more than 50% e-bikes.

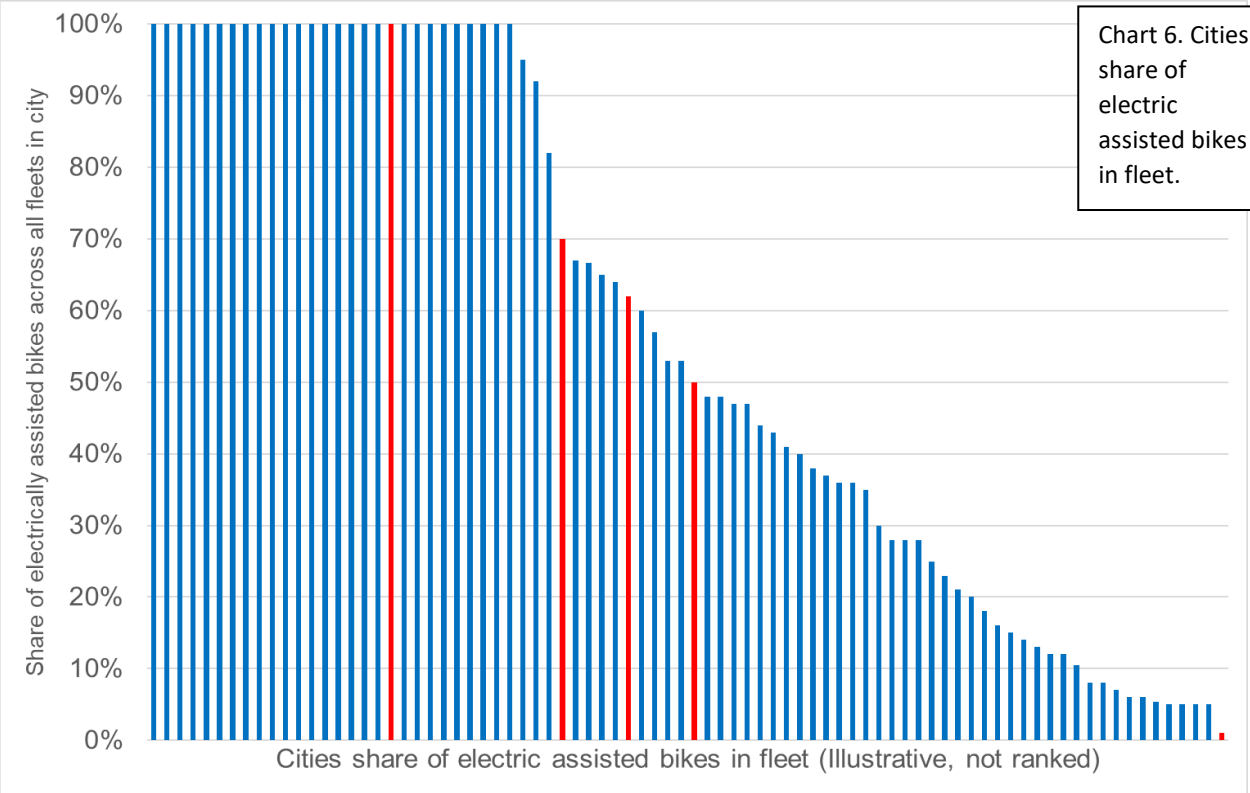


Chart 6. Cities share of electric assisted bikes in fleet.

The data does however make the case that e-bikes are a growing part of the bike sharing offer, to the extent that top performing cities include those with 100% and 70% e-bike share. This is important evidence that business models exist that can make e-bikes part of the shared mobility offer in the city.

Therefore bike-sharing experts warn against use of this indicator in isolation. The role of e-bikes cannot be disconnected from city topography and climate which was not assessed in this data. In general, it is known that e-bike use is a strong driver of cycle use in countries and cities that have hilly terrain, hot or windy conditions, but also e-bikes may have higher prices to both operate and rent which means that the business model and funding approach is an essential part of a review. Lower cost access to bikes may be significant in achieving high usage. Experts recommend before and after tracking when new e-bike fleets are introduced.

E-bikes also provide bike sharing for a different trip length to other shared mobilities, which is discussed elsewhere in the study. Bike sharing is also an important contributor to public access for e-bikes for persons whose social or economic circumstances mean that ownership is not possible.

Therefore, the recommendation is that cities work with operators to look at the need and potential for e-bikes in their circumstances, using this benchmarking data and local information to see how e-bikes could increase the possible trips made by bike share.

Is there a distinction between different parking (docking) approaches for bike fleets?

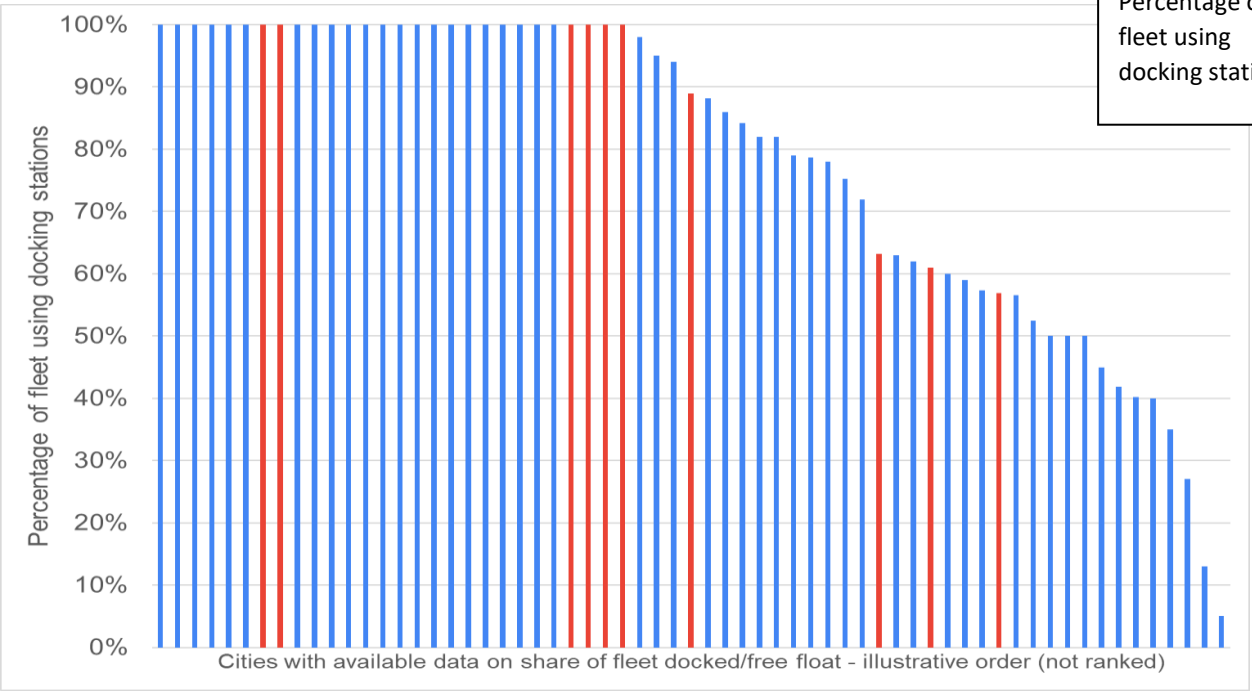
The data is not able to draw a clear conclusion.

The industry recognises multiple categories of shared bike parking including docked in physical stations, parked at virtual stations (not free-float), 100% free-float and hybrids of the above. However, the data collected for this study is not able to distinguish these categories and was only available to CIE as either docked or free-floating. Even if data were available down to this level of detail it is likely that it could not be published because certain approaches could identify the performance of an individual business model which would not meet our anonymity criteria.

Of the 77 cities where trip data was available 28 were recorded as having 100% docked fleets, 14 were recorded as having entirely free-floating fleets. This split was used to evaluate the impact on trips generated, but even this split is inconclusive. Chart 7 gives a visualisation of the diversity in strategies.

Six of the top ten performing cities in terms of trips per head of population had 100% docked fleets, and two of the top 5. By contrast 22 cities with 100% docked fleets did not get a top ten ranking on trips generated, including one as low as 73rd.

Chart 7. Percentage of fleet using docking stations



The top 5 also included two cities below 70% docked fleet, including the number one city in the ranking, Paris. The lowest share of docked fleet in the top 10 was 57%. No city with a completely floating fleet was in the top 10. With these contrasting results it is recommended that this data set be used in conjunction with other data sets, not in isolation.

Trip length data

Experts believe trip length is an important indicator for shared mobility fleets of all kinds.

This information can be used to understand the potential geographic coverage of a fleet in a city based on the physical size of the city, to compare the differing modes and their likely role in the mobility system and to evaluate specific needs such as the impact of e-bikes.

At a city and commercial decision-making level understanding distances can have a big impact of planning the locations for bike sharing and the cost or subsidy model deployed. (Per trip, per km, subscription etc.)

For example, within the CIE Bike Sharing Expert Group it is widely understood that there is a significant difference in average distances travelled between mechanical bikes and e-bikes.

Therefore, within this study we wanted to carry out a benchmarking exercise on trip distances and compare it to other indicators. Data was however only available for 34 cities and in many of those cities it is only certain operators that allow data to be accessed. We also compared trip length to overall bike sharing performance in trips generated, using the same convention as other charts, and highlighting top 10 performers in red in chart 8 (where data is available).

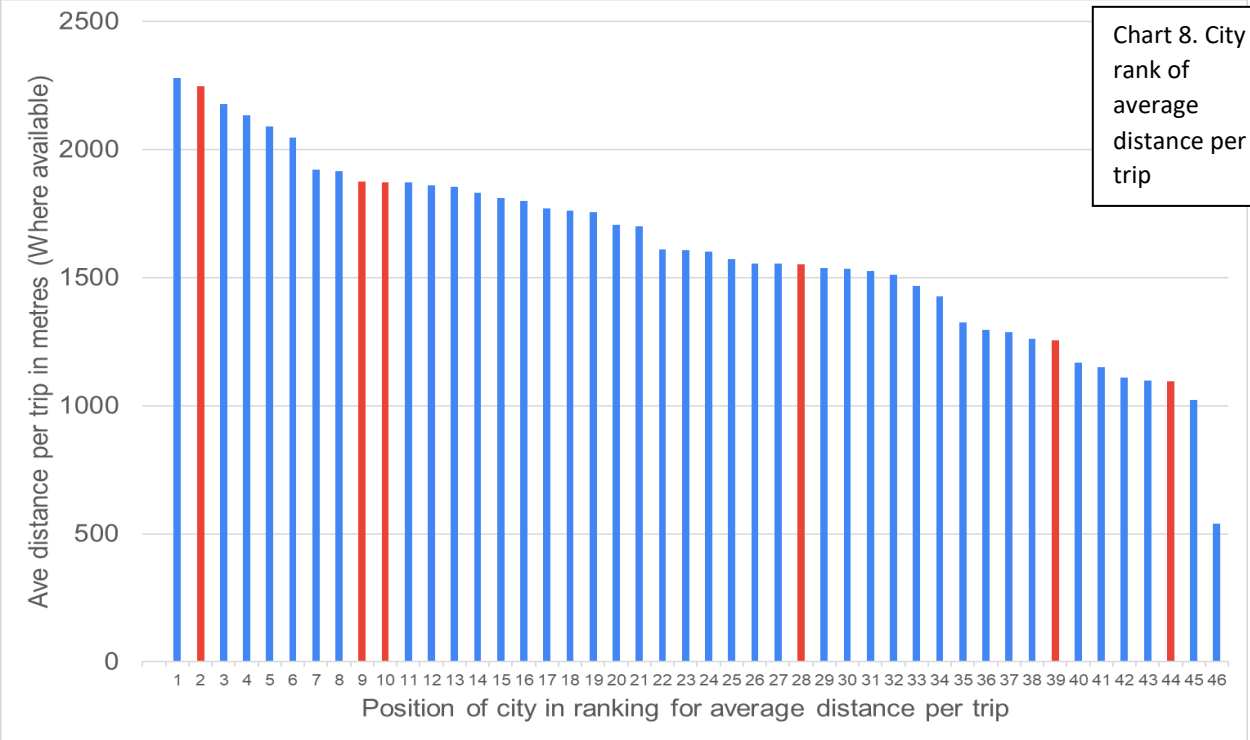


Chart 8. City rank of average distance per trip

This data is very useful for comparison with walking, scooter fleet trips and motoring trips as it shows a clear indication of where bike sharing fits into the trip profile, between 1 and 2.5km on average.

It clearly shows that bike share is playing a different role to walking, and potentially to rented scooters which are estimated by the industry to have trip lengths around 1km average. In both case bike sharing seems to provide longer trips. As 25% of all automotive trips are less than 5km there is a very high potential for bike share to substitute many of these trips.

It is less clear that there are strong trends on trip length in relation to overall city performance, with the top ten cities spread through the table.

To try and understand more we also carried out cross comparisons of trip length with the following data sets:

- City population (as a proxy for size of city)
- E-bikes share of the fleet
- Number of bikes per 1000 population

These analyses also did not show any conclusive evidence that these factors correlate with trip distance. Expert advice is that factors like boundaries of the bike share fleet availability, the layout of public transport hubs, cost per trip formulae may play a much more significant role in distance but we don't have that information at this point.

Therefore, we regard this as an area for discussions within individual cities, with potential for additional benchmarking if more data becomes available.

Annex 1: Ranking table[14]

Cities	Trips per 1000 head/day rank	Bikes per 10k inhabitants rank	Trips per bike per day rank	Average trip length rank	Transparency Indicator[15]
Paris	1	7	3	2	100%
Bordeaux	2	1	24	9	100%
Antwerpen	3	3	16	43	96%
Toulouse	4	10	10	Not available	100%
Lyon Metro	5	28	5	Not available	100%
Espoo	6	12	17	Not available	100%
Helsinki	7	14	17	10	100%
Valencia	8	30	9	Not available	100%
Wrocław	9	23	11	27	100%
Milano	10	8	28	38	94%
Dublin	11	24	12	1	96%
Karlsruhe	12	61	2	32	100%
Nantes	13	22	23	Not available	100%
Grenoble	14	2	44	Not available	100%
Malmö	15	44	20	Not available	100%
Barcelona	16	64	6	Not available	91%
Köln	17	53	14	18	100%
Dresden	18	85	4	Not available	100%
Mannheim	19	73	8	45	99%
Utrecht	20	6	55	4	100%
Bruxelles	21	5	45	30	82%
Heidelberg	22	59	22	Not available	99%
Göteborg	23	47	27	6	100%
Leipzig	24	50	25	8	100%
Zaragoza	25	63	13	13	89%
Lahti	26	65	21	Not available	100%
Marseille	27	43	32	Not available	100%
Nice	28	32	34	17	100%
Bilbao Metro	29	98	1	20	100%
Düsseldorf	30	57	29	44	100%
Nürnberg	31	26	39	41	100%
København	32	11	60	21	100%
Bonn	33	66	26	29	100%
Bergamo	34	39	36	Not available	100%
Rotterdam	35	13	59	15	100%
Hamburg	36	68	30	22	100%

[14]Although cities' names are translated to English in the text, the full ranking refers to the cities in local language. Some reported errors in this table were corrected on 27/09/2023.

[15] Shows what proportion of the bike fleet in each city provided usable trip data that could be used for benchmarking. Acts as an indicator of the transparency policies of the city or operator.

Cities	Trips per 1000 head/day rank	Bikes per 10k inhabitants rank	Trips per bike per day rank	Average trip length rank	Transparency Indicator[15]
Budapest	37	91	15	3	100%
Sevilla Metro	38	40	35	Not available	78%
Den Haag	39	25	53	5	100%
Eindhoven	40	34	49	7	100%
Praha	41	52	40	25	100%
Lisboa Metro	42	97	7	23	100%
Berlin	43	35	56	28	99%
Bielefeld	44	60	37	Not available	100%
Turku-Naantali	45	21	65	Not available	100%
Amsterdam	46	15	64	Not available	71%
Dortmund	47	95	19	26	100%
Roma	48	55	38	42	82%
Groningen	49	19	70	12	100%
Hannover	50	71	41	39	100%
Århus	51	74	43	Not available	100%
Torino	52	42	33	34	35%
Bochum	53	67	52	Not available	100%
Lappeenranta	54	38	51	Not available	55%
Klagenfurt	55	49l	66	Not available	100%
München	56	29	68	11	77%
Poznań	57	45	71	Not available	100%
Frankfurt a/M	58	9	67	37	47%
Duisburg	59	100	31	Not available	100%
Wien	60	86	62	Not available	100%
Münster	61	69	69	19	100%
Bratislava	62	81	47	14	49%
Essen	63	94	58	Not available	100%
Bremen	64	105	42	36	100%
Vilnius	65	106	48	Not available	100%
Stockholm	66	110	54	35	100%
Tallinn	67	109	63	16	100%
Madrid Metro	68	92	61	24	34%
Guimarães	69	88	76	Not available	100%
Rīga	70	112	73	Not available	100%
Zagreb	71	121	57	40	100%
Málaga	72	115	72	Not available	100%
Genova	73	124	50	Not available	100%
Kraków	74	114	75	31	100%
Bucureşti	75	111	74	Not available	53%
Warszawa	76	31	77	33	100%
Porto Metro	77	126	46	Not available	100%
Aachen	Not available	89	Not available	Not available	0%
Alicante	Not available	127	Not available	Not available	0%
Angers	Not available	54	Not available	Not available	0%
Athína	Not available	119	Not available	Not available	0%
Bari	Not available	96	Not available	Not available	0%
Bologna	Not available	18	Not available	Not available	0%
Brno	Not available	84	Not available	Not available	0%

Cities	Trips per 1000 head/day rank	Bikes per 10k inhabitants rank	Trips per bike per day rank	Average trip length rank	Transparency Indicator[15]
Bydgoszcz	Not available	79	Not available	Not available	0%
Catania	Not available	104	Not available	Not available	0%
Cluj-Napoca	Not available	87	Not available	Not available	0%
Córdoba	Not available	123	Not available	Not available	0%
Cork	Not available	70	Not available	Not available	0%
Differdange	Not available	127	Not available	Not available	0%
Dijon	Not available	41	Not available	Not available	0%
Dunkerque	Not available	127	Not available	Not available	0%
Firenze	Not available	4	Not available	Not available	0%
Gabrovo	Not available	127	Not available	Not available	0%
Gävle	Not available	127	Not available	Not available	0%
Gozo	Not available	127	Not available	Not available	0%
Guadeloupe (Pointe-à-Pitre)	Not available	122	Not available	Not available	0%
Helsingborg	Not available	16	Not available	Not available	0%
Ioannina	Not available	127	Not available	Not available	0%
Kalamata	Not available	116	Not available	Not available	0%
Katowice / Górnośląska	Not available	107	Not available	Not available	0%
Kaunas	Not available	93	Not available	Not available	0%
Košice	Not available	103	Not available	Not available	0%
Kozani	Not available	99	Not available	Not available	0%
Kranj	Not available	17	Not available	Not available	0%
La Louvière	Not available	127	Not available	Not available	0%
Las Palmas de Gran Canaria	Not available	113	Not available	Not available	0%
Lefkosia	Not available	72	Not available	Not available	0%
Lemesos	Not available	37	Not available	Not available	0%
Leuven	Not available	82	Not available	Not available	0%
Liberec	Not available	76	Not available	Not available	0%
Liepaja	Not available	127	Not available	Not available	0%
Ljubljana	Not available	46	Not available	Not available	0%
Łódź	Not available	120	Not available	Not available	0%
Lublin	Not available	56	Not available	Not available	0%
Lund	Not available	58	Not available	Not available	0%
Miskolc	Not available	127	Not available	Not available	0%
Murcia	Not available	83	Not available	Not available	0%
Napoli	Not available	101	Not available	Not available	0%
Padova	Not available	20	Not available	Not available	0%
Palermo	Not available	48	Not available	Not available	0%
Palma de Mallorca	Not available	62	Not available	Not available	0%
Parma	Not available	51	Not available	Not available	0%
Pécs	Not available	118	Not available	Not available	0%
Plovdiv	Not available	127	Not available	Not available	0%
Prato	Not available	127	Not available	Not available	0%
Rzeszów	Not available	102	Not available	Not available	0%
Santa Cruz de Tenerife Metro	Not available	117	Not available	Not available	0%
Sofia	Not available	125	Not available	Not available	0%

Cities	Trips per 1000 head/day rank	Bikes per 10k inhabitants rank	Trips per bike per day rank	Average trip length rank	Transparency Indicator[15]
Sønderborg	Not available	127	Not available	Not available	0%
Stuttgart	Not available	78	Not available	Not available	0%
Suceava	Not available	127	Not available	Not available	0%
Szczecin-Świnoujście	Not available	80	Not available	Not available	0%
Tampere	Not available	27	Not available	Not available	0%
Tarragona-Reus Metro	Not available	127	Not available	Not available	0%
Taurage	Not available	127	Not available	Not available	0%
Thessaloniki	Not available	75	Not available	Not available	0%
Timişoara	Not available	108	Not available	Not available	0%
Tricity Gdańsk-Gdynia-Sopot	Not available	127	Not available	Not available	0%
Trikala	Not available	77	Not available	Not available	0%
Umeå	Not available	127	Not available	Not available	0%
Valladolid	Not available	36	Not available	Not available	0%
Valletta	Not available	90	Not available	Not available	0%
Varna	Not available	127	Not available	Not available	0%
Velenje	Not available	33	Not available	Not available	0%
Vitoria-Gasteiz	Not available	127	Not available	Not available	0%
Wuppertal	Not available	127	Not available	Not available	0%
Liege	Not available	Not available	Not available	Not available	0%