

# Private car or public transport? - what effects does the service accessibility have on public transport utilisation in the City of London

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# Abstract

In recent years there have been an increased drive globally to reduce private car journeys and increase the public transport use, cycling or walking. To support the shift in behavioural change and enable transition to more sustainable transport choices, many researches have been carried out to identify factors that may influence commuters' decisions in relation to their transport mode selection. Number of those have shown that good quality public transport services can lead to its improved attractiveness. This study examines public transport accessibility levels across the City of London and its effects on the public transport utilisation and car ownership in the city.

## Introduction

In London, 17.5 billion vehicle miles of traffic were travelled by cars and taxis in 2019. (DfT, 2021). Hydrocarbon fuelled automobiles result in many negative impacts, such as air pollution including the CO<sub>2</sub> emissions and road congestion. Air pollution has an adverse effects on human health, CO<sub>2</sub> emissions accelerate global warming and road congestion leads to roads being less welcoming for the pedestrians and cyclists as well as negatively impacts efficiency of public transport and freight.

London is considered to have well developed public transport system and although number of trips made by foot, cycle and public transport have risen from 52% in 2000 to 63% in 2019 (TfL, 2021), major improvements are necessary to meet the Mayor of London goal of "80 per cent all trips in London to be made on foot, cycle or using public transport by 2041" (Greater London Authority, 2018).

This study assesses the public transport accessibility across the City of London by analysing the content from the WebCAT planning tool and travel time mapping. London travel demand survey data was used to analyse public transport utilisation, car use and car ownership across the city. Accessibility, public transport use, car use and ownership were then assessed for any interconnection.

## Research question and objectives

The research question is as follows: Private car or public transport? - what effects does the service accessibility have on public transport utilisation in the City of London

The objectives are as follows:

Establish what effects service accessibility has on public transport utilisation in the City of London by:

1. Determining public transport accessibility, public transport utilisation, car use and ownership across the City of London

## 2. Determining interconnection between public transport accessibility, public transport utilisation, car use and ownership across the City of London

### Literature review

Many factors are found to have an effect on commuters travel behaviours and their satisfaction. Travel satisfaction is a complex phenomenon and high overall satisfaction appear to depend upon multiple characteristics such as reliability, comfort, safety or information (Sukhov et al., 2021). Studies show, good public transport accessibility have impact not only on peoples' ability to connect and access many areas but also have a positive impact on their personal relationships. (Mouratidis, 2019)

Study of Melbourne have found the rail disruptions have negative impact on passengers satisfaction with regards to public transport (Currie and Muir, 2017). In terms of these disruptions, the "waiting tolerance" of affected public transport users was found to be critical piece of information that could be used by transport authorities to design and integrate more effective recovery strategies in case of such service disruptions (Lin, 2017). (Rahimi, et al., 2019) found the travel disruptions can have a severe negative impact on public transport users 'experience. As per the the survey in the Chicago region, approximately 33 percent of public transport users reported that they would wait more than 20 min for the system to be restored, however his figure drops down to about 8 percent of users that would wait more than 45min.

Although disruptions appear to be one of elements, many studies have found accessibility being the key factor in impacting people choices with regards to how they travel. Study built on travel survey in Oslo, Norway found that walking distance to a public transport station, transfers and waiting time have negative impact on commuters' satisfaction (Lunke, 2020). Another study in Oslo found that large proportion of working people that commute to the city centre is situated along the main railway and metro lines. Oslo city centre is highly attractive due to its recent developments to its public transport hub in comparison to other city areas such as Fornebu, west of Oslo city centre where high levels of car use are associated with limited public transport system (Gundersen et al., 2016). Further research into subject found the residents in the less urban and dense areas would have reduced public transport use and increased private care use. People in these areas were more likely to choose private car over the public transport use because the stations were found to be far (Hook et al., 2021). (Azimi, et al., 2020) found the longer the access length (distance from the origin to the transit station), the users were more likely to choose micro mobility, TNC or taxi, carpool, or drove alone modes.

### Methods

Constructionist epistemology approach was chosen. The "truth," or meaning, comes into existence in and out of our engagement with the realities in our world; no real world preexists that is independent of

human activity or symbolic language (Moon, 2014). How different individuals construct the meaning of something will depend upon their perspectives, experiences, and interactions with others.

Content analysis method was used. Rather than solely a data collection technique, content analysis was used to analyse the data itself (Miller, 2003). The source of documents and content was limited to two government organisations, Department for Transport (DfT) and Transport for London (TfL) to ensure data ease of access, suitability and legitimacy. To ensure reasonable amount of data for analysis, the time frame limit for the sample was set between 2015 and up to 2020. Data sample excluded the time frame of the COVID pandemic outbreak, 2020 onwards.

The applicable documentation and content were found by searching for “public transport accessibility London” and “transport demand London” directly in the GOV.UK of the DfT and TfL websites. Due to the large amount of data per individual workbook and WebCAT tool the number of sources was limited to 4.

For the analysis purposes, selected documentation was sorted into two groups ‘transport accessibility’ and ‘transport demand’. Each group was coded and both data and text were analysed as appropriate (Miller, 2003) :

- Transport accessibility: ‘public transport accessibility’; ‘public transport connectivity’
- Transport demand: ‘transport mode share public transport (national rail, underground, bus)’; ‘transport mode share car (car driver, car passenger)’; ‘car ownership’

## Results

Based on analysis of ‘transport accessibility’ content it was found the Transport for London (TfL) developed a PTAL measure (Public Transport Access Level), the measure rates a selected place based on how close it is to public transport and how frequent services are in the area. The PTAL values range between 0 and 6, with highest value indicating the best public transport connectivity and lowest score indicating the worst public transport connectivity (TfL, 2015). PTAL measure depends on following factors: walking distance to nearest station or stop, waiting times at nearest station or stop, more services at nearest station or stop and major rail stations nearby (TfL, 2015).

Based on result from the analysed, WebCAT data it appears there are significant variations in PTAL accessibility scoring across London areas, specifically between inner and outer London. The highest PTAL values of 5 and above are limited and mostly present in the inner areas of London. The lowest PTAL values are mostly present in the outer London, with many areas of outer London with the PTAL score of 1 and 0. Although the inner London appears to have good PTAL, there are still many pockets found with the score of 1 and below. Figure 1. The public transport accessibility map for London (TfL, 2021) demonstrates current PTAL scoring across the city.

Data from travel time mapping was used to assess connectivity and accessibility of locations by public transport across the City of London (TfL, 2015). Based on analysed content, it appears the number of

town centres within the City of London that can be reached within 30 minutes via public transport varies across the city and in many cases cannot be achieved. In the inner London, number of town centres that can be reached by public transport within 30 minutes is found to be mostly between 4, 6 and above, however there are still cases where that number drops to 1. In the outer London, number of town centres that can be reached by public transport within 30 minutes drops and is found to be mostly between 1 and 4. Furthermore, in the outer London there is a large proportion of cases where none of the town centres can be reached within 30 minutes by public transport.

Travel demand survey workbook data (TfL, 2019/20) was used to analyse travel demand and transport mode utilisation in the city of London. The data for the following periods was analysed, 2015/16, 2016/17, 2017/18, 2018/19 and 2019/2020. Over the period, on average the inner London public transport (national rail, underground/DLR, bus/tram) share accounted for 35.0 percent of journeys and car (including car driver and car passenger) accounted for 19.6 percent share. In the outer London the public transport accounted for 25.8 percent of trips and the car journeys rose to 44.9 percent.

The travel demand survey workbook (TfL, 2019/20) was also used to analyse the car ownership data. Over the same period, on average, 67.7 percent residents owned 1 or more cars in the outer London compared to 39.9 percent in the inner parts of the city. Additionally 21.5 percent residents of outer London owned two or more cars in comparison to 5.9 percent residents in the inner parts of the city. Although since 2015 the number of residents without the car appears to have been minimally increasing in both inner and outer London, the annual car and taxi miles driven across the city have grown over the same period (DfT, 2021).

## Discussion

The aim of this paper was to establish effects service accessibility has on public transport utilisation, car use and ownership in the City of London and strong interlink has been found. Public transport utilisation appears to be rising in the areas with the higher/better PTAL accessibility scores and declining where the PTAL scores worsen. Furthermore the proportion of car journeys and ownership rises where the public transport accessibility and connectivity drops.

There is a vast number of literature available that focuses on research into factors that influence commuters in relation to their transport mode selection. Many align with this research and point at the accessibility, amongst other factors such as disruptions being one that plays critical role in the public transport utilisation. It is therefore important for all the governments globally to recognise that building resilience into public transportation systems is critical in all levels of national and local agencies alike to enable its improved utility (Baylis et al., 2015).

Findings of this research provoke a question of large disparity and inequality in accessibility levels to public transport across different areas of London. The outer areas appear to be more disadvantaged in general in terms of public transport accessibility with a larger proportion of the less reachable areas than

inner London. However, although inner London is found to have higher public transport accessibility levels overall, there appear to be number of places difficult to reach by public transport service.

The number of car trips appear to be greater in the outer London overall, however the areas with good access to public transport in the outer London have fewer car trips than inner London with low access to public transport. This may indicate that car ownership isn't a matter of choice for residents in areas with low PTAL scores but matter of being able to get from a to b, which often is work, school and other necessities. Therefore further research to identify trip purposes may be required.

To enable transition to sustainable transport it is important for the authorities of London to focus on improving the public transport accessibility levels for all and focus on transport planning to prioritise the "ease by which valued destinations can be reached". This will help achieve meaningful progress means and increase the attractiveness by which locations can be reached by human rather than only by cars (Glaser et al., 2020).

## Conclusion

This paper presents helpful insights into public transport accessibility levels across the areas of city of London. It highlights effects these accessibility levels appear to have on commuters in relation to their transport mode selection. The research findings demonstrate the importance of good public transport accessibility and connectivity levels to enable improved public transport utilisation, reduction in car journeys and car ownership.

The results can be used to support policy development and facilitate the public transport services in targeting the areas where enhancement is required the most. By doing so it will not only aid the city in achieving the targets of carbon footprint and pollution reduction but it can also safeguard the equality of public transport access for residents of all parts of London.

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## Declarations

Competing interests: The author declares no competing interests.

## Figures

## Figure 1

London Public Transport Accessibility Map - Source WebCAT (TfL, 2021)