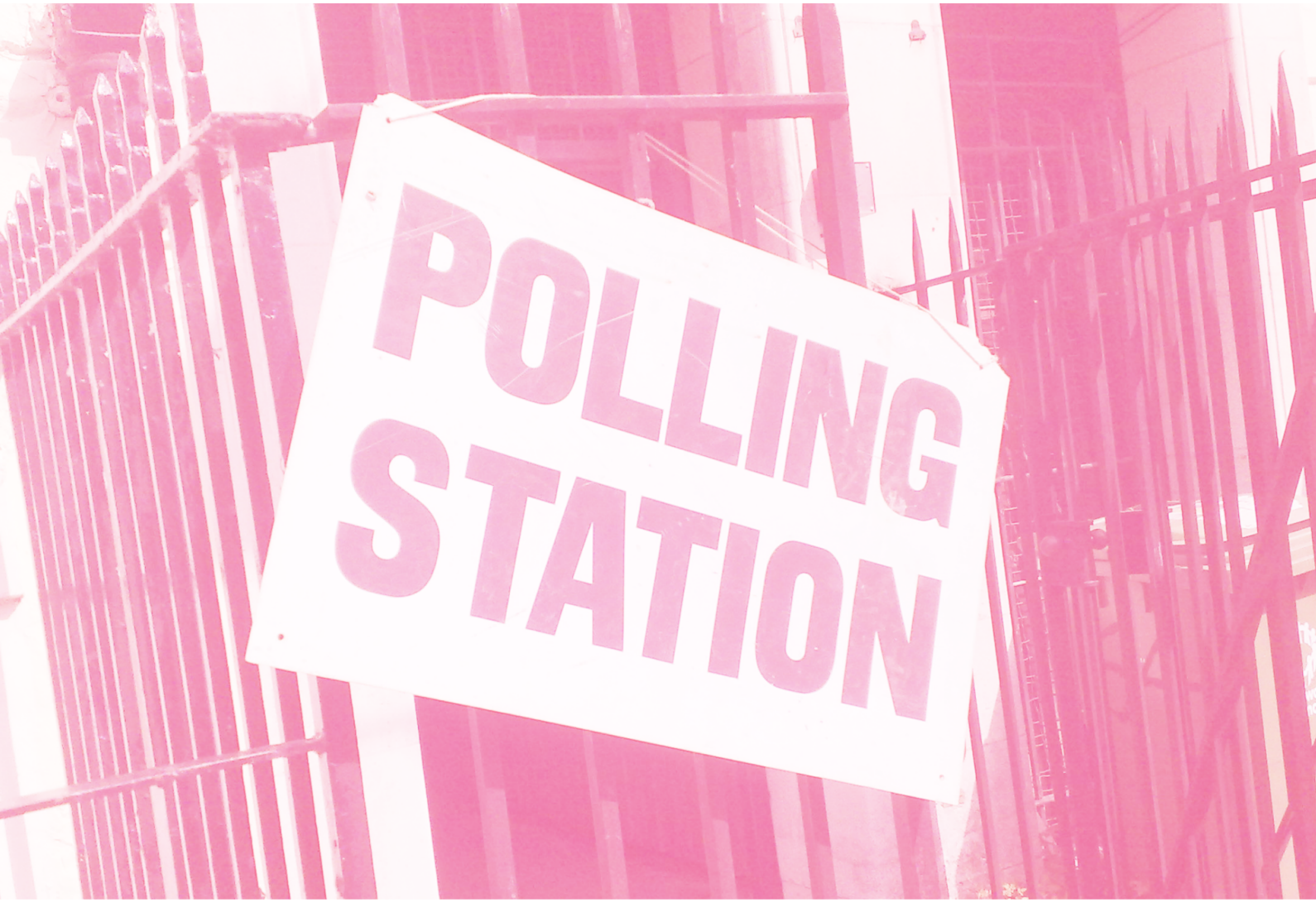
Sound and fury?

The impact of councillors' LTN positions on voting behaviour in Greater London

July 2023



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About the authors

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Executive summary

During the Covid-19 pandemic, Low Traffic Neighbourhoods (LTNs) were introduced in urban areas across the country, most notably in Greater London. Their aims were to reduce through traffic in residential areas, whilst creating a more pleasant environment that encourages an uplift in walking, wheeling and cycling.

LTNs have proved controversial. Despite early evidence of benefits, opposition from some residents led to the early removal of some schemes. In May 2022, an article in the *Independent* estimated that around three in 10 LTNs introduced during the pandemic had been taken out[1]. One motivating factor is likely to have been concerns that controversy about schemes would translate into rejection at the ballot box for councillors.

This report seeks to explore to what extent councillors' concerns about the potential electoral impact of expressing a view on LTNs are supported by evidence. Specifically, we examine the extent to which, across Greater London, the public stance of incumbent councillors impacted on the probability that they would hold their seat at the 2022 local elections. The aim is to understand whether tweeting about LTNs and more precisely taking a positive, negative or neutral stance had any impact on being re-elected. We also consider the effects using a more sophisticated measure of the change in the relative number of votes received between the two elections. These are important questions for the future of active travel schemes, since councillors may be concerned that support for policies such as LTNs might harm them at the ballot box.

The analysis in this report confirms that councillors who tweeted, or those who tweeted regularly about LTNs, were not any more or less likely to hold their seat than councillors who did not tweet about LTNs. While there was no effect of tweeting about LTNs on probability of holding a seat, we did find evidence that tweeting about

[1] Cuff, M. (2022)

LTNs was associated with a more positive change in relative number of votes compared to not tweeting about LTNs. This suggests there were limited negative, and potential positive effects associated with tweeting about LTNs, irrespective of the sentiment. However, caveats must be considered. For instance, councillors who tweeted more frequently about LTNs may be those who already felt confident of being re-elected or of the popularity of LTNs in their area.

In terms of expressing positive or negative sentiments about LTNs on Twitter, this report has highlighted clear party divergence. Despite LTNs being funded by the national Conservative government, incumbent Conservative councillors were generally negative in their public stance on LTNs, whereas Labour councillors were much more positive. At least compared to Conservative councillors, the more positive that Labour councillors were about LTNs, the more positive the change in the relative number of votes they received. In contrast, being more positive (or less negative) about LTNs appeared to have more negative outcomes for Conservative councillors, at least in comparison to their Labour counterparts. For Liberal Democrats and Greens, sample sizes were inevitably too low to find any effects.

Based on these findings, it seems that the likely effects of LTN sentiment on councillors' electoral performances at the 2022 local elections were fairly small. For most councillors across Greater London, it is unlikely that either tweeting about LTNs, or for Labour councillors, tweeting positively about LTNs, was likely to lead to negative consequences at the ballot box in the 2022 local elections. If anything, the evidence here suggests that tweeting positively about LTNs was more likely to have a positive impact for Labour councillors. Of course, we cannot foresee that these findings will be mirrored in future elections, or that there are not local exceptions to the overall rule: each LTN is implemented differently with varying popularity and in areas with their own unique political and environmental contexts.

Introduction

What are LTNs?

Low Traffic Neighbourhoods (LTNs) are transport infrastructure interventions that prevent car drivers using minor streets as short-cuts between main roads. They are area-level interventions recently pioneered in London by Waltham Forest, which in 2015 described its planned 'Village' (LTN) schemes as ideally each covering around 1 km squared[2] (see Figure 1). Bollards, planters and other physical or camera infrastructure (called "modal filters") are typically placed on minor streets throughout the area to prevent motor vehicle traffic passing through, while still enabling people walking, wheeling and cycling to pass (see Figure 2). Motor vehicle access to all homes is retained, albeit routes by car may have to be changed. Many include at least some exemptions to 'virtual' filters, such as school transport, emergency services, and waste removal, potentially Blue Badge holders and in some cases scheduled bus services.

The aims of LTNs include reducing through-traffic in specific areas, reducing car use more widely, creating more pleasant and safer roads for walking, wheeling and cycling, and increasing walking, wheeling and cycling. They might be thought of as offering a 'carrot' - a better environment for walking, wheeling and cycling - alongside a 'stick' - an environment that makes car journeys slightly more difficult.

Research in London suggests that LTNs were associated with positive policy outcomes including lower car ownership[3], reduced traffic volume[4], increased levels of walking, wheeling and cycling[5], lower levels of air

[2] Waltham Forest Council (2015)
[3] Goodman, A., Urban, S. & Aldred, R. (2020)
[4] Yang, X. et al. (2022)
[5] Aldred, R. & Goodman, A. (2021)

pollution[6], reduced street crime[7] and reduced road traffic injuries[8]. Recent London-based research has explored two prominent criticisms of LTNs - that they simply move motor traffic from inside LTNs to boundary roads ("traffic displacement") and that they are disproportionately implemented in richer and/or whiter areas. The studies found on average little change in boundary road motor traffic[9], and that LTNs across London had tended to be placed in more deprived areas[10], although with variation between boroughs or schemes for each outcome.

In 2020-21, with funding from the Department for Transport's Emergency Active Travel Fund[11], over 100 LTNs were installed by councils across the UK. In London, Transport for London decided whether to fund LTNs or not, while the decision on whether and where to implement them sat with the Borough Councils. 80 LTNs were implemented in the capital between March 2020 and May 2022, excluding those removed post-implementation. At the time of the 2022 local elections, several other LTNs[12] in London were in some stage of planning or consultation, but had not yet been implemented.

[6] Yang, X. et al. (2022)
[7] Goodman, A. & Aldred, R. (2021)
[8] Goodman, A. et al. (2021)
[9] Thomas, A. & Aldred, R. (2023)
[10] Aldred, R. et al. (2021)
[11] Jones, T., Cámara-Menoyo C. & Spencer, B. (2021)
[12] We have included in this research 3 LTNs that were being planned (and have subsequently, post 2022 local elections, been implemented) in Haringey, 2 LTNs in Lambeth and 1 in Newham.

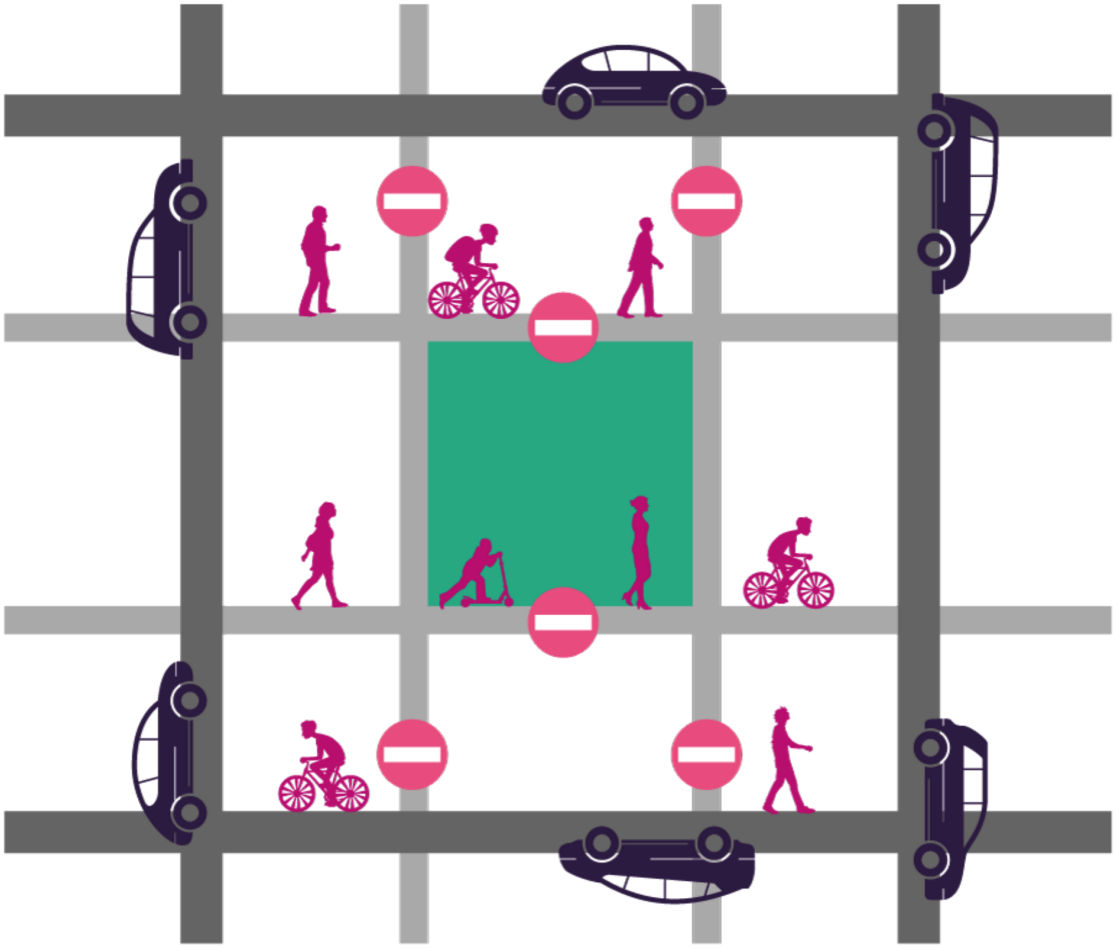

Figure 1. LTNs are normally created by closing residential roads to through motor traffic. Adapted from Healthy Streets Harrow.

Figure 2. A typical modal filter used to stop cars and allow walking, wheeling and cycling (image credit: Crispin Hughes)

Media coverage of LTNs

Despite emerging evidence showing largely positive outcomes associated with LTNs, they have received significant criticism in the media. LTNs received much media coverage in the run up to the 2021 local elections in London, with right-leaning media helping amplify anti-LTN rhetoric[13] and the BBC describing the measures as "more divisive than Brexit"[14]. While there was more positively or neutrally framed coverage of LTNs, such as in The Guardian[15], journalists tended to either focus on the negatives of LTNs or that they were divisive and leading to "culture wars"[16,17] (see Figure 3).

[13] Cooke, P., Sherrington, R. & Herrmann, M. (2021)
[14] Rowlatt, J. (2021)
[15] Voce, A. & Walker, P. (2021)
[16] Glancy, J. (2021)
[17] Stewart, J. (2021)

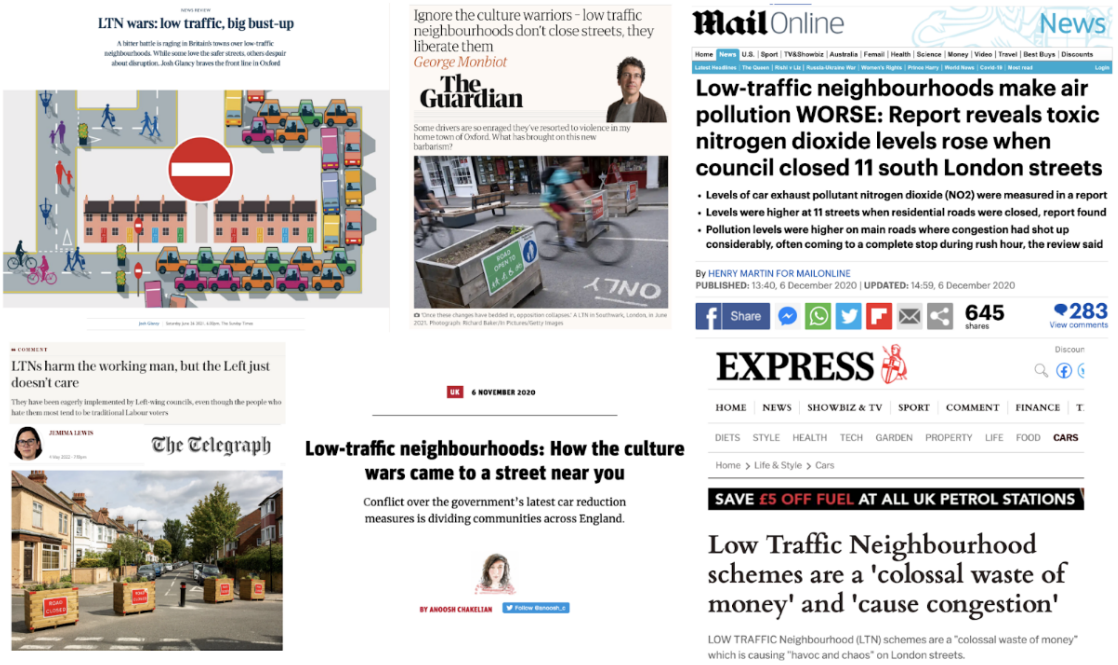

Figure 3. Examples of media coverage of LTNs in UK newspapers

Public opinion towards LTNs

On social media, advocates and opponents to LTNs tend to be vocal and vociferous, giving the impression that public opinion is highly polarised. The run up to the local elections in 2021 and 2022 saw anti-LTN protests across Greater London. More recently, thousands of campaigners marched in Oxford against LTNs[18] and a council meeting in the London borough of Haringey was abandoned after disruption from anti-LTN protesters[19].

Local authority consultations with residents on specific schemes being introduced have tended to produce mixed responses - some more positive, others more negative. However, we know that local authority consultations have tended to have sampling bias. That is, respondents are typically not representative of

[18] BBC News (2023)
[19] Allin, S. (2022)

residents in the local area, often with younger people and non-car owners under-represented. This is likely to distort findings.

By comparison, representative polling has tended to show more public support for, than opposition to, LTNs. National and local polls have pointed to at least a plurality voicing support in principle [20,21,22] (see Figure 6). However, when questions relate to specific LTNs at the local level, the picture is much more opaque. In Hackney, representative polling of residents around existing LTNs in 2021 found an even split in favour of keeping or removing LTNs[23].

Figure 4. Anti-LTN demonstration (image credit: Roger Green // CC BY-SA 4.0)

[20] Logan, T. et al. (2021)
[21] Redfield & Wilton Strategies (2021)
[22] Walker, P. (2020)
[23] Hackney Council (2021)

Figure 5. Vandalism of LTN signage in Croydon, Greater London. (Image credit: London Cycling Campaign)

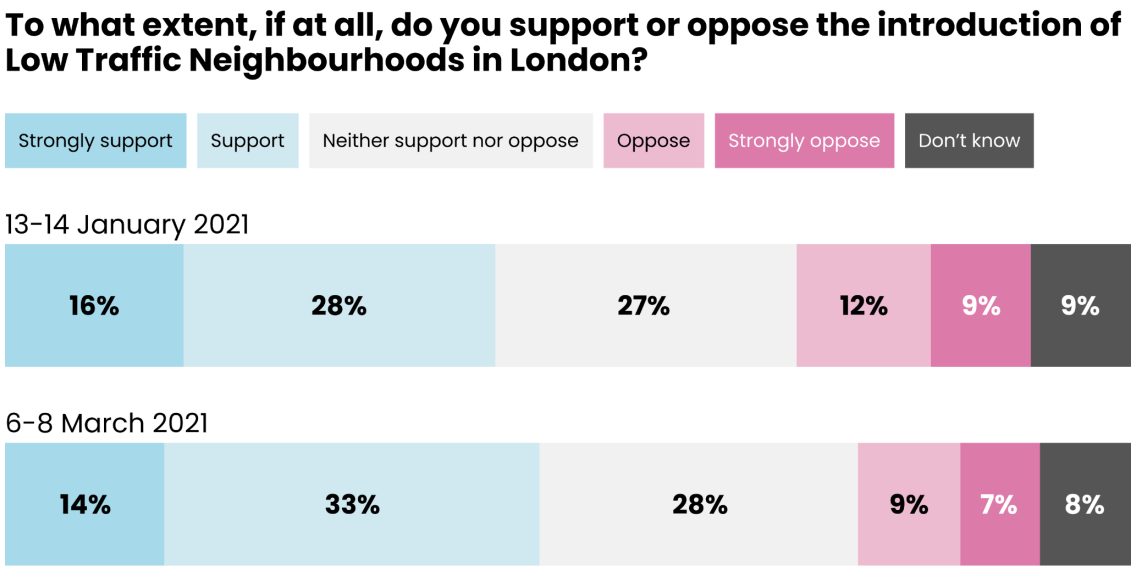

Figure 6. Redfield and Wilton's polling on support for LTNs in London. Data from polls of 1500 eligible voters in London. Note: percentages may not sum to 100% due to rounding. (Source: Redfield & Wilton)

LTNs in the 2022 UK local elections

In the run up to the May 2022 local elections, some journalists suggested that LTNs might decide the outcome.[24,25,26] Candidates in areas where LTNs had been implemented were reported as saying it was "the biggest thing" that came up on the doorstep, with one candidate claiming that "one in five" conversations included LTNs.[22] Many Conservative candidates in particular ran adverts on Facebook declaring that they would support the removal of LTNs if elected[27].

There are three potential hypotheses about how LTNs might have affected electoral results at the 2022 local elections.

Position 1: Supporting LTNs is politically negative. "Being in favour of LTNs will lose a politician/political party votes" and vice versa

[24] Donovan, T. (2022)
[25] Lalic, J. (2022)
[26] Walker, P. (2022)
[27] McIntyre, N. (2022)

Position 2: Supporting LTNs is politically positive. "Being in favour of LTNs will win a politician/political party votes" and vice versa

Position 3: Supporting LTNs is politically neutral. "A politician's/political party's position on LTNs will not significantly impact on votes received"

Post-election commentary

After the elections, commentators gave their verdicts on how they interpreted the results. The Telegraph, which ran anti-LTN stories prior to the election, maintained its stance, claiming that LTNs contributed to the Conservatives winning seats in Harrow, Enfield and Croydon, and contributed to Labour losing in Tower Hamlets.[28] Other commentators argued that LTNs had minimal impact on the election outcome. One article called LTNs "the dog that didn't bark"[29], and another pointed out that anti-LTN candidates "failed to make inroads" at the 2022 elections across the UK.[30]

An article by the Centre for London thinktank proposed that LTNs had little impact on the results either way. Nick Bowes, chief executive of the Centre for London thinktank, said: "On the face of it, campaigners opposed to LTNs and projects that promote walking and cycling didn't seem to have a marked influence on the local election results. In those boroughs which embraced these schemes the most, nearly all the councillors were returned and there were no changes in control. [While] Labour lost in both Tower Hamlets and Croydon, and LTNs proved controversial in parts of both boroughs, there were a range of bigger priorities for voters."[31]

While the Centre for London's commentary was the most detailed, there has so far been no published systematic analysis examining at councillor level impacts of the stance taken by different candidates towards LTNs on their electoral fortunes.

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[28] Penna, D. (2022)
[29] Lydall, R. (2022)
[30] Barradale, G. (2022)
[31] Huseyin, D. (2022)

The aim of this report

This research primarily aims to understand whether social media positions taken by councillors and councils in relation to Low Traffic Neighbourhoods (LTNs) had any impact on voting outcomes in the 2022 London Local Elections. To test this, it performs a sentiment analysis on LTN-related tweets of all incumbent councillors living in councils having or soon to be implementing LTNs. Councillors are given a sentiment score from -1 to 1 that signifies how anti-, neutral or pro- LTN their public Twitter stance was. This sentiment score is then included in a statistical model to test the extent to which, after controlling for demographic, geographical and other political characteristics, having a particular position in relation to LTNs was associated with a) a positive or negative relative change in votes between the 2018 and 2022 Local Elections; and b) the probability of winning the seat again in 2022. These are important questions in the future of active travel schemes, since councillors may be concerned that support for policies such as LTNs might harm them at the ballot box.

Research questions

The two main research questions are as follows:

1) To what extent did incumbent councillors' positive or negative stances on local LTNs affect their likelihood of retaining their seat between the 2018 and 2022 local elections in London?

2) To what extent did incumbent councillors' positive or negative stances on local LTNs affect their relative number of votes[32] between the 2018 and 2022 local elections in London?

Finally, the report considers whether there were political consequences associated with the frequency of tweets about LTNs. Amongst councillors that tweeted about

[32] As is explained in more detail in the methodology section, the relative number of votes refers to the percentage difference between the number of votes a councillor received and the mean number of votes per councillor in their ward at that election.

LTNs at all, it is important to understand whether tweeting more often was associated with a more successful electoral outcome than tweeting less often. More specifically, the report asks:

3) Was there a relationship between the number of LTN-related tweets by a councillor and the change in their relative electoral performance?

Methodology

To answer the research questions, the methodological approach is separated into several key stages:

1) Determining an appropriate measure of councillor vote changes between elections
2) Identifying and accounting for ward boundary changes
3) Identifying incumbent councillors in local authority areas with LTNs
4) Analysing the sentiment of councillors' LTN tweets
5) Predicting the effects of tweeting and LTN sentiment on seat results and vote changes

The final section of the methodology considers some of the key caveats and limitations of this research.

Measuring councillor vote changes

Election results, including the candidates' names, the ward name and the number of votes they received, were acquired for 2018 and 2022[33] for each ward in Greater London. In order to study the impact of the change in vote shares between two elections, the analysis is restricted to incumbent councillors only – that is, those councillors who were elected in the 2018 local elections and stood for re-election in the local elections in 2022 in the same ward.

[33] 2018 and 2022 local election data comes from Democracy Club, 2023

Outcome variables: winning a seat and change in relative votes

One part of the analysis that follows will identify the relationship between LTN sentiment and whether or not the candidate was re-elected in 2022. The second, more sophisticated measure, entails the calculation, for each incumbent in both 2018 and 2022, of the percentage difference between the number of votes they received and the mean (average) number of votes per candidate in their ward. This is to provide comparability in vote share measurement, as vote share is in part a product of the number of seats and number of candidates standing in a particular ward, which can change significantly between elections[34]. A positive value indicates that the incumbent received more votes than the mean; a negative value indicates that the incumbent received fewer votes than the mean.

The following analysis studies the change in the relative votes for councillors between the 2018 and 2022 local elections. A positive change in relative votes indicates that, the difference between their received votes and the mean vote per ward candidate increased; a negative change in relative votes being the opposite. The percentage difference between councillor A's votes and the mean number of votes per candidate (B) is calculated as follows:

$$\%\, difference \;=\; 100 \;*\; \frac{|A-B|}{(A+B)/2}$$

For example, councillor A received 500 votes in 2018. In councillor A's ward, the mean votes per candidate was 300. In 2018, the % difference for councillor A would be as follows:

[34] We do accept that this is just one way of measuring change in support for individual councillors. Most political science studies do not include councillor-level measures of change due to the complex nature of comparing across elections with different numbers of candidates, ward boundaries, seats for election and so on. One risk is that where more candidates stand, the mean number of votes per candidate is likely to decrease. If a councillor had the same number of votes across two elections, but the mean fell because of an increase in candidates standing, it naturally appears as if their relative support has increased. To deal with this issue, in the statistical models outlined in the 'Predicting the effects of LTN sentiment' section of this methodology, the change in number of candidates standing between the two elections is always included as a control variable.

$$\%\ difference\ =\ 100\ *\frac{500-300}{(500+300)/2}\ =\ 50$$

Let's now assume that councillor A received 700 votes in 2022 and the mean votes per candidate was, again, 300. In 2022, the % difference for councillor A would be as follows:

$$\%\ difference\ =\ 100\ *\frac{700-300}{(700+300)/2}\ =\ 72.73$$

In 2018, councillor A's relative votes was 50 and in 2022 it was 72.73. Between 2018 and 2022, the change in relative votes is calculated as the 2022 relative votes minus the 2018 relative votes. In this case, 72.73 minus 50 equals 22.73. For councillor A, there was a 22.73 increase in the relative number of votes[35] received between 2018 and 2022.

It is worth noting that values can be greater than 100. For example, let's assume that a candidate was extremely popular in 2018 and then very much the opposite in 2022. They received 2000 votes in 2018 compared to a mean of 500, which is a percentage difference of 120. In 2022, they received 500 votes compared to a mean of 500, which is a percentage difference of 0. In this case, the change in their relative votes is -120.

Identifying and accounting for boundary changes

Of the 631 councillors included in this study, 391 had significant boundary changes[36] to their ward between the 2018 and 2022 local elections. For these candidates, the analysis cannot simply compare their 2018 votes with their 2022 votes as the demographic composition of their area is likely to have changed, potentially significantly. The difference in their relative votes could

[35] The term 'change in relative number of votes' or 'change in relative votes' is used throughout the report, mostly because it is more concise than writing 'change in the percentage difference to the mean number of votes'.

[36] To determine what was a 'significant' boundary change, we intersected the 2022 ward boundaries with the corresponding 2018 boundaries of the same name. We calculated the proportion of the total area of the 2022 boundaries that intersected with the 2018 boundaries. We then repeated the process in reverse. A ward was considered to have significant boundary changes when the total intersected area, in either case, was below 90%.

be the result of the changes to the boundaries and the subsequent more or less favourable demographics. For example, a councillor could have seen an increase or decrease in their vote that would not have occurred had the ward boundaries remained the same.

For these councillors with ward boundary changes, regression modelling[37] has been used to predict their relative votes (i.e. the percentage difference between their votes and the mean vote per candidate in their ward) at the 2018 local elections, on the boundaries used in the 2022 local elections. The first step of this is to create a model that predicts, based on political and demographic information[38], the relative vote scores for all candidates at the 2018 local elections. This model is then used to estimate the expected value for councillors whose ward boundaries had changed in 2022. It therefore predicts their relative votes as if the 2018 local election had been fought on the same boundaries as the 2022 local election. The predicted 2018 relative votes (at 2022 boundaries) are used in place of their actual 2018 relative votes. That means for these councillors, the analysis can compare their relative votes in 2022 with their predicted relative votes in 2018, assuming that the 2022 local election boundaries were used in both elections.

The accuracy of the 2018 regression model was tested on the actual 2018 results, to ensure that, for candidates in this election, the model was estimating their results sufficiently well. There was a high level of accuracy for the models estimating results for Labour and the Conservatives. The R-squared value, which measures the proportion of the variance in the 2018 relative votes explained by the model is 0.79 for Labour councillors and 0.77 for the Conservative councillors. In other words,

[37] The model was created based on data from all 2018 candidates. It used 2021 ward-level socio-demographic census data (unemployment rate, ratio of older to younger adults, degree-level qualifications, ethnic makeup, population density, inner or outer London) combined with 2014 and 2010 election results to estimate, for every 2018 candidate, their relative votes. Once the model accuracy was sufficiently high, it was then used to predict the notional 2018 relative votes for councillors assuming the election had been fought at their 2022 ward boundaries.
[38] Sociodemographic data comes from the 2021 census and political data from Democracy Club.

79% of the variance in the relative Labour votes and 77% of the variance in the relative Conservative votes are explained by this model.

In the end, for each councillor, there are two clear outcome variables on which to conduct analysis:

1) Whether they won their seat again at the 2022 local elections.

2) The change in their relative number of votes between the 2018 and 2022 local elections. For councillors with substantial boundary changes, the 2018 relative votes value is predicted rather than observed.

Identifying incumbent councillors in relation to LTNs

A dataset[39] of LTNs implemented since March 2020 and forthcoming LTNs has been used to identify incumbent councillors in London boroughs in which either:

1) an LTN had been implemented since March 2020 and had not subsequently been removed.

2) an LTN was planned to be implemented[40] following the 2022 local elections. Some of these LTNs have subsequently been implemented and others are still in various stages of planning and consultation.

[39] Data on LTN implementations, locations and extents has been compiled and regularly updated by a team of researchers in the Active Travel Academy at Westminster University.

[40] It is much more difficult for us to keep track of planned LTNs across every borough in Greater London. Therefore, it is quite likely that some LTNs have been missed. In many cases, planned LTNs are in the same boroughs as existing LTNs, so any missed LTNs would not affect the inclusion or exclusion of a councillor from the analysis.

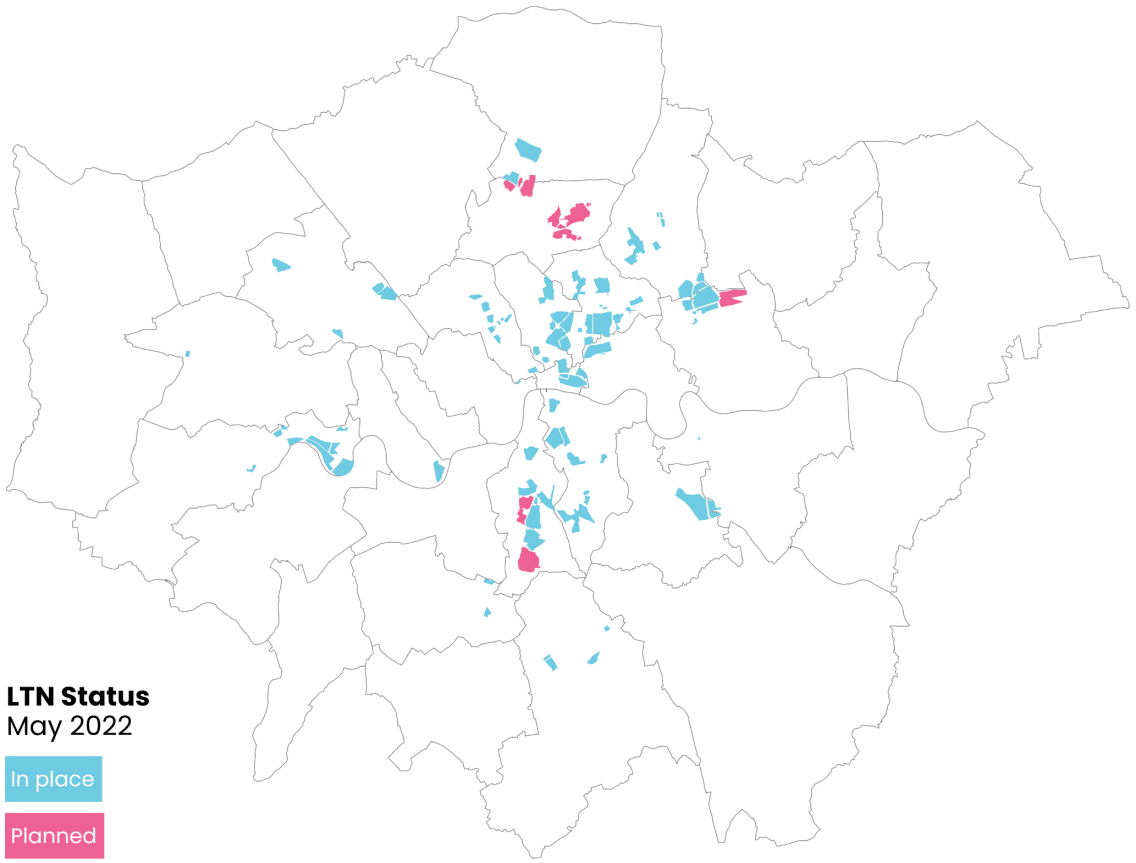

Figure 7. A map of existing and planned LTNs at the time of the May 2022 local elections

Incumbent councillors are only included in the study if they meet these criteria. This ensures that this report examines only the stances of councillors in areas where LTNs were likely to play some role in the local elections, either because they had recently been, or were soon to be, implemented. Councillors in a local authority without any existing LTNs or planned LTN are not included in this analysis. The focus is also only on incumbent councillors, as this allows us to measure vote share change between 2018 and 2022. Other 2022 candidates, even if they won the seat, are likely not to have stood for election in 2018 making analysing change across the two elections impossible.

Based on these criteria, councillors from 18 of the 32 local authority boroughs in Greater London were included in this research. Figure 8 shows the boroughs included in the study. Perhaps unsurprisingly, there are generally fewer councils included in outer London. Every

one of the 18 boroughs was run by the Labour Party at the time of the 2022 local elections. Apart from Tower Hamlets (which the local Aspire Party gained control of in 2022) and Croydon (which changed to No Overall Control), all of the other 18 continue with a Labour majority since the 2022 local elections.

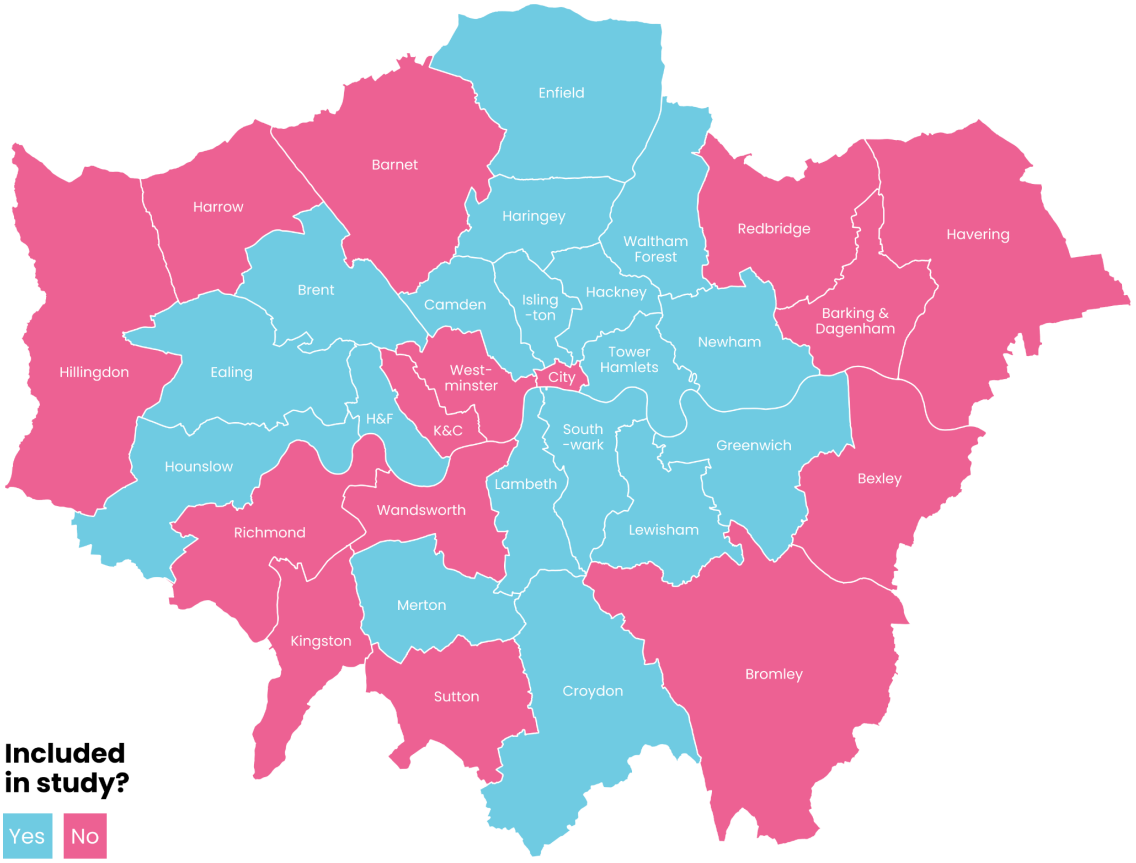

Figure 8. A map showing the local authorities that are included and excluded from this study

Analysing the sentiment of councillors' tweets

Once the election data was obtained for incumbent councillors in local authorities where LTNs were likely on the political agenda, the next task was to conduct a sentiment analysis to identify the positivity or negativity of attitudes towards LTNs as expressed in councillors' tweets. This process had several stages:

1) Identifying councillor' Twitter accounts

2) Identifying councillors' tweets related to LTNs
3) Conducting a sentiment analysis to determine the positivity/negativity expresses in each LTN tweet
4) Generating an overall LTN sentiment score for each councillor based on all of their tweets about LTNs

Identifying councillors' Twitter accounts

For all 631 incumbent councillors, a systematic method utilising consistent search terms[41] was used to identify each councillor's associated Twitter account(s). Both 'professional' Twitter accounts that were clearly linked to the individual's role as a councillor and 'personal' Twitter accounts that did not mention their role as councillor were recorded. All accounts were reviewed to ensure that they were active, accurately identified and were clearly associated with the councillor. Twitter accounts were also verified through search engines, Twitter search and through public information available on council webpages. In the sentiment analysis that follows, tweets are analysed from both professional and personal accounts, as the distinction was often rather blurred.

Of the 631 incumbent councillors who are included in this study, 471 (74.6%) had at least one active Twitter account. We could not identify accounts for 160 councillors[42]. Table 1 presents the number of Twitter accounts (as of December 2022-January 2023), broken down by political party, excluding Independents and Independent groups. A similar proportion of Labour (74.2%) and Conservative (73%) councillors had an active Twitter account.

[41] This was a combination of their full name, political party, local authority name and Twitter account.
[42] Note that it is possible that some councillors will have had a Twitter account prior to the May 2022 local elections and have subsequently closed/deleted the account.

Table 1. The number of active Twitter accounts of incumbent councillors in this study broken down by political party

Party	Number of incumbents included in study	Number with Twitter accounts	Percent of councillors of that party
Conservative	89	65	73
Green	6	4	66.7
Labour	507	376	74.2
Liberal Democrats	28	25	89.3
Total[43]	**631**	**471**	**74.6**

Figure 9 shows the number of councillors (with Twitter accounts) included in the study broken down by each Local Authority borough. The boroughs with the largest number of councillors included were Southwark (34), Lambeth (33) and Ealing (32).

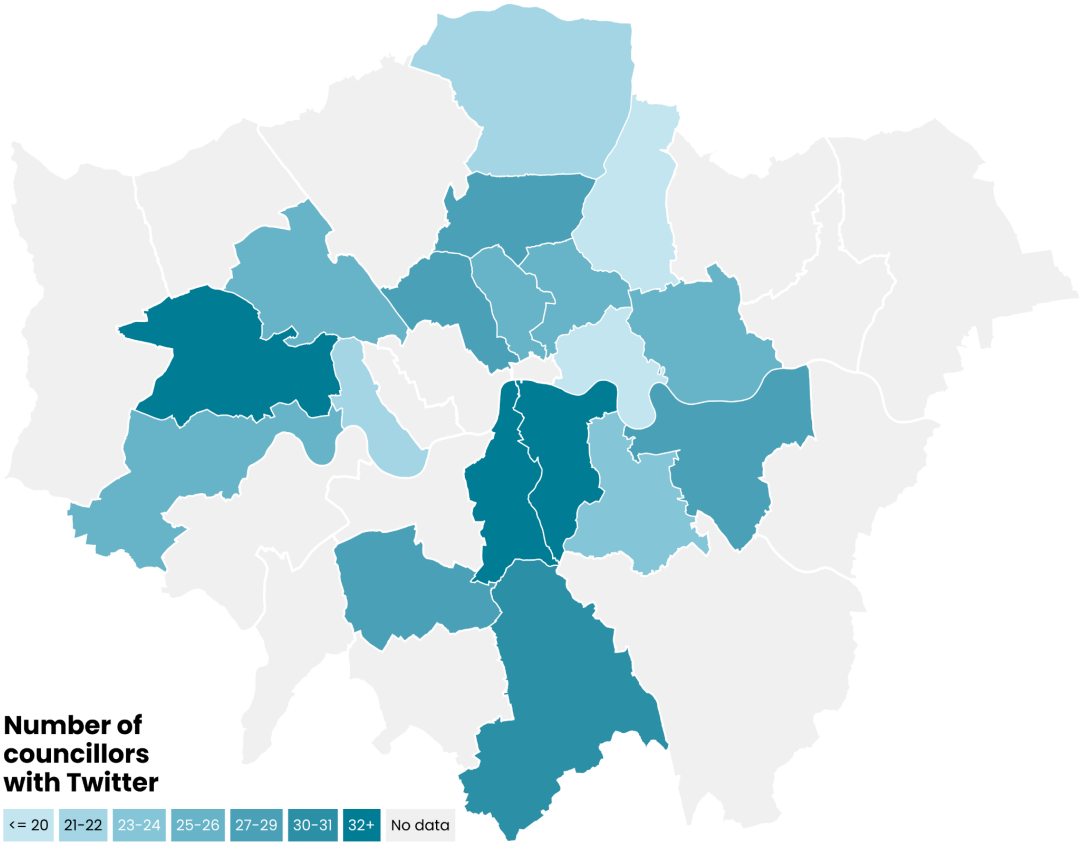

Figure 9. A map showing the number of incumbent councillors with Twitter accounts in each local authority area included in this study

[43] Includes independent councillors.

Identifying tweets related to LTNs

For each of the councillor twitter handles, public tweets were programmatically retrieved using Twitter's V2 API service[44]. Access to the service was authorised with academic research credentials. Using the API, large amounts of pre-filtered tweets can be downloaded subject to rate limits and limitations to protect privacy of users. Academic level access, which allows full archive search of public tweets and increased data downloads, is granted only to individuals affiliated with an academic institution. To use this service, Twitter must be satisfied that the data is used for the sole purpose of research.[45] Ethics approval for this data collection was obtained from the University of Westminster Ethics Committee in November 2022.

All tweets[46] were downloaded in raw text format for each identified Twitter account for the period from 1st January 2020 to 5th May 2022. This covers the period in which most recent LTNs have been implemented across Greater London, up to the date of the 2022 local elections. Tweets on the topic of LTNs were identified using a set of keywords. This set of keywords included the most common scheme identification names of 'LTN' and 'low traffic neighbourhood' as well as less common forms: 'healthy street', 'liveable neighbourhood', 'healthy neighbourhood', 'people friendly street' and their plural versions. The keyword search was run on hashtags and the general text in each tweet (excluding urls and handles). If a keyword match was found, then the tweet

[44] Twitter API
[45] As of 29/04/2023 some V2 Twitter API services, including the academic research plan, were deprecated and replaced with new access plans.
[46] Note that retweets and replies are not included: due to data and context limitations it was deemed unfeasible to classify councillors' twitter replies and retweets reliably and accurately. The data downloaded from the twitter API service is delivered from the back-end of the Twitter website in a raw text format. This means crucial contextual information such as tweet threads and other users' original retweeted tweets are not returned from the service. A manual attempt was made to classify this data. However, in most cases, there simply was not enough information in the text of the reply/retweet to determine whether it was positive, negative or neutral. It would have required opening and analysing the original tweet to determine the sentiment of the replies and retweets, which it was determined would be too time-consuming.

record was added to the final dataset. Only standalone tweets were included in the analysis. Retweets and replies were not included as part of the final dataset. Only public accounts were queried and only public tweets were collected. The Twitter data collection API service was limited to the public data that Twitter had made available for academic research. At no point was access to private Twitter information (such as private messages or user activity) possible.

Conducting a sentiment analysis on each LTN tweet

Once the text was obtained for each LTN tweet, the next task was to determine whether the tweet expressed a positive, negative or neutral sentiment towards LTNs or a particular LTN. Due to the large number of tweets, manual classification was considered too labour intensive. Instead, a methodological approach referred to as sentiment analysis was employed. Sentiment analysis is a well-established research area where methods aim to categorise positive/negative polarity of opinions, emotions, and views in a text[47]. In addition to sentiment, often the views or stance towards certain topics can be investigated using the same text mining and classification methods.

Here an important distinction between sentiment and stance is made. The positive and negative tone of an opinion (i.e. the sentiment) does not always reliability indicate the underlying attitude towards an entity (i.e. the stance)[48]. People may use very positive language to describe how much they are against a topic. Investigating attitudes towards topics is a similar area in text mining called stance detection. Stance detection is a rapidly growing area related to sentiment analysis and is interested in how a speaker/writer aligns their views for or against a given topic or argument[49].

In this research, it was important to develop a methodology that could account for this distinction between sentiment and stance. For this reason, a

[47] Liu, B. (2012) *Sentiment Analysis and Opinion Mining*. Morgan & Claypool: Chicago
[48] Mohammad, S.M., Sobhani, P. & Kiritchenko, S. (2017)
[49] ALDayel, A. & Magdy, W. (2021)

supervised learning approach[50], a Naïve Bayes classifier, was employed. This classifier is a simple, intuitive and understandable machine learning algorithm in text mining and has been utilised recently with good accuracy for both sentiment analysis and stance detection purposes[51]. The Naïve Bayes classifier uses statistical assumptions to 'predict' the probability that any given piece of information/text belongs to a predefined set of categories.

The Naïve Bayes classifier was designed to be used on tweets to predict sentiment towards LTNs. For every analysed tweet, the classifier outputs a positive, negative, or neutral sentiment category label and corresponding probability calculations for each of the three categories. That is, for each tweet we obtain the following:

1) A classification as positive, negative, or neutral in sentiment towards LTNs.
2) The probability that the tweet is positive, negative, or neutral in sentiment towards LTNs.

The sentiment classifier model was trained with a random sample of tweets which were manually coded according to the observed positive, negative, or neutral sentiment expressed towards an LTN (or LTNs). Using the training data, the model calculated the probabilistic relationship between the information in the tweet and the outcome sentiment. The model was then applied to the entire tweet dataset. Sentiment probabilities were calculated for each tweet and the resulting category with the largest probability was selected as the final sentiment of the tweet.

A key benefit of this approach is that the constructed model looked at a range of features of each tweet to determine the sentiment category. To predict a category, the model included information on:

[50] The supervised learning approach was taken after an initial pilot analysis showed that an unsupervised (dictionary/rule-based) sentiment analysis method was not fit for purpose with a high proportion of tweets being misclassified.
[51] Mourad, S.S. et al. (2018); Fitri, V.A., Andreswari, R. & Hasibuan, M.A. (2019); Pang, B., Lee, L. & Vaithyanathan, S. (2002); Jurafsky, D. & Martin, J.H. (2023)

- **The text** in the tweet, including words, hashtags and mentions.
- The **emotional tone** of the tweet[52]
- **Additional context features** including the borough, political party of the councillor and whether that party was in power in the borough.

The overall accuracy score of the model was 82%. This means when tested against the training data (in which we have manually assigned categories), it assigned the correct sentiment category to 82% of tweets. This was almost exactly in-line with the agreement between two manual coders on a sample of the data, implying that the model is as accurate as a human being with significant knowledge of LTNs and British politics.

Generating an overall sentiment score for each councillor

The final step in determining each councillors' public sentiment towards LTNs was to aggregate the positive, negative and neutral sentiment probabilities of each councillor's tweets into composite scores. There are two scores – the first based on the counts of positive, negative and neutral tweets and the second based on the probabilities of each type. The scores range from -1 (most negative) to +1 (most positive) with 0 being neutral. The scores are hereafter referred to as 'LTN sentiment scores'.

Predicting the effects of LTN sentiment on seat results and vote changes

Once each councillor was given a sentiment score based on their tweets about LTNs, the analysis explores the distribution of councillors who have tweeted about LTNs across Greater London's local authorities and political parties. This is followed by an examination of the distribution of LTN sentiment to show whether

[52] The emotional tone feature was designed to identify words which indicated the presence of several emotion types, such as surprise, fear, joy etc. The emotion types and process of identification were based on an existing emotion lexicon in wide usage (see Mohammad, S. & Turney, P. (2010); Mohammad, S. & Turney, P. (2013); Vishnubhotla, K. & Mohammad, S.M. (2022)).

councillors of parties or local authorities were more likely to tweet positively, negatively, or neutrally about LTNs. The analysis continues to explore the distribution of two different dependent variables: 1) seat retention at the 2022 local election; and 2) changes in the relative number of votes received. The aim of this section is to give the reader a comprehensive understanding of where the councillors included in this study are located, which parties they stand for, how their LTN sentiment varies and how votes changed between the two elections.

After this summary, the analysis is primarily focused on understanding the effects of a) tweeting about LTNs; b) tweeting positively, negatively, or neutrally about LTNs on the probability of a councillor holding a seat and the changes in the relative number of votes received. Initially, this is explored through descriptive analysis, providing an overview of some of the key patterns of interest in the data. Statistical modelling is then used to test whether any relationships are statistically significant once political and demographic characteristics are also accounted for:

1) To predict the probability of councillors holding a seat, logistic regression models are created with a binomial outcome variable (1 = Yes, 0 = No). One model includes a binary explanatory variable to indicate whether the councillor had tweeted about LTNs or not. An additional model includes the LTN sentiment score of the councillor as an explanatory variable.

2) To predict the change in relative number of votes received between the 2018 and 2022 local elections, linear regression models are created with the change value as a continuous outcome variable. As above, there are two separate models to test the association of tweeting versus not tweeting and of LTN sentiment score with the change in relative number of votes.

In both sets of models, other explanatory variables are included. While there is little interest in interpreting the relationship between additional variables and the

outcomes, they are included to ensure that the influence of confounding factors is limited. This ensures that a correlational relationship can be established between our explanatory variables of interest (tweeting at all, LTN sentiment) and the outcome variables (holding a seat, change in relative number of votes).

Although the exact specification of the models varies depending on measures of model performance, additional variables can be separated into political and demographic characteristics.

Political characteristics: political party of candidate, change in the number of candidates standing in the ward, the political party in control of the council in 2018, the share of the vote of the councillor's party in the local authority in 2018, whether there was a ward boundary change between 2018 and 2022.

Demographic characteristics (proportions unless specified): White population, degree-level qualifications, household car ownership, ratio of older to younger people, households deprived on 3 or 4 dimensions, population density.

In many cases, an interaction effect between political party and LTN sentiment (or tweeting or not) has been added to the statistical models. This is to test the extent to which the relationship between LTN sentiment (or tweeting or not) and the outcome (probability of holding the seat, change in relative number of votes) varies depending on the political party of the candidate.

Caveats and limitations of the study

The findings in this report must be treated with caution. Firstly, the conclusions are based only on the LTN sentiments of incumbent councillors – that is, councillors who were elected in 2018 and then stood again in the same ward in 2022. There may be significant differences in the effects of taking a stance for new candidates or for opposition candidates. These were excluded from any analysis because it would not allow for a comparison with 2018 votes.

Secondly, the analysis here is focused only on Twitter as a channel of communication for councillors as it is relatively straightforward to identify councillors' accounts that are also publicly accessible. The stance of a councillor on Twitter is considered a proxy for their public stance more generally. While Twitter may not be the path through which councillors might have the most impact on voting behaviour of residents, it is at least likely to be representative of the opinions that many councillors convey to residents on LTNs through other means. Of course, the research, and indeed sample size, is limited by only including councillors who are active on Twitter. A future extension of this analysis would be to supplement Twitter data with data from other contexts.

Thirdly, this analysis is focused solely on Greater London and the time period between 2018 and 2022. London was chosen because many LTNs have been implemented in the city. But we note that London is in some ways very different to other parts of the UK: it generally has better public transport, a higher population density and lower car ownership than many other areas. Politically, there are also many more Labour councillors than those of any other party. For these reasons, we make no suggestions that these findings would be replicated in other areas of the UK nor at other elections.

Fourthly, due to the political makeup of Greater London and the councils that have implemented LTNs, there are a much higher number of Labour councillors included in this research than those standing for any other party. The findings here may not be replicable across cities and towns with a much less Labour-dominated political context. In addition, while it is important to remember when making conclusions about incumbent councillors generally that the majority are Labour councillors, great care has been taken throughout this analysis to test whether there are different relationships between LTN sentiment and changes in electoral outcomes for councillors of different political parties. Few conclusions can be made about incumbents for smaller parties, such as the Green Party or various independent groups.

Analysis

Councillors and tweets about LTNs

Most councillors with an active Twitter account in boroughs where one or more LTNs had been implemented or were planned had not actually tweeted about LTNs at all. Of the 631 councillors, 134 had tweeted about LTNs – just under 21%. This is clear evidence that most incumbents refrained from referring to LTNs on Twitter. The mean number of Tweets per councillor was 2, with the median of 0 reflecting the fact that the majority had not tweeted about LTNs at all. Amongst councillors who had tweeted at least once, the mean number of tweets was 9.3 and the median number of tweets was 3. While half of councillors tweeted 3 times or less, a small number of councillors tweeted about LTNs much more frequently. 31 councillors tweeted 10 times or more about LTNs and one councillor tweeted 135 times on the subject.

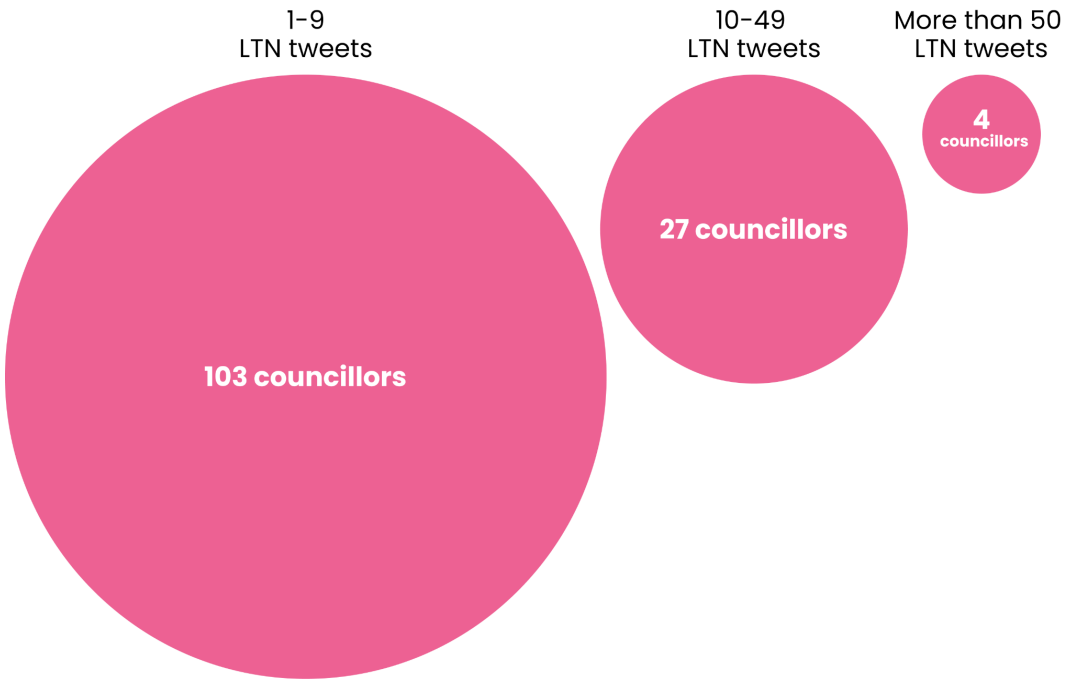

Figure 10. The distribution of councillors in this study by the number of tweets about LTNs

Table 2 presents a summary of the number and percent of incumbent councillors who had tweeted about LTNs, broken down by their political party. While a higher total number of Labour councillors (507) tweeted about LTNs, this reflects the over-representation of Labour councillors in the sample. In fact, a lower percentage (18.5%) of Labour councillors had tweeted about LTNs than either their Conservative (31.5%) or Liberal Democrat counterparts (35.7%). This may reflect a cautiousness amongst incumbent Labour councillors given that most LTNs have been implemented by Labour councils. In fact, once LTNs that had been removed were omitted from this study, every council that had implemented LTNs that were still in place in May 2022 was Labour-controlled, with the exception of Merton, where the Liberal Democrats were in power.

Table 2. A summary of the number of councillors who tweeted about LTNs by political party

Party[53]	No. Councillors with Twitter accounts	No. who tweeted about LTNs	Percent
Conservative	89	28	31.5
Green	6	2	33.3
Labour	507	94	18.5
Liberal Democrats	28	10	35.7

Table 3 presents a full summary of the breakdown of councillor information by council area. It shows, for each council area, how many LTNs there were (including those planned), the number of incumbent councillors, how many incumbents won in 2022, how many have active Twitter accounts and how many tweeted about LTNs. It also presents the total number of LTN-related tweets recorded by incumbent councillors in each council area across the time period.

[53] Due to very small counts, information about councillors standing as Independents or as part of an independent group from analysis aggregated to political parties. This is the case throughout the whole report.

There is significant geographical spread in the numbers and proportions of councillors who had tweeted at all about LTNs. In Hammersmith and Fulham, where the South Fulham Clean Air Neighbourhood project was implemented in July 2020, only 1 councillor had tweeted about the scheme. In other areas, the proportions are much higher - in Islington for instance, where 7 LTNs had been implemented, 56% of incumbent councillors had tweeted about LTNs.

The geographical spread of tweets about LTNs across Greater London was also particularly uneven. In Lambeth, there were a total of 400 tweets, although it is worth noting that 135 of these came from one councillor. Enfield also had a high concentration, with 152 tweets. Other local authorities with high numbers include Islington (133 tweets), Ealing (114 tweets) and Newham (89 tweets). In contrast, in Hammersmith and Fulham and Sutton, there were fewer than 10 LTN tweets respectively – both with a mean average of under 1 tweet per councillor[54].

Table 3. The breakdown of LTN tweets and other related variables by London local authority

Council	Number of LTNs	Total councillors (2018)	Incumbent councillors in 2022	Incumbent winners	With Twitter accounts	Have tweeted about LTNs	Percent tweeted about LTNs	No. of tweets
Brent	4	60	33	29	26	7	26.9	20
Camden	9	54	31	29	28	4	14.3	15
Croydon	2	70	33	33	30	13	43.3	38
Ealing	2	69	43	42	32	11	34.4	114
Enfield	2	63	35	29	21	8	38.1	152
Greenwich	1	51	31	26	29	8	27.6	38
Hackney	13	57	35	33	26	8	30.8	43
Hammer-smith and Fulham	1	46	31	25	21	1	4.8	2
Haringey	3	57	39	34	28	7	25	55
Hounslow	6	60	39	36	26	7	26.9	34
Islington	7	48	33	32	25	14	56	133

[54] It is worth noting that this may not reflect the 'true' level of tweeting around LTNs in these particular boroughs. This study only analyses the tweets of incumbent councillors. There may be new councillors and other candidates who tweet about LTNs but have been excluded from this study as we could not compare the change in their votes across the two elections.

Lambeth	7	63	36	31	33	13	39.4	400
Lewisham	1	54	29	29	24	5	20.8	30
Merton	2	60	42	27	27	4	14.8	11
Newham	4	60	38	37	25	6	24	89
Southwark	6	60	40	38	34	8	23.5	38
Tower Hamlets	2	45	24	13	17	8	47.1	21
Waltham Forest	5	60	39	38	19	2	10.5	14

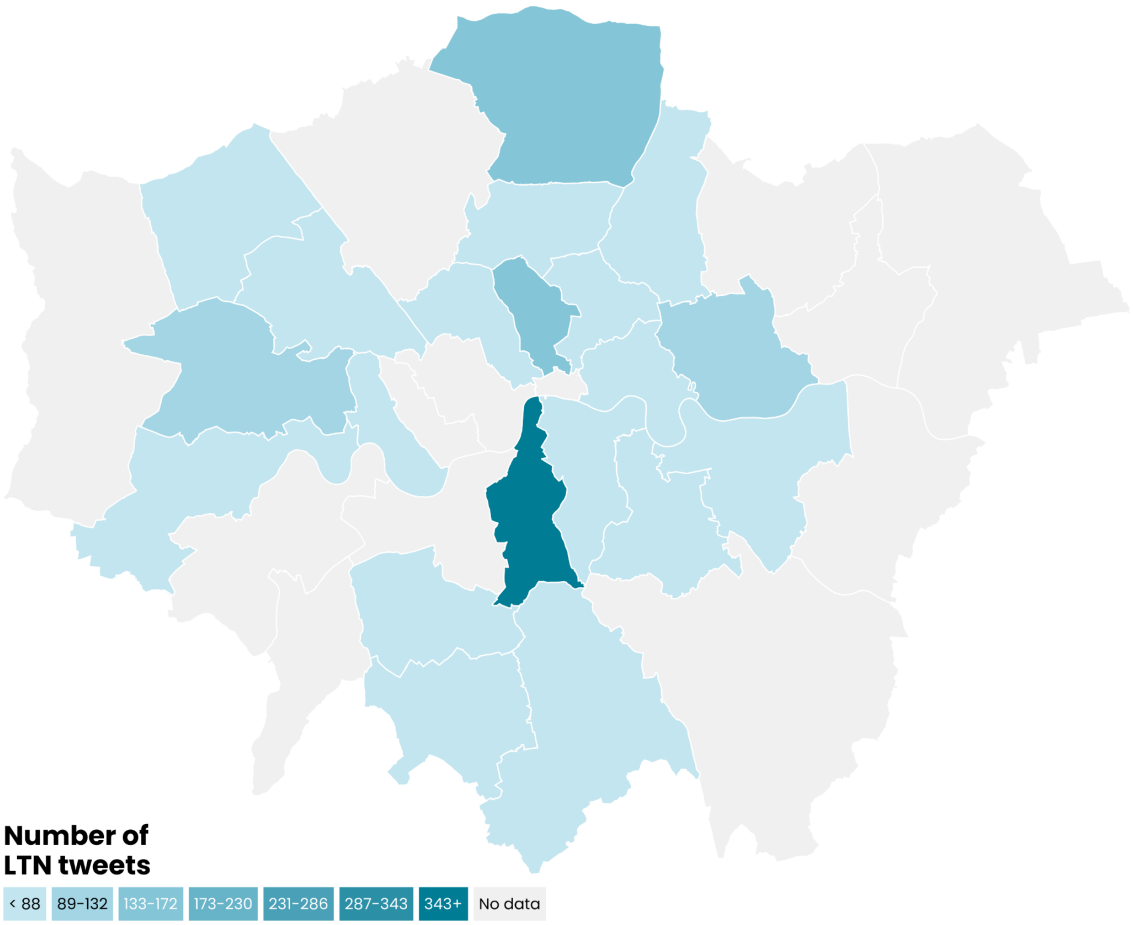

Figure 11. A map to show number of LTN tweets by councillors across Greater London local authorities

Councillors and LTN sentiment scores

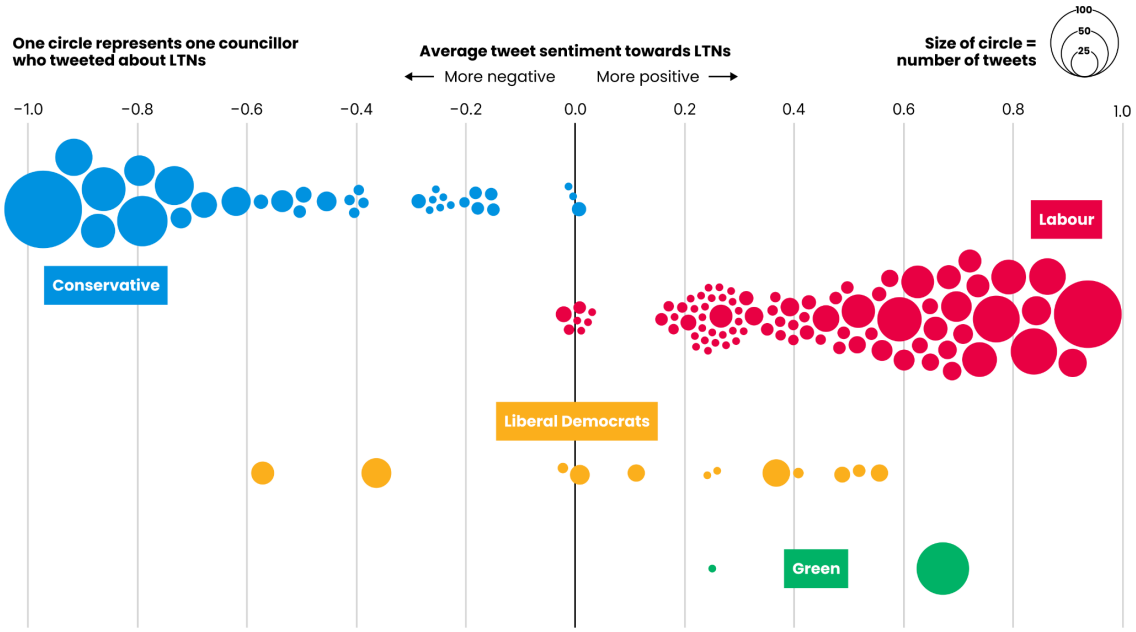

Figure 12. The distribution of councillors' LTN sentiment scores by political party

Figure 12 shows the distribution of councillors' LTN sentiment scores (ranging from -1 being most negative to +1 being most positive), broken down by political party. It shows clear evidence that, despite LTNs being funded under a Conservative government (e.g. via the Emergency Active Travel Fund), the majority of Conservative councillors who have tweeted about LTNs have a negative LTN sentiment score. In fact, of 406 LTN tweets by Conservative councillors, 357 have been identified as negative – some 87.9% (see Table 5). There were no positive tweets about LTNs attributed to incumbent Conservative councillors. The median LTN sentiment scores for Conservative councillors is also negative, at -0.42. This is evidence of the negative stances of Conservative incumbent councillors in Greater London (at least those who tweet about LTNs) towards LTNs.

Perhaps unsurprisingly, given that LTNs have been predominantly implemented by Labour-run councils,

Labour councillors have generally more positive stances towards LTNs. Figure 12 shows that most Labour councillors have an LTN stance score of above zero, indicating a positive stance. The median score for Labour councillors who have tweeted is 0.29 and 25% of Labour councillor tweets are above 0.57. Of 679 tweets by Labour councillors, 81.8% have been coded as positive towards LTNs and 18.1% have been coded as neutral.

The fact that there are no positive Conservative or negative Labour tweets about LTNs shows that there is clear political divergence on the LTN issue, at least in public. This may reflect the fact that no Conservative councils had implemented LTNs, so the Conservative councillors here are tweeting about LTNs implemented by opposition parties only. Just as Labour councillors may be unlikely to express negative thoughts about LTNs implemented by Labour-run councils, Conservative councillors may be unlikely to tweet positively.

Despite being fewer in number, Liberal Democrats are the only party whose councillors have expressed both positive and negative attitudes towards LTNs. Overall, of 77 tweets by Liberal Democrats, 20 are negative, 25 positive and 32 neutral. Overall, the median sentiment score for Liberal Democrat councillors is slightly positive at 0.18. For the Green Party, 45 of 62 tweets were positive - some 72.6%.

Table 4. A summary of LTN sentiment scores by political party

Party	Minimum	Lower quartile	Median	Mean	Upper quartile	Maximum	Standard deviation
Conservative	-0.94	-0.64	-0.42	-0.44	-0.2	0	0.28
Green	0.25	0.36	0.46	0.46	0.57	0.67	0.3
Labour	0	0.25	0.29	0.39	0.57	0.93	0.25
Liberal Democrats	-0.57	0	0.18	0.13	0.43	0.5	0.36
All parties	-0.94	0	0.25	0.19	0.5	0.93	0.42

Table 5. A summary of the counts and proportions of negative, neutral and positive LTN tweets by political party

Party	Total Tweets	Negative stance		Neutral stance		Positive stance	
		Count	Percent	Count	Percent	Count	Percent
Conservative	406	357	87.93	49	12.07	0	0
Green	62	1	1.61	16	25.81	45	72.58
Labour	702	1	0.14	127	18.09	574	81.77
Liberal Democrats	77	20	25.97	32	41.56	25	32.47
All parties	1247	379	30.39	224	17.96	644	51.64

Table 6 outlines, for each local authority, the number of incumbent councillors that tweeted about LTNs and whether they were, overall, a 'positive', 'negative' or 'neutral' tweeter about LTNs. Unsurprisingly given their largely Labour-dominated composition, councils such as Brent, Camden, Hackney, Islington, Lambeth, Newham and Haringey were all dominated by positive tweeters. In contrast, Enfield, Croydon and Hounslow all had more negative than positive tweeters. A similar pattern is evidence in the overall number of positive, negative and neutral tweets per council, though with some extreme cases. In Enfield for instance, 133 out of 152 tweets were negative in stance towards LTNs.

Table 6. A summary of positive, negative and neutral 'tweeters' and tweets by local authority

Council	Have tweeted about LTNs	Positive 'tweeter'	Negative 'tweeter'	Neutral 'tweeter'	Total no. of tweets	Positive tweets	Negative tweets	Neutral tweets
Brent	7	6	0	1	20	15	0	5
Camden	4	4	0	0	15	14	0	1
Croydon	13	4	6	3	38	14	17	7
Ealing	11	3	3	5	114	25	46	43
Enfield	8	2	5	1	152	2	133	17
Greenwich	8	3	1	4	38	9	15	14
Hackney	8	7	0	1	43	37	0	6
Hammer-smith and Fulham	1	1	0	0	2	2	0	0

Haringey	7	5	0	2	55	40	3	12
Hounslow	7	2	3	2	34	7	23	4
Islington	14	14	0	0	133	113	1	19
Lambeth	13	10	1	2	400	215	131	54
Lewisham	5	4	0	1	30	26	0	4
Merton	4	2	0	2	11	6	1	4
Newham	6	6	0	0	89	81	0	8
Southwark	8	4	0	4	38	21	2	15
Tower Hamlets	8	2	1	5	21	6	4	11
Waltham Forest	2	1	1	0	14	11	3	0

Voting outcomes: change between 2018 and 2022 elections

The first question we consider is what proportion of councillors in this study were re-elected again in 2022. Across all parties, including independents (excluded from Table 7), 88.9% of councillors were re-elected – 561 of 631 councillors. There was significant variation by political party: a much higher proportion of Labour councillors (92.7%) were re-elected than Conservative councillors (73%) or Liberal Democrat councillors (75%).

Table 7. Counts and proportions of incumbent councillors in this study that held their seat in 2022 by political party

Party	Held Seat	Count	Percent
Conservative	No	24	27
	Yes	65	73
Green	No	2	33.3
	Yes	4	66.7
Labour	No	37	7.3
	Yes	470	92.7
Liberal Democrats	No	7	25
	Yes	21	75
All parties	No	70	11.1
	Yes	561	88.9

The second question considered is how the relative number of votes that a councillor received changed between the 2018 local elections and the 2022 local elections. Across all councillors in the study, there was on average a small decrease (median change of -8.5) in the number of votes relative to the ward average. This implies that overall, there has been a fall in the relative support of incumbents included in this analysis between 2018 and 2022. There was a slightly greater median decrease in vote scores for the Conservatives (-12.8) than for Labour (-7.9). However, the higher standard deviation implies that there was more variation in the change in Conservative vote scores than those for Labour. This is driven by the larger number of Conservative councillors who saw much bigger falls (over 100) in their relative number of votes.

Table 8. Distribution of change in relative number of votes by political party

Party	Minimum	Lower quartile	Median	Mean	Upper quartile	Maximum	Standard deviation
Conservative	-152.8	-28.0	-12.8	-16.4	0.4	40.4	31.5
Green	-43.3	-20.0	-7.3	-13.4	-1.3	1.2	17.1
Labour	-131.1	-21.3	-7.9	-10.9	2.6	45.6	21.3
Liberal Democrats	-198.1	-33.3	-11.1	-23.3	12.2	41.2	54.5
All parties	-198.1	-22.7	-8.5	-12.6	2.8	45.6	26.7

Voting outcomes and the effects of tweeting about LTNs

The first question we consider is whether tweeting about LTNs, irrespective of LTN sentiment, has any association with a) being re-elected; b) the change in vote score between the 2018 and 2022 local elections. Were incumbent councillors that tweeted or tweeted more often about LTNs more or less likely to hold their seat or increase or decrease their relative votes?

Table 9 shows the count and percentage of incumbent councillors who held their seats broken down into three categories: 1) those that have not tweeted about LTNs; 2) those that have tweeted about LTNs at least once; 3) those in the top 5% of councillors based on number of tweets about LTNs. These are councillors who have tweeted at least eight times about LTNs, so might be considered the most vocal, irrespective of sentiment.

Table 9. The breakdown of councillors by whether they tweeted about LTNs and whether they held their seat in 2022

Tweeted about LTNs?	Held seat?	Count	Percent	Lower confidence interval (95%)	Upper confidence interval (95%)
No	No	53	10.7	8.2	13.7
	Yes	444	89.3	86.3	91.8
Yes	No	12	12.2	7.1	20.2
	Yes	86	87.8	79.8	92.9
Yes and in top 5% of tweeters	No	5	13.9	6.1	28.7
	Yes	31	86.1	71.3	93.9

There is no observable relationship between tweeting about LTNs and the proportion of councillors who held their seat. There is 95% confidence that the difference in the proportion holding their seat between the group that has not tweeted and those that had tweeted falls between -0.061 (-6.1 percentage points) and 0.092 (9.2 percentage points). Therefore, it is not possible to say with sufficient certainty that the difference is not equal to zero. Being in the top 5% of tweeters about LTNs compared to not tweeting at all was also not significant. Councillors who tweeted or those who tweeted regularly about LTNs were no more or less likely to hold their seat than those who did not tweet at all.

Further statistical models were executed to test whether, after accounting for demographic and political factors, tweeting about LTNs (compared to not tweeting about LTNs) had any statistically significant effect on the probability of holding a seat. Again, there was no effect found of tweeting about LTNs on probability of holding seat (pr(holdSeat) = 0.49, OR = 0.96, P = 0.90) across all

candidates (see Figure 13). Nor was there any variation in effects of tweeting depending on the party of the councillor: being a Labour councillor (rather than a Conservative councillor) who tweeted had no effect compared to not tweeting pr(holdSeat) = 0.50, P = 1.00).

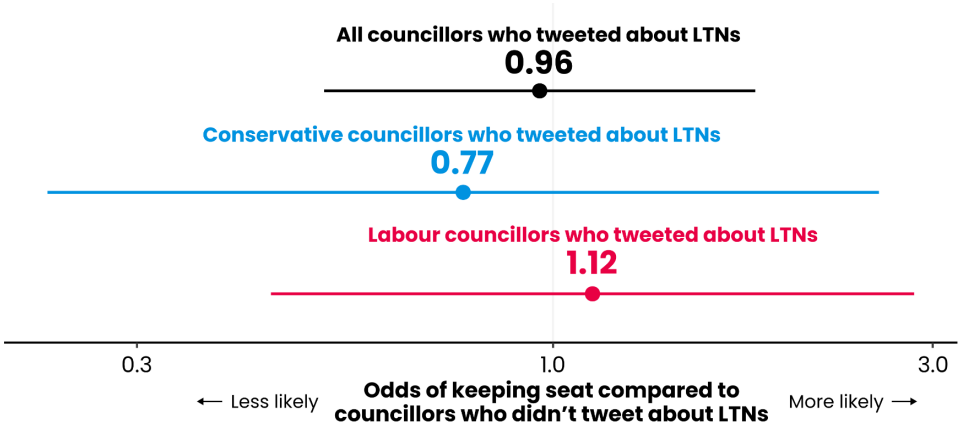

Figure 13. Odds ratios of holding seat by whether councillors had tweeted about LTNs at all

There is some variation in the change in relative number of votes depending on whether the councillor had tweeted about LTNs or not. The median change amongst those who had tweeted was -5.47 compared to -9.5 amongst those who had not tweeted. Those in the top 5% of tweeters had a lower fall in median relative votes of -1.45, though the sample size for this group is small. Using regression models, it is possible to test whether these differences are statistically significant, after accounting for other demographic and political characteristics. As Figure 14 shows, compared to not tweeting about LTNs, tweeting about LTNs was associated with a 4.74 increase in relative number of votes (P = 0.04), once ward-level demographic and political characteristics were accounted for. This is a significant finding suggesting that rather than negative effects associated with tweeting about LTNs, there may have been more likely positive effects. There was no variation in the effect of tweeting (compared to not tweeting) by party.

Table 10. A summary of change in relative votes broken down by whether councillors had tweeted about LTNs

Tweeted about LTNs?	Minimum	Lower quartile	Median	Mean	Upper quartile	Maximum	Standard deviation
No	-198.13	-24.62	-9.5	-14	1.88	45.58	26.94
Yes	-172.56	-21.18	-5.47	-10	4.68	37.32	25.21
Yes and in top 5% of tweeters	-68.46	-15.08	-1.45	-2.73	12.99	25.9	20.77

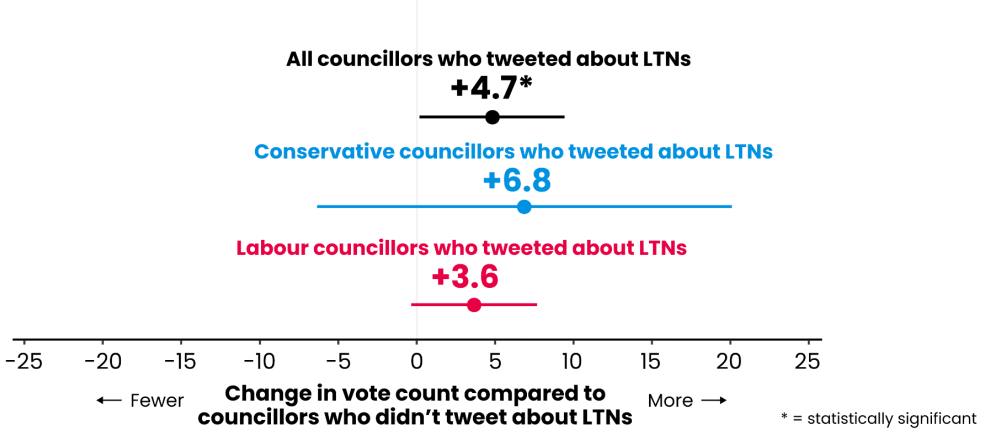

Figure 14. Modelled estimates of the relationship between tweeting at all and change in relative number of votes

Voting outcomes: how do they change depending on councillors' LTN sentiments?

The second key aim of this report is to understand whether there were any effects on voting outcomes of councillors' sentiments towards LTNs, as expressed through their tweets. First, we consider the relationship between LTN sentiment score and being re-elected. Second, we explore the association between LTN sentiment score and change in relative votes.

Figure 15 shows the probability that a councillor held their seat depending on their sentiment score and their political party. The plot shows that, generally, for Conservative councillors, the less negative their LTN sentiment score, the lower the probability of holding

their seat. For Labour councillors, the overall trend is in the opposite direction - those who expressed more positive views about LTNs had a very slightly higher probability of being re-elected (with the exception of the 2 candidates with an LTN sentiment score of 1).

Across all councillors, Table 11 shows that 92.2% of those expressing a positive LTN sentiment were re-elected compared to 78.6% of those who tweeted negatively and 75% of those who were more neutral. However, the wide confidence intervals (at 95% confidence) mean there is insufficient certainty about these differences to make definitive conclusions. It is not possible to say with sufficient certainty that the difference between negative, neutral and positive councillors is not equal to zero.

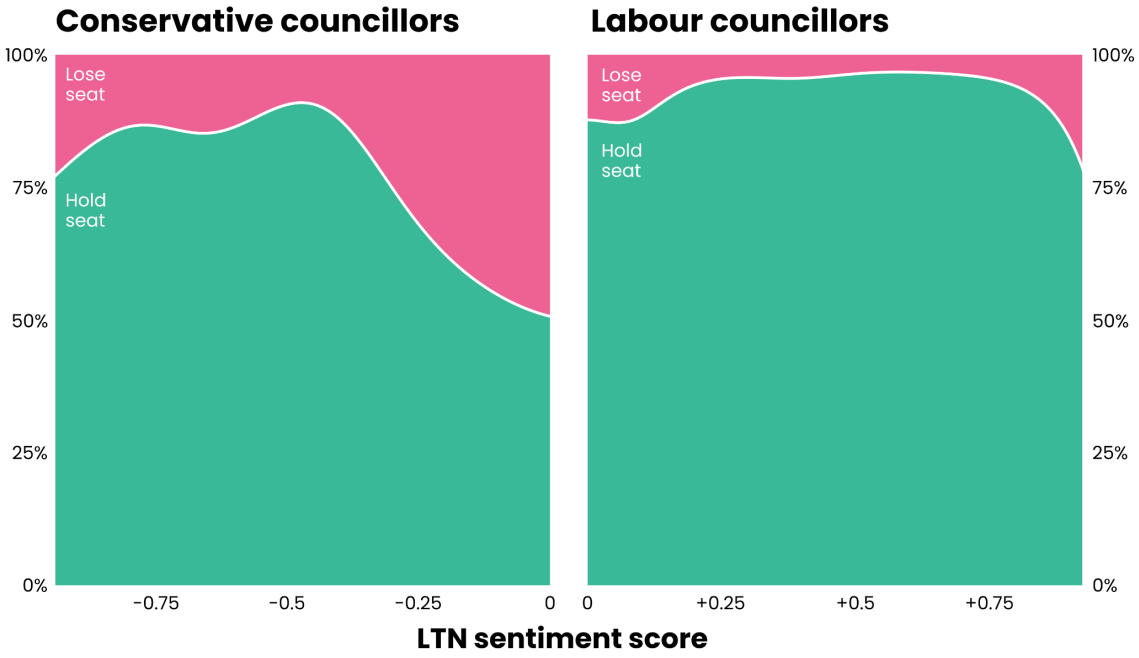

Figure 15. Probability that a councillor holds their seat by LTN sentiment and political party

Table 11. Count and proportion of councillors that held their seat by their LTN sentiment classification

LTN sentiment councillor classification[55]	Held seat?	Count	Percent	Lower confidence interval (95%)	Upper confidence interval (95%)
Negative	No	6	21.4	10.2	39.5
	Yes	22	78.6	60.5	89.8
Neutral	No	4	25	10.2	49.5
	Yes	12	75	50.5	89.8
Positive	No	7	7.8	3.8	15.2
	Yes	83	92.2	84.8	96.2

It is to be expected that a higher proportion of councillors who tweeted positively held their seats, since the vast majority are Labour and a higher proportion of Labour councillors were re-elected than Conservative or Liberal Democrats. It is for this reason that statistical models are used to test what effect, if any, LTN sentiment had on the likelihood of a councillor holding onto their seat after accounting for the effects of the party they stood for and other important contextual factors (as discussed in the methodology). In these statistical models, there was neither a positive nor negative statistically significant effect of LTN sentiment on the probability of being re-elected in the 2022 local elections. Figure 16, which plots the probability estimates associated with the LTN sentiment score (for all councillors and then for councillors of different parties) confirms these findings.

[55] Here councillors have been coded according to their most common tweet category. I.e. if a councillor had written 5 neutral tweets, 3 positive tweets and 2 negative tweets, they would be coded as 'neutral'.

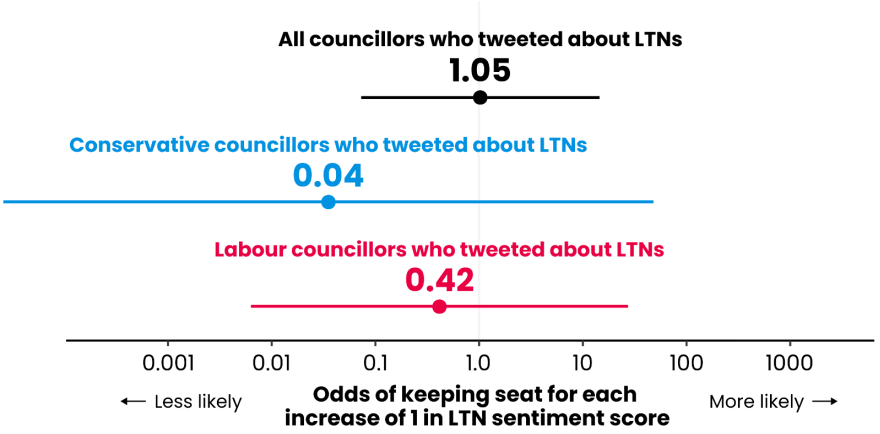

Figure 16. Predicted (modelled) probability of holding seat by LTN sentiment score

Table 12 summarises the change in relative votes between 2018 and 2022 by LTN sentiment. Amongst councillors who expressed negative sentiments towards LTNs, there is a median decrease in vote score of 8.51 compared to a decrease of 4.1 amongst those who expressed positive LTN sentiments. Interestingly, those with neutral scores had a more substantial median decrease of -20.5, although the sample size in this group is low (16 councillors).

Table 12. A summary of change in relative number of votes by LTN sentiment classification of councillors

LTN sentiment	No. of councillors	Minimum	Lower quartile	Median	Mean	Upper quartile	Maximum	Standard deviation
Negative	28	-104.87	-19.28	-8.51	-10.18	7.77	27.28	27.16
Neutral	16	-172.56	-37.15	-20.5	-26.84	0.88	11.44	42.84
Positive	90	-68.46	-15.37	-4.1	-6.95	4.95	37.32	18.87

Figure 17 presents the relationship between councillors' LTN sentiment scores and the change in relative vote scores between the 2018 and 2022 local elections, broken down by political party. The correlation coefficient of 0.1 indicates a very weak but positive relationship between LTN sentiment and change in relative number of votes. When tested with a statistical model, across all councillors, there was no association between sentiment score and change in the number of relative votes ($\beta x = -3.86$, $P = 0.60$).

However, differences emerge when councillors are separated by political party. For Labour councillors specifically, there is a correlation of 0.30 between LTN sentiment and the change in their relative number of votes[56]. While the sample size is small, the implication is that, overall, Labour councillors who tweeted positively about LTNs, compared to those that were more neutral (note there were no Labour councillors with negative sentiment scores), had a more positive change in their relative number of votes. This relationship is not evident for Conservative councillors, as Figure 17 shows: the correlation coefficient of -0.27 confirming that, compared to councillors who were neutral, Conservative councillors that were more negative in their sentiment towards LTNs had a more positive change in their relative number of votes between 2018 and 2022. This is tentative evidence that tweeting neutrally was not beneficial to either Labour or Conservative councillors.

[56] At the council-level, there was also a statistically significant (*P = 0.030*) positive correlation of 0.68 between the council-level LTN sentiment and the change in proportion of seats. However, due to the small sample size of councils, the within-council variation in seat changes and the many confounding factors influencing election results, it was considered too tenuous to make any conclusions about potential effects of councillors' tweets at this wider geography.

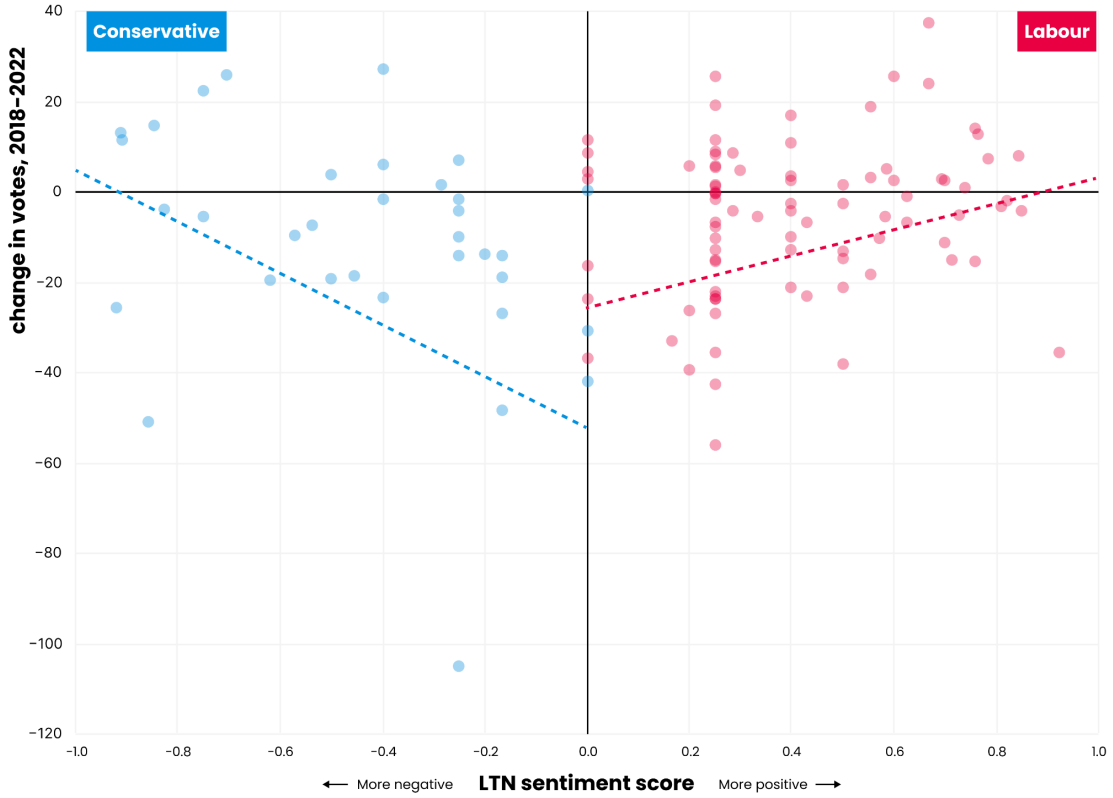

Figure 17. The relationship between councillors' LTN sentiment scores and the change in relative vote scores between the 2018 and 2022 local elections, broken down by political party

Statistical modelling can also test whether the different relationships observed between LTN sentiment and change in relative votes across different political parties hold true after accounting for ward-level characteristics. Is there a statistically significantly different relationship between LTN sentiment and councillors' change in relative votes depending on what party they represent? The evidence here is that there is.

Compared to Conservative councillors, a 1 unit increase in LTN sentiment score leads to 35.2 (P = 0.01) greater change in the relative number of votes for Labour councillors. In other words, a more positive LTN sentiment is associated with a more positive change in relative votes for Labour councillors than for Conservative councillors. In contrast, being more positive (or less negative) about LTNs is likely to be a less successful strategy for Conservative councillors, at least compared to Labour councillors.

Discussion

The implementation of LTNs, and some other road space reallocation or charging measures, has become a contentious local issue across much of Greater London and England more widely. While many local authorities are tied to climate targets and aim to reduce motor traffic, councillors will be aware that attempting to encourage behaviour change comes with political risks. In the run up to the 2022 local elections, there was much media discussion around possible effects of councillors' and councils' support for LTNs, with varying expectations that it could be either electorally negative, positive, or neutral.

While councillors' positions on LTNs, as well as the broader effectiveness of such schemes, should be scrutinised, there are accounts of councillors receiving abuse and harassment implementing such schemes. In this context, it is perhaps not surprising that one important finding from this report is that most incumbent councillors chose not to tweet at all about LTNs prior to the 2022 local elections. This may reflect a lack of interest in the issue for some, but for others it may reflect a fear of adding to what often appears online to be a polarising issue. In addition, some councillors may simply fear that taking any public position on LTNs could lead to a decrease in their popularity and reduce their chances of being re-elected.

This is, however, not what the evidence suggests in this report. Councillors who tweeted or those who tweeted regularly about LTNs were no more or less likely to hold their seat than those who did not tweet at all. What's more, the analysis here has shown that there was a positive association between tweeting about LTNs and the change in relative votes between 2018 and 2022. Those who tweeted about LTNs more frequently were more likely to receive a more positive relative number of

votes compared to 2018, even after accounting for their political party (most were Labour).

Although some Labour and Conservative councillors remained neutral or chose not to tweet at all about LTNs, there was clear evidence of divergence in their public stances. Despite LTNs being supported and funded by the national Conservative government, there was not one positive tweet by an incumbent Conservative councillor in a local authority where LTNs had been implemented (or were planned) before the 2022 local elections. Perhaps this, and Labour councillors' much more positive stances are unsurprising, given almost all LTNs have been implemented in Greater London by Labour-run councils.

But to what extent was being more positive or negative about LTNs associated with more positive or negative changes in popularity? Here, there is also divergence by political party. For incumbent Labour councillors, at least compared to their Conservative counterparts, the more positive the tweets about LTNs, the more positive the relative changes in their support. Similarly, Labour-run local authorities where incumbent councillors had tweeted more positively about LTNs tended to see more positive seat changes between 2018 and 2022. In contrast, being more positive (or less negative) about LTNs is likely to be a less successful strategy for Conservative councillors, at least compared to Labour councillors.

This report is the first of its kind to analyse, for individual councillors, the potential impact of stance on LTNs on their chances of being re-elected. Up until now, much of the analysis has been speculative, drawing conclusions based on electoral outcomes in specific boroughs, some of which (e.g. Tower Hamlets) may be inconsistent with overall trends. It is assumed that one reason this research has not yet been implemented is the difficulty of accounting for ward-level boundary changes between elections and the time-consuming nature of identifying Twitter accounts and coding tweets. This research successfully overcomes these issues by using an innovative approach to predict notional election

results where boundaries have changed and by utilising a complex Naïve-based sentiment analysis to code tweets related to LTNs. That the sentiment analysis was as accurate as manually coding the tweets gives confidence in the classification of councillors' tweets in this analysis.

There are, nonetheless, some limitations and important caveats to this research. Of course, local elections are complex. There are many factors that influence voting behaviour, and it is impossible to account for all of these in any statistical modelling. Indeed, the fact that overall, there was no association between LTN sentiment and holding a seat may well reflect the many more important factors than LTNs that determined the local election outcomes seen in 2022. In addition, most of the councillors in this study represented the Labour Party. This limits the conclusions that can be made about other parties, notably the Liberal Democrats and Greens, where sample sizes were particularly small. The analysis undoubtedly is most impactful in its analysis of the impact of Labour incumbents' publicly held positions on LTNs.

It is important also to exercise some caution even in the interpretation of the findings with regard to Labour councillors. Some Labour councillors may tweet more positively about LTNs because they are already more confident (than other councillors) that the schemes are well-received or that they are likely to be re-elected. To some extent, the analysis has controlled for these external influences (e.g. the statistical models include political and demographic context). However, it is not possible to answer the following question: would Labour have done better in the 2022 local elections if their incumbent councillors had been more vocal in their support of LTNs? On the one hand, individual councillors and Labour-run councils generally did a little better relative to 2018 when there was more vocal, more positive support for LTNs. On the other hand, councillors may have been more vocal when they already felt confident that they had sufficient support from the electorate on LTNs.

Despite these caveats, this report still contains some clear and valid findings. It should offer some reassurance to incumbent councillors, particularly Labour councillors, that tweeting about LTNs and tweeting positively about LTNs is unlikely to have had negative political consequences at the 2022 local elections in Greater London. Despite the noise on social media, protests on the street and countless articles about the polarising, divisive or simply unpopular nature of LTNs, there is little evidence here to suggest that there are significant electoral consequences. This is not to say that there is not variation across different contexts, but rather that, it appears more likely that any effects, at least for Labour incumbents, might have been more often positive rather than negative.