The Influence of Low Traffic Neighbourhood Scheme on Multimodal Traffic Flow in London

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Summary

This study aims to investigate the influence of Low Traffic Neighbourhood (LTN) Scheme deployed since the COVID-19 pandemic on multimodal traffic flow in London. We adopt a mobile phone application dataset to investigate the changes in multimodal traffic flow generated by the general public following the introduction of LTNs. Three LTNs located in London are explored between 4th May and 30th August 2020. The analysis approved that LTN scheme could encourage residents to take cycling and restrict through-traffic, but the influence varies across areas, travel modes and groups and may affect by specific measures.

KEYWORDS: Multimode, Traffic flow, Low Traffic Neighbourhood, London

1. Introduction

After the outbreak of the COVID-19 pandemic in early 2020, the LTN schemes have been quickly delivered in several London boroughs to make it easier for active travel to keep social distance. These new LTNs are implemented based on the combination of local knowledge and TfL's Strategic Neighbourhoods Analysis (Transport for London, 2020). Based on this analysis and decision-making, several combinations of intervention measures are adopted to make up LTNs, such as modal filters, bus gates, traffic signals. After deploying these measures, the through-traffic will be restricted to access the intervened areas, but residents' vehicles and public services vehicles can still arrive at the destinations within the LTNs.

Existing research explored the influences of LTN schemes deployed before and after the pandemic on impacts on active travel (O'Malley, 2021), road safety (Goodman et al., 2021), and health (Laverty et al., 2021). These existing studies contributed useful knowledge for evaluating LTN schemes, but their direct influences on preventing driving through traffic and mode shifting are rarely examined due to the limitations of available data sources. Although some local authorities monitored the changes in traffic flow after introducing LTNs through traffic count sites, this data only reported the driving flow on limited road segments. Besides, existing research only focused on the responses of residents (via social survey) but ignore the well-being of people with trip attractions (i.e., workers and visitors) and pass-through people, which are also important components of local mobility. Besides, existing research did not reveal the responses of cycling and walking flow to LTN scheme, which is one of the important targets of LTN scheme.

To address the gap in existing research, this paper aims to evaluate the impacts of LTNs on mobility by analysing the multimodal traffic flow in the general public, including residents, people with trip attractions, and pass-through people. We will generate a multimodal traffic flow dataset based on an individual multimodal derived from Mobile Apps GPS data. Three LTNs deployed in London from

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June to July 2020 are selected to be the study cases. The details of data, methodologies and case study are given as below.

2. Study cases and dataset

2.1. Study cases

Three LTNs introduced in London from June to July 2020 are selected to be the study cases (**Figure 1**). The detailed information of selected LTNs is listed in **Table 1**. In three LTNs, the dominant land use is different. Dulwich Village is located in Inner London, and its dominant land use is high and medial density residential with retail and commercial sites. Soho West is also located in Inner London, but its dominant land use is mainly commercial and retail with residential pockets and high density residential sites. The land use of Hilltop is mainly high density residential sites. The transport interventions deployed in these areas are also different. These characteristics provide a good lens to observe the influence differences of LTN schemes. In order to diminish the interferences of national lockdowns, the study period is 17 consecutive weeks from 4th May to 30th August 2020.

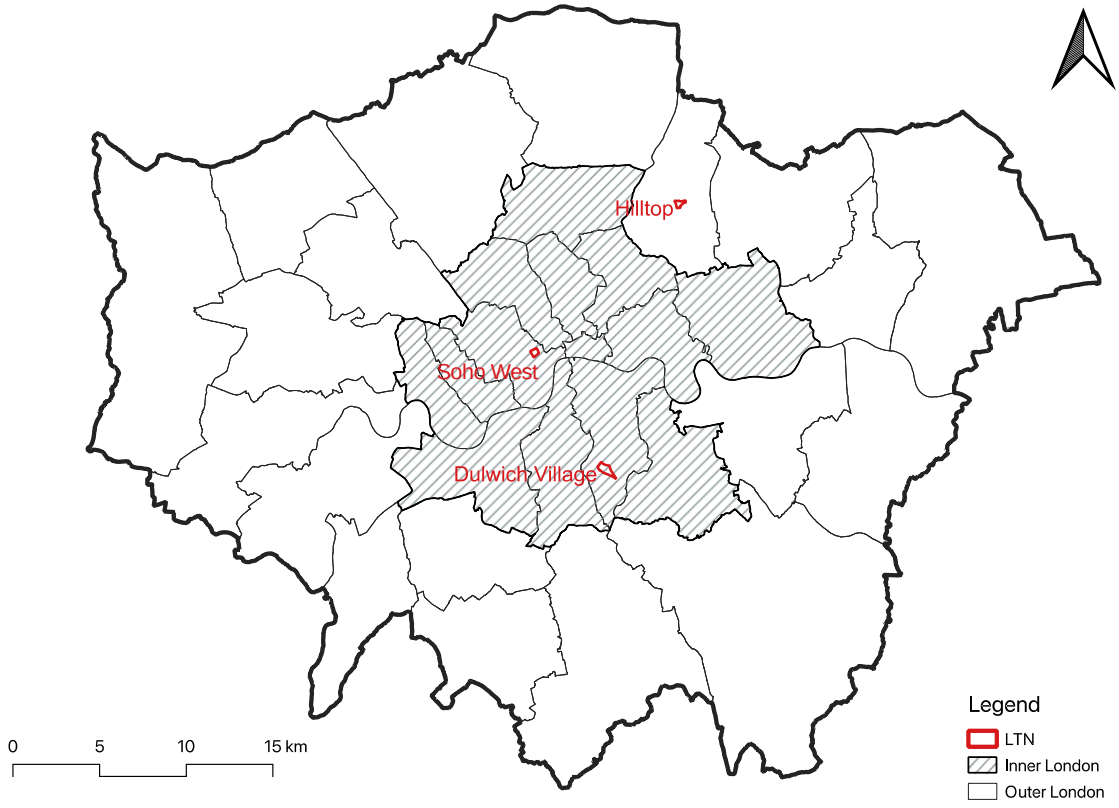

Figure 1 The spatial distribution of selected LTNs

Table 1 The information of selected LTNs

LTN	Borough	Location	Area	Implementation Date
Dulwich Village	Southwark	Inner London	0.39 km^2	25/June/2020
Soho West	Westminster	Inner London	0.15 km^2	04/July/2020
Hilltop	Waltham Forest	Outer London	0.15 km^2	06/July/2020

2.2. Dataset

The individual multimodal dataset is generated from GDPR-consented mobile phone application data by using travel mode detection algorithms. Three travel modes, including car, cycle and walk, are filtered out of the original dataset to reveal the impacts of LTN schemes (Zhang & Cheng, 2022). In addition, the through-streets data in London from CycleStreets (https://www.cyclestreets.net) is also

adopted to assist in interpreting the results, which presents the pass-through potential of different streets after introducing transport interventions.

3. Methodology

3.1. People group identification

People groups are identified to accurately understand the influences of LTN. In this research, rule-based methods are employed to identify three people groups, including residents, people with trip attractions (i.e., workers and visitors), and pass-through people. Residents will be first detected according to their nighttime activities. People with trip attractions are identified by their travel mode and stay time. Pass-through people are detected based on their travel modes, routing, and appearance time. **Error! Reference source not found.** presents the average weekly number of three groups in the selected LTNs.

Table 2 The average weekly number of three groups

LTN	Resident	People with trip attractions	Pass-through people
Dulwich Village	27	60	586
Soho West	19	35	130
Hilltop	24	355	1008

3.2. Multimodal traffic flow generation

The original individual multimodal data consist of trajectory points. The original trajectory points will be mapped to the corresponding road segments, and the paths between two consecutive points will be found by using a route searching algorithm. After these processes, the street-level multimodal traffic flows of different groups will be produced, which could present how many devices pass through a road segment by certain travel modes in a day (Zhang & Cheng, 2022).

4. Results

Multimodal traffic flow generated by different groups is summarised to present the influence of LTN schemes on local transport. Overall, the LTN schemes could restrict driving flow and encourage more active travel, which achieved the original intent of the policy design. However, the influence of LTN scheme varies across areas, travel modes and groups.

To begin with, the implementation of LTN in Dulwich Village and Hilltop resulted in a reduction in driving flows generated by almost all three groups. The decline in driving flow was more pronounced in Dulwich Village and Hilltop, particularly in terms of flows generated by people passing through. In contrast, the recovery of driving flow in Soho West was not constrained by the transport interventions. Although these three areas introduced similar transport interventions for preventing through-traffic, the potential for pass-through on the inside streets is different. After deploying transport interventions, almost all roads within Hilltop cannot be used for rat-running. However, pass-through people still could choose suitable routes through intervened areas in Dulwich Village and Soho West. In addition, the driving flow in Inner London recovered rapidly after lifting the first national lockdown on 10th May. This stronger impact may weaken the performance of LTN scheme on restricting through-traffic, especially in urban centres areas like Soho West.

In contrast to the relatively consistent change of driving flow, the responses of cycling and walking flow are more varied. After implementing LTN schemes, there was a slight increase in residential cycling flows in the three LTNs, but varying degrees of decline in walking flows. Cycling and walking flow of people with trip attractions and pass-through people decreased in Dulwich Village and Hilltop but increased in Soho West. These results seem to contradict the origin intent of the policy but are reasonable given the context of LTN implementation. Although people preferred cycling and walking during the first national lockdown, this trend did not sustain after lifting the lockdown. Cycling and walking flow began to decrease in the whole London after the first lockdown (Zhang & Cheng, 2022). Considering the overall changes in active travel after the macro policy transformation, the obvious

increase in cycling flow generated by local residents may further prove the effectiveness of LTN in encouraging active travel. In order to ensure this influence, the analysis with longer study periods and wider objects should indeed be conducted after controlling the influences of the pandemic.

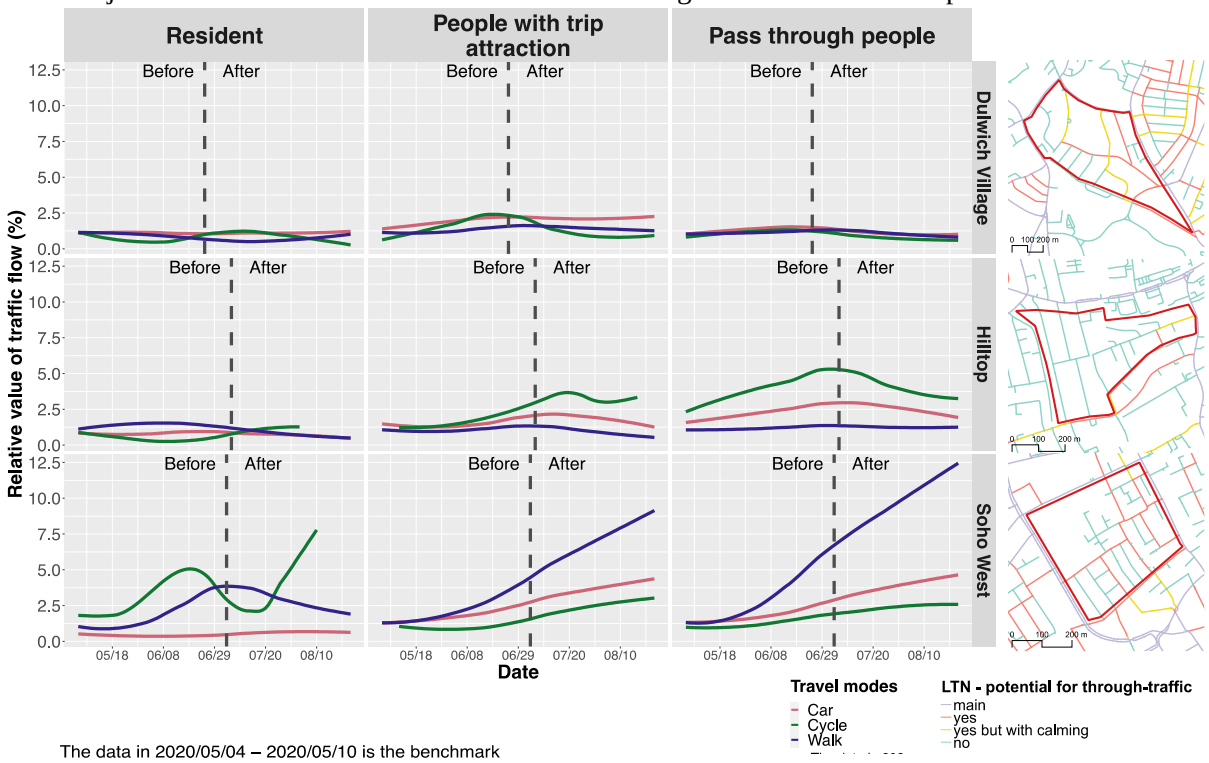

Figure 2 The relative value of multimodal traffic flow within the LTNs

5. Conclusions

This study explores the influence of LTN scheme on multimodal traffic flow generated by different groups. The analysis confirmed that LTN scheme could encourage cycling and restrict through-traffic. However, the impacts of LTN scheme are different across areas, travel modes and groups, and further investigation is needed to unravel the behind reasons. Future research should consider controlling the interferences of the COVID-19 pandemic. Besides, the specific context and intervention measures of LTNs should be incorporated into the analysis to explain the influence differences.

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