CYCLING IN MAYOR CITIES

Growing cycling in London

FINAL EMPLOYER PROJECT
JUNE 2023 TEAM 5 - DATASURFERS

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1. BACKGROUND AND CONTEXT

1.1. PROBLEM STATEMENT

Transport For London (TfL) has commissioned DataSurfers to investigate how TfL could achieve that 80% of all trips in London are made by foot, cycle or using public transport by 2041. Specifically, this research has focused on identifying actions and recommendations to increase cycle transit. In addition, the initial hypothesis made by TfL regarding correlation between the availability of cycling infrastructure and the prevalence of cycling has been explored.

Several factors that might influence or encourage cyclists to use the bike have been investigated using the data provided by TfL and additional sources of information including the London Plan 2021 and the Mayor's London Strategy.

1.2. STUDY OBJECTIVES

DataSurfers has studied the progress that TfL has made to reach the 80% benchmark as well as factors influencing this progress. To achieve this objective, three main goals have been investigated in this study. These are shown below:

Figure 1. Goals investigated in the present study

2. PROJECT APPROACH

2.1. DATA PROCUREMENT AND CLEANING

To undertake this analysis an extensive set of information was investigated including a dataset provided by TfL and other sources of information publicly available. A list of the data considered can be found in Appendix A.

A phased approach was followed to carry out this analysis. It is shown in the figure below:

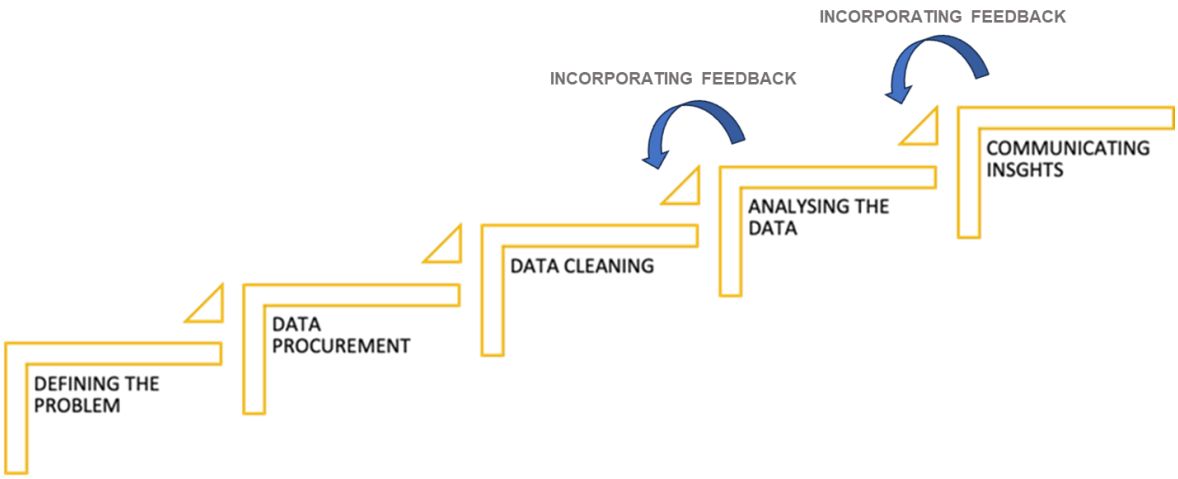

Figure 2. Research approach

First, the problem was defined, and the potential factors influencing cycling behaviour identified. Following a quick investigation of data available it was decided which factors could be feasible to investigated.

Then, the data cleaning process started where duplicates and missing data was identified and addressed. Merging of the different datasets and data categories for variables like weather, location and period was undertaken using excel.

2.2. DATA ANALYSIS

Once the datasets were clean and ready to be used, a preliminary analysis of the data was carried out using Python and Tableau where initial trends and insights were identified. To evaluate the progress made by TfL to achieve that 80% of all trips in 2041 are made by foot, walk or public transport, a forecast analysis using the ARIMA method was undertaken. It is known that in 2015, 60% of all trips were made on foot, by cycle or using public transport. Therefore, an increase of at least 20% is needed to ensure the target is met in 2041.

2.3. TECHNICAL OVERVIEW OF THE CODE

In undertaking the data analysis project, tools and techniques were carefully selected and tailored to the requirements of the project. The selected choices were guided by the need to gain a comprehensive understanding of the data at hand.

To analyse the data popular Python libraries were used such as Pandas, NumPy, Seaborn and Matplotlib. These tools allowed the examination of the data structures, to perform data manipulation and transformation, and visualize the results. The extensive functionality provided by these libraries greatly facilitated the understanding of the data and enabled the identification of patterns, correlations, and trends in the data.

Overall, the selection of Python-centric analysis enabled the management of large datasets in an efficient way. It was also possible to extract valuable insights and present the findings through intuitive visualizations. The vast array of Python libraries and the community support behind them significantly facilitated the analysis tasks, enabling the completion of the project more effectively. Additionally, the robustness of the Python ecosystem ensured that security, privacy, and testing aspects were adequately addressed during the development process.

2.4. VISUALISATIONS

Clear and impactful visualisations were created using Tableau, Python and R. A colourblind palette was selected to ensure the different graphs and charts are more accessible to people with visual impairments. Visuals created to illustrate the different trends and insights are shown in the following section.

3. PATTERNS, TRENDS AND INSIGHTS

3.1. GOAL 1 – PROGRESS MADE TOWARDS ACHIEVING GOAL OF 80% OF ALL TRIPS BEING MADE ON FOOT, CYCLE OR PUBLIC TRANSPORT BY 2041

To address the first goal, a forecast analysis was undertaken using the ARIMA method to understand the total number of cycle trips expected by 2024. The forecast was undertaken considering a dataset containing the Covid 19 pandemic period (Figure 3 bottom graph) and omitting the years of 2020 and 2021(Figure 3 top graph).

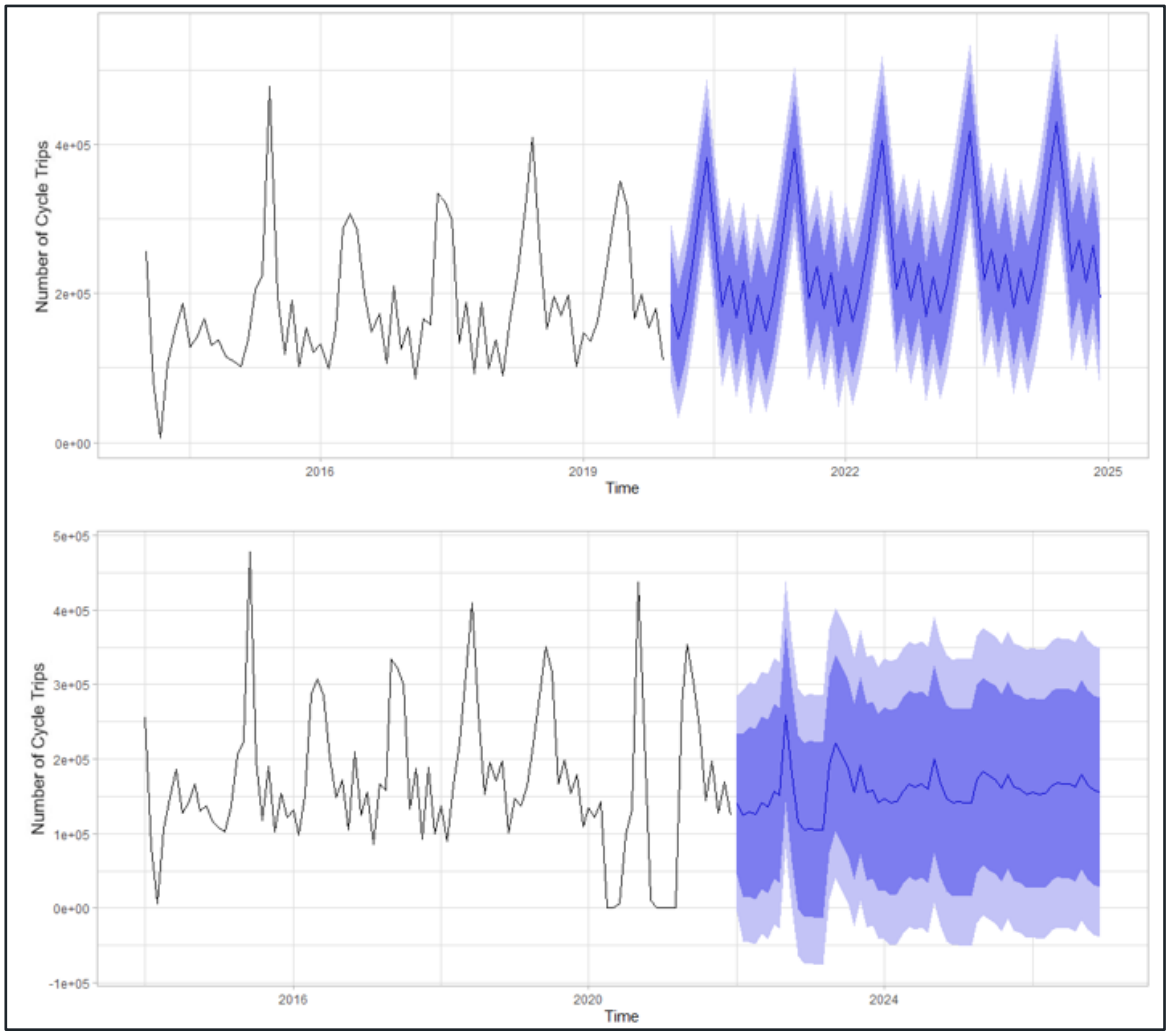

Figure 3. ARIMA forecast for 2024. Top figure covers period 2014 to 2019. Bottom figure covers period from 2014 to 2021. Source: Data provided by client

It can be observed that the forecast using the period of Covid 19 pandemic is distorted and unreliable and the results have not been considered. The forecast undertaken omitting the data for 2020 and 2021 estimates an increase of 34% by 2024.
A positive trend is identified for walking and public transport as shown in Figure 4. It is also noted that private transport is decreasing.

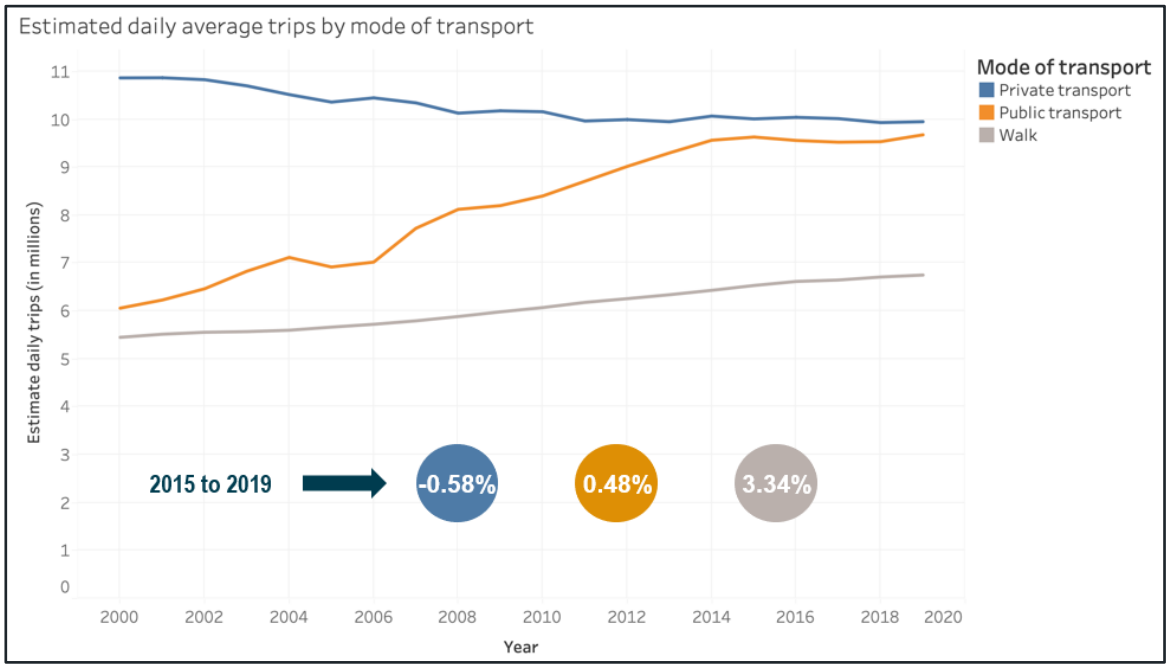

Figure 4. Estimated daily trips by mode of transport. Source: [TfL City Planning - Travel in London - Report 13 (2020)]

Since the forecast is higher that the required 20% and the trends of walking and public transport are positive, it could be concluded that TfL is moving in the right direction to achieve the 80% goal.

3.2. GOAL 2 – FACTORS IMPACTING CYCLING

Cycle Safety (Accidents)

The following figure shows the ratio of all casualties in London for cyclists, ranging from minor accidents to accidents that have resulted in death or serious injury, combined with the Total Cycles.

From 2015 to 2019, the ratio of casualties decreased slightly. However, for 2020 and 2021, the decrease in total cycles combined with the number of casualties remained constant leading to an increase in the ratio of Total Cycles and Casualties.

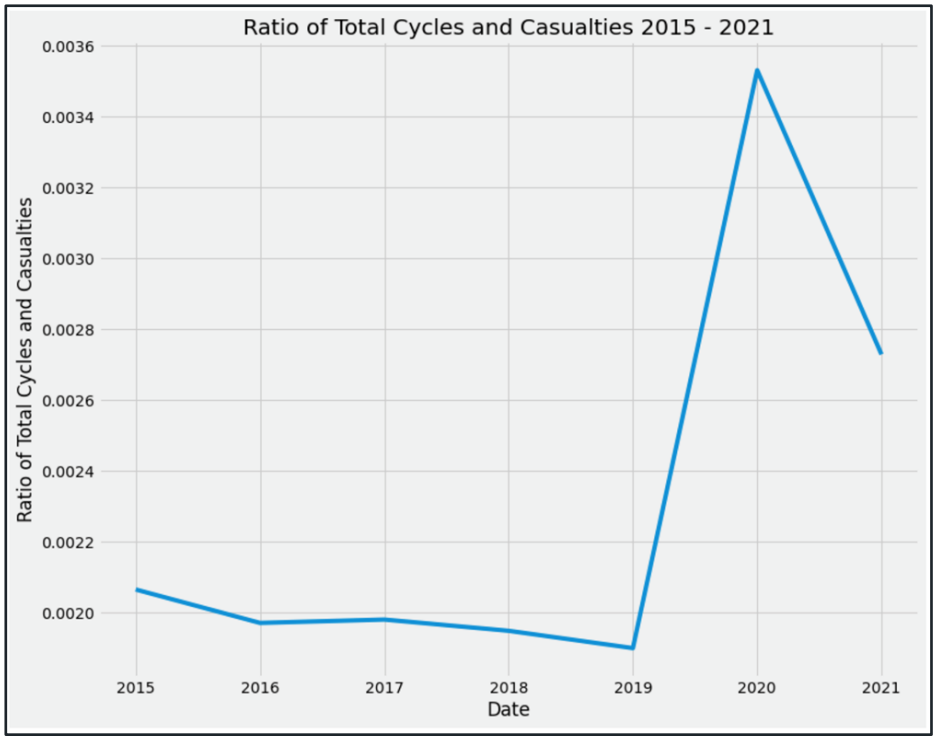

Figure 5. Ratio of Total Cycles and Casualties 2015 – 2021. Source: Data provided by client and GOV.UK, Passenger Casualty Rates

Cycle Safety (Theft)

The following figure indicates that bicycle theft has increased in London since 2015 and the number of bicycle thefts is higher during the summer months since there are more cyclists.

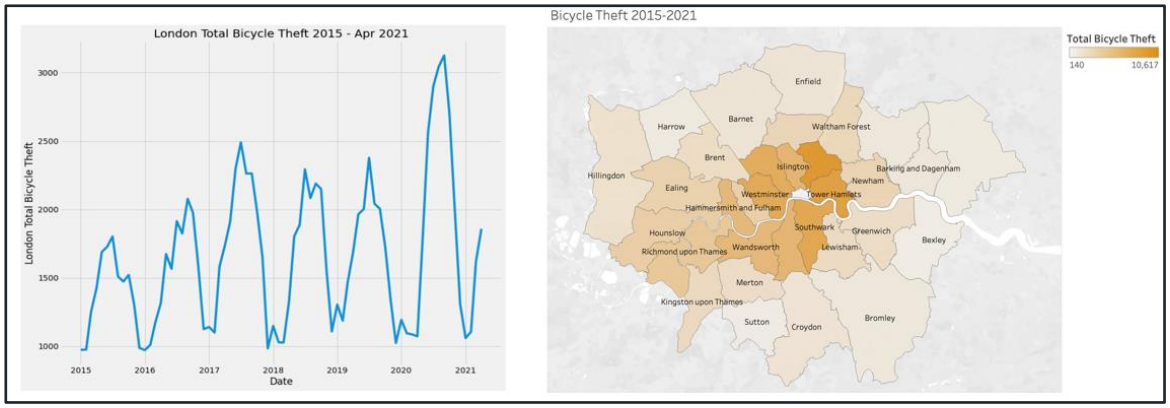

Figure 6. Bicycle theft 2015 – 2021. Source: London Datastore, Bicycle Theft

Cycle Parking (Security)

Figure 7 and Figure 8 indicates that secure and hangar parking is not available for people who live in the outer boroughs of South and North London.

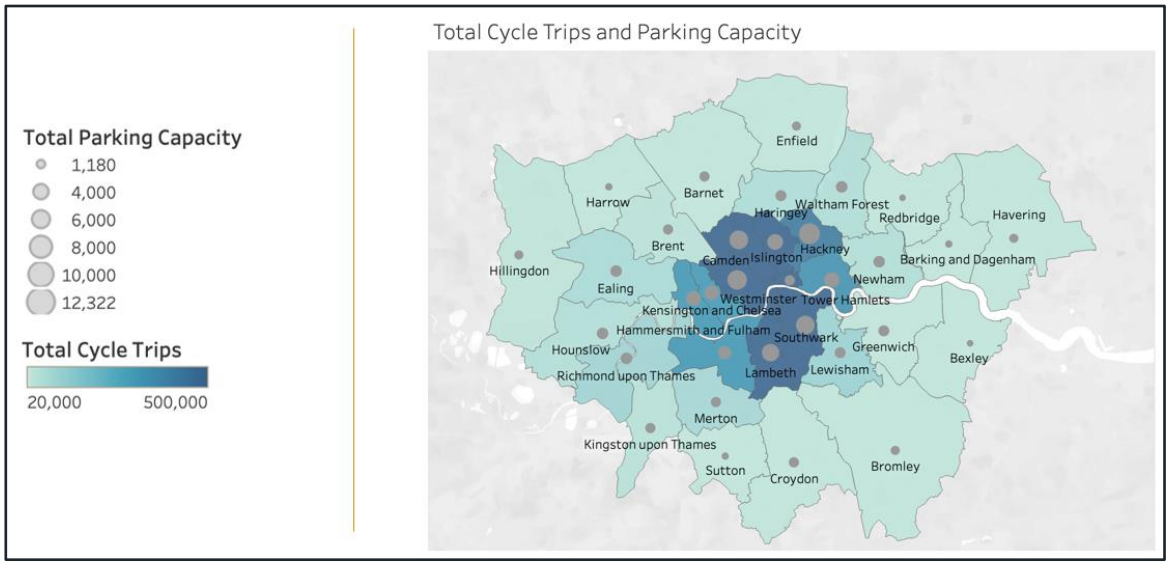

Figure 7. Total cycle trips and parking capacity. Source: [TfL - Cycling Infrastructure Database]

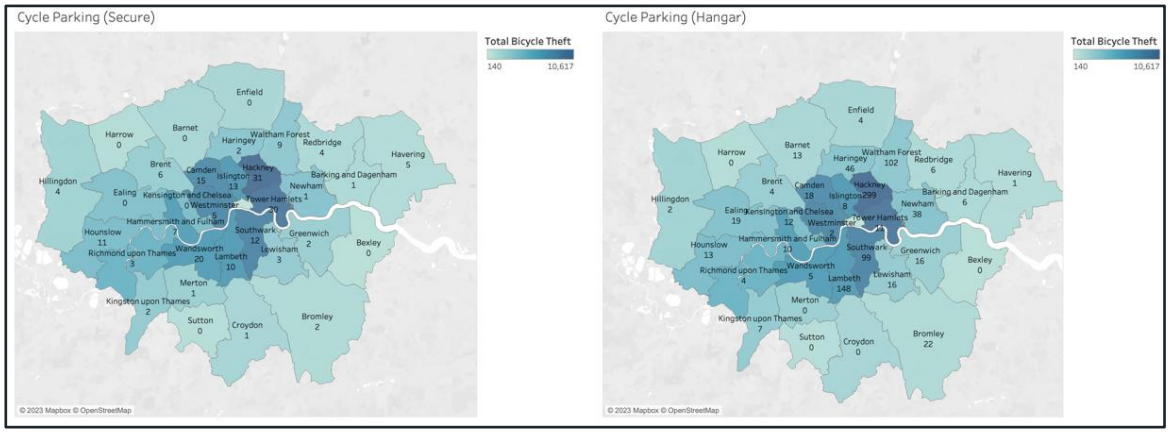

Figure 8. Cycle Parking (Secure and Hangar). Source: [TfL - Cycling Infrastructure Database]

Weather impact on cycling

Figure 9 shows that although the dry weather is the preferred option for most people, there is still a percentage of cyclists that will ride despite the rain.

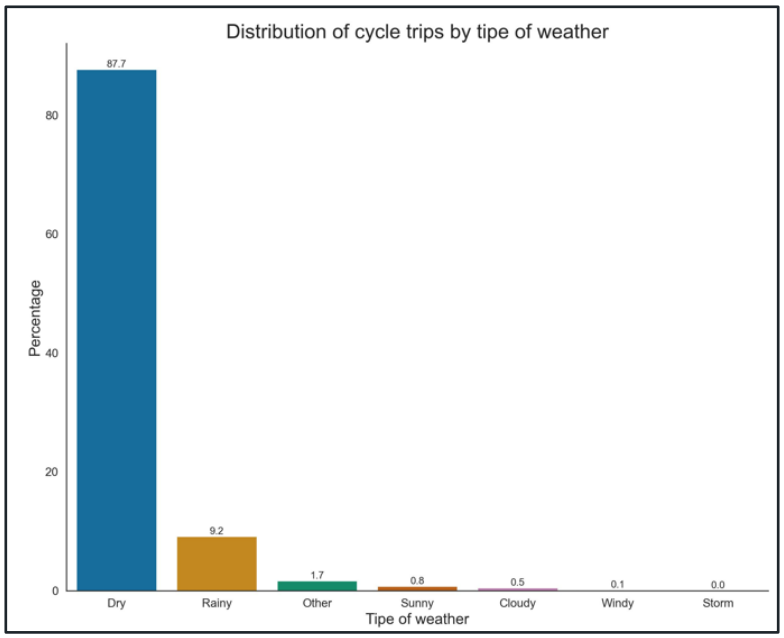

Figure 9. Type of weather. Source: Data provided by client

3.3. GOAL 3 – CORRELATION BETWEEN CYCLING INFRASTRUCTURE AND CYCLING

The below figure shows that areas with a dense network of cycling routes has a higher number of cycling trips.

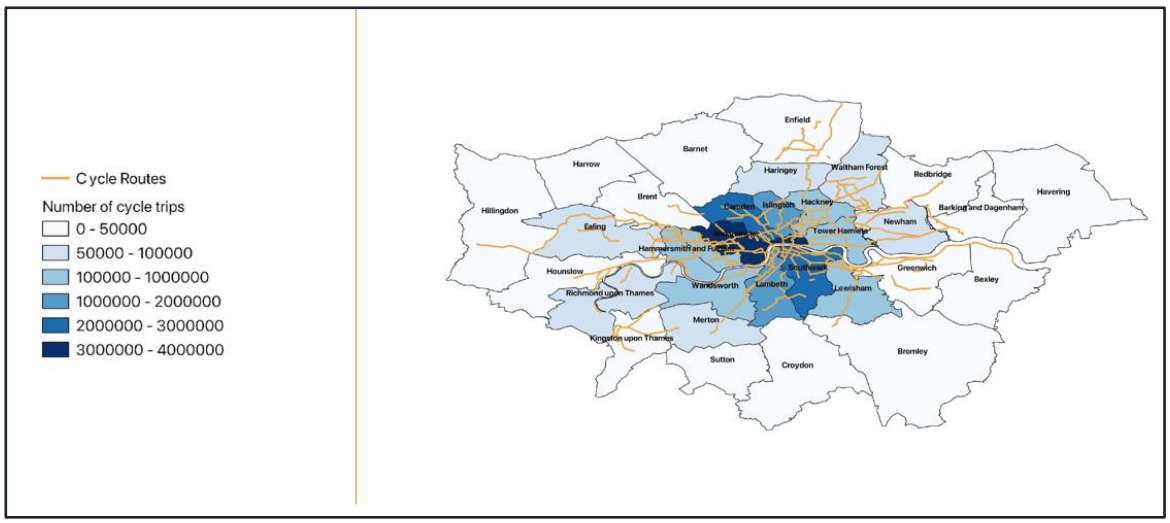

Figure 10. Cycle routes. Source: [TfL - Cycling Infrastructure Database]

The following figure suggests that there are only docking stations in central London and in some areas in inner London. It is believed that increasing the number of docking stations throughout inner and outer London will encourage more people to cycle.

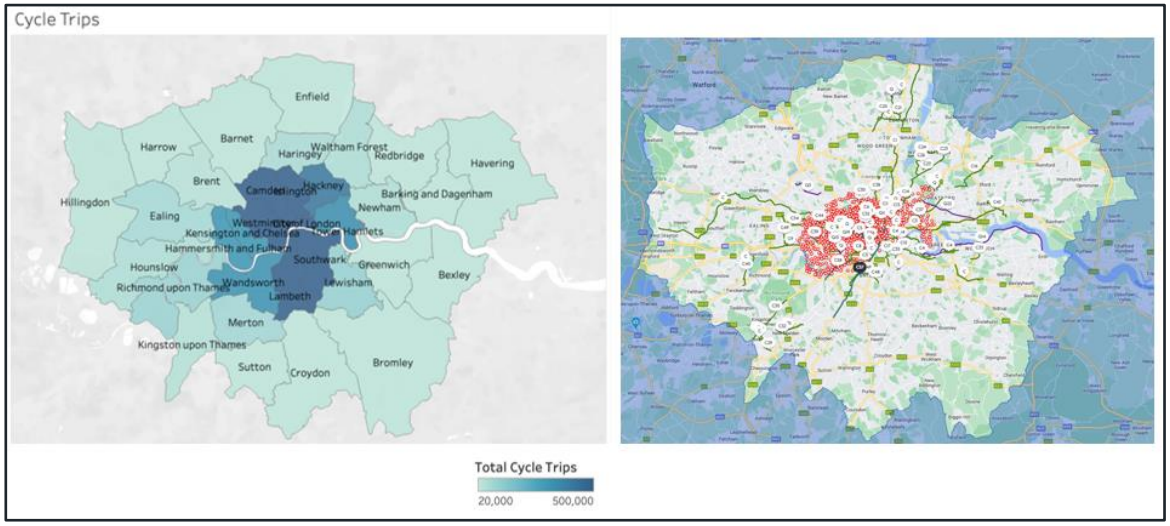

Figure 11. Docking stations. Source: [TfL – Maps - Cycle]

4. RECOMMENDATIONS

The following recommendations are proposed based on the analysis:

- Include a dedicated cycle carriage in the train network and bike racks on buses to allow non-folded bikes onboard at any time of the day. It will increase accessibility in both directions, into central London and out of central London.
- Increase the number of segregated cycle lanes to reduce the number of cycle accidents which has been increasing during the past 2 years.
- Increase the number of secure cycle parking facilities (as it has been done in central and inner London) in the outer boroughs may increase the number of people cycling in these areas. It will reduce the risk of bikes thefts which has been increasing during the past 5 years.
- Cycle friendly infrastructure like in-kerb gullies should be used in cycling routes to improve drainage and safety.
- Although outer London may exhibit different behaviours compared to central or inner London due to variations in demography, population density and distance to public transport, there is a specific opportunity to make progress towards the primary goal of the Mayor's Transport Strategy by actively encouraging commuters from outer London to incorporate cycling into their journeys to central London, along with the current public transport they already use.

It must be noted that these recommendations consider future climate, demographic and working patters trends so they are able to adapt to future changes.

5. FURTHER WORK

Future research and analysis are recommended to improve the accuracy and robustness of the provided insights. The main areas of research are shown below for each goal:

Goal 1:

- Further analysis using a longer timeseries (representative sample). It will increase confidence and accuracy of the forecast.
- Undertake a sensitivity analysis using other time series forecasting methods (Naïve, Holt's trend, Tbats) to analyse robustness and performance and from these methods and select the most appropriated for the data available.
- Gather more data in order to perform a forecast by area which could provide a more granular understanding of the situation.

It must be noted as a risk that the ARIMA forecast using short timeseries can outperform and provide inaccurate outcomes.

Goal 2 and 3:

- Further analysis of interventions in other major cities (Sydney, New York) that could be applied in London to accelerate the progress towards 2041 goal.
- Further investigation is required on diversity and inclusion factors to ensure future interventions consider London wider diversity.
- Limited financial resources could delay the development of new cycling infrastructure. Also, dedicated cycle carriage in trains and bike racks in buses might delay current services and add a new safety risk that need to be managed and mitigated accordingly.

6. CONCLUSIONS

- It is concluded that the Mayor's vision is achievable, given the positive trend in cycling, walking, and public transport use.
- There is still room for improvement in infrastructure and accessibility.
- The interventions implemented in central and inner areas have shown positive results and should be extended to the outer area, which lags behind.

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