Transport Policy 171 (2025) 615–640

Contents lists available at ScienceDirect

Transport Policy

journal homepage: www.elsevier.com/locate/tranpol

Deliberating sufficiency in transport: Fair car use budgets for London

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ARTICLE INFO

Keywords:
Mobility budgets
Sustainability
Equity perceptions
Local democracy
Behavioural change
Policy instruments

ABSTRACT

This paper investigates notions of fairness and the role of deliberative exercises as part of urban transport policy design. Its point of departure is the sufficiency principle informed by conditions of scarcity for private car use in cities. It focuses on questions of fairness in assigning hypothetical car use budgets for the case of London. Two different budgets are considered, one associated with carbon emission ceilings and another for space constraints. The study that underpins this paper is based on a mixed method approach including a dedicated representative survey for London, a deliberation simulation based on a citizens' jury with nine participants and a pilot behavioural experiment alongside interviews with a total of 19 London car drivers. Three key findings are established: First, deliberative engagement can be a constructive and feasible approach adding to the general democratic legitimacy of decision making in transport policy. Second, while fairness deliberations, perceptions and sentiments are complex, coherent understandings do emerge for both differential treatments of social groups and priorities of fairness principles. Third, car use budgets may be a helpful tool that can be indirectly utilised for policy design and deliberative formats. While they are generally understood by participants as useful tool to consider implications of limits and distributional questions of driving, they require additional research and testing to refine their role and utility. Alongside, the pilot experiment revealed the utility and feasibility of several methodological approaches, some ready for scaling other requiring further refinement. The use of mobility tracking and the deliberative approach to car use budgeting were confirmed as scalable.

1. Introduction

As the sustainable urban transport paradigm of "avoid, shift, improve" (Estermann, 1991; Heinze, 1993; Bakker et al., 2014) has entered mainstream transport policy in European cities (TUMI, 2019), transport debates have become noticeably politicised and polarised (Dudley et al., 2022; Rode, 2023; Karjalainen, 2024). As measures such as low-traffic neighbourhoods, generous bicycle infrastructure, low-emission zones, superblocks, higher parking fees, road pricing, speed restrictions and walkability improvements have been scaled up, some have challenged the fundamentals of urban transport transitions (Wågsæther et al., 2022; Marquet et al., 2024). A central theme underpinning the backlash are fuzzy notions of fairness and allegations of overreach by city governments pushing through "unpopular" solutions.

This paper examines how perceptions of fairness can put transport transitions at risk, aiming to better understand how people can be involved in developing fair urban transport policy. In particular, it looks at deliberative approaches (Dryzek, 2000; Floridia, 2018) such as citizens' assemblies and juries (Guerrero, 2014; Curato et al., 2021) as an alternative to more conventional participatory methods. Related democratic innovations have shown a considerable potential to overcome polarisation, confrontation and even conflict (Garry et al., 2021).

At the core of this is the concept of sufficiency – what is "enough" in urban transport? – and notions of fairness with regard to how (and whose) mobility is constrained. While efficiency and sustainability are discussed explicitly, notions of sufficiency are more often only implied usually around the 'avoid' dimension of the above-mentioned sustainable transport paradigm. They underpin measures such as 15-min cities, urban compaction, accessibility planning, walkability and micromobility. Rather than focussing only on movement functions, they consider which level of mobility may be enough or could be replaced by otherwise improving access to opportunities.

More recently, an explicit sufficiency tool in transport has been introduced: mobility budgeting (Millonig et al., 2022) with a fixed

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https://doi.org/10.1016/j.tranpol.2025.06.005
Received 9 October 2024; Received in revised form 2 June 2025; Accepted 4 June 2025
Available online 12 June 2025

budget for mobility (irrespective of transport modes) – for example, in the form of mobility cards. Mobility budgets have also been conceptualised as actual consumption ceilings, recognising individuals' responsibility to attenuate the negative impacts of their travel. The latter approach informs the concept of car use budgets (Rode, 2024), which is applied in this paper.

The study focuses on London, where progressive transport policies have been introduced by still relatively young institutions such as the Mayor of London, the Greater London Authority and Transport for London (TfL) alongside many of the city's 33 boroughs. London is Europe's most congested city (INRIX, 2024), and the mayoral elections of May 2024 confirmed a strong and stable mandate for further reductions in car use and its negative impacts, including an ultra-low emission zone and low-traffic neighbourhoods. At the same time, the political debate in the run-up to the elections revealed considerable discontent and polarisation associated with the sustainable transport agenda and related policy instruments (YouGov, 2024). Put simply, the wide ranging, decade-long consensus of no longer building new roads for London is not matched by agreement on how to distribute existing road space.

Earlier TfL analysis had found that six out of nine groups in its customer segmentation research showed a considerable willingness to shift their travel towards more sustainable modes (TfL, 2017). Yet a notable number of residents, particularly in Outer London, strongly oppose recent green transport measures, such as the expansion of London's ultra-low emission zone (YouGov, 2024). Such attitudes stem partially from concerns about a lack of alternatives to driving. They also increasingly overlap with lower-income people's frustration at being priced out of the city and having to relocate to areas underserved by public transport (Smith and Barros, 2021).

Progressive policy-makers in London widely agree on a strategy of "showing what change looks like" (Davis and Altshuler, 2018) as a way to build support. Based on this theory of change, instead of involving people from the outset, some have argued for delivering proof of concept first and then proceeding with consultations about the permanent implementation of transport measures. With that as the point of departure, this paper investigates (1) fairness framings by the general public for managing car use in London, (2) the role of mini-publics in putting forward more consensual interventions, and (3) how deliberative efforts affect the attitudes and behaviour of both participants and non-participants. The overarching research question is:

> *What can we learn from a deliberative approach when addressing sufficiency and a fair distribution of car use budgets as part of transport policy?*

In particular, we sought to learn whether deliberating jointly on fairness in transport and reaching a shared understanding could increase acceptance of travel behaviour change and related policies. To address this research question, we applied a novel mixed-method approach involving a representative survey and a pilot experiment with a citizens' jury coupled to a behavioural study and in-depth interviews with London car drivers.

The paper is organised as follows: Section 2 reviews the literature on sufficiency in transport, mobility budgeting, transport equity/fairness, and the relationship between deliberation and transport policy acceptability. Section 3 presents our research framework, mixed-method approach and key research phases. Section 4 discusses our main findings linked to perceptions of fairness, including the differentiation of social groups, the fairness approach and the role and legitimacy of a citizens' jury. Section 5 proceeds with how the deliberative approach operationalised car use budgets and presents the behavioural and attitudinal findings. A final, substantive Section 6 covers the key insights gained from the experiment and its implications for policy and practice.

2. Sufficiency and equity in urban transport

This project applied two fundamental concepts from the literature to the transport domain: sufficiency and equity. While necessarily brief and concise, this literature overview takes a slightly broader scope than usual, reflecting the central roles these texts play in shaping our study's conceptual framing. The concept of sufficiency underpins the idea of mobility budgets and its interpretation as car use budgets. Our focus on fairness concerns procedural fairness in particular and briefly covers contemporary discourse on citizen deliberation and mini-publics.

2.1. From sufficiency to mobility budgeting

At the most basic level, the concept of sufficiency refers to "an amount of something that is enough" (Cambridge Dictionary, 2024), though more recently, it has been equated to a much wider recognition of 'enoughness' (Jungell-Michelsson and Heikkurinen, 2022). In the context of sustainable development, sufficiency is sometimes referred to as a third core principle, along with efficiency and consistency (Princen, 2005, Schäpke and Rauschmayer, 2014), and generally means adjusting consumption to be in line with available resources. The term has been used in ecological economics, political ecology and ecological philosophy (Jungell-Michelsson and Heikkurinen, 2022). Applying it to public policy, Spangenberg and Lorek (2019) stress that "sufficiency requires radical change redefining the rules of the game, incremental steps will not be enough" (p1077). Important related knowledge gaps concern a better understanding of quantifiable, domain-specific sufficiency levels and their operationalisation (Jungell-Michelsson and Heikkurinen, 2022).

Arguably, one of the biggest political tests for the sufficiency principle is to apply it to transport and mobility. Here it may clash with desires of unrestricted mobility that are often equated to freedom (Sager, 2006). Notable work on sufficiency in transport includes a general introduction by Waygood et al. (2019) and its application to bicycle subscription business models (Niessen et al., 2023).

So far, however, the sufficiency principle has found little direct recognition in transport policy (Rode, 2023). In the words of Ternes et al. (2024), "discussions of 'not enough' are not mirrored by discussions of 'too much'" (p9). There is only a niche interest in excess travel (Wadud et al., 2022; Cass et al., 2023), even though some consider sufficiency fundamental for achieving urgent sustainability outcomes in the sector (Millonig et al., 2022). Rode (2023) suggests that many sustainable transport interventions implicitly apply the principle, particularly those based on the "avoid, shift, improve" paradigm (Bakker et al., 2014).

Mobility budgets are a rare explicit operationalisation of sufficiency in transport. They can take many forms. Corporate or employee mobility budgets replace company cars with a predefined budget for travel expenses (Schlegel and Stopka, 2022; Zijlstra and Vanoutrive, 2018). Individual mobility budgets propose an allocation of budgets for personal travel, typically derived from carbon budgets (Millonig et al., 2022; Arhipova et al., 2023) and informed by transport-related carbon permits (Harwatt, 2008; Wadud, 2011). Taking a needs-based perspective, such budgets have also been proposed as "floors" – for example, with a yearly travel budget of 3500–4500 km as sufficient mobility in Europe (Holden, 2016). Mobility budgets for public policy could also build on personal carbon trading (Fawcett, 2010; Raux et al., 2015), use "mobility coins", a multi-modal tradeable credit scheme (Hamm et al., 2023), or underpin a fairer design of established policy instruments such as road pricing (Rode, 2024).

Across these applications, the concept of mobility budgeting remains vague and can range from allowances to rationing. Referencing Hajer (1995), Zijlstra and Vanoutrive (2018) suggest that ambiguity is typical for successful policy concepts and may contribute to the appeal of mobility budgets. Conversely, transport sufficiency and associated interventions face the general risk of growing opposition and polarisation

as the level of specificity or proposed interventions increases (Mau et al., 2023).

The interpretation of mobility budgets that underpins this study is more concrete, the mode-specific approach of *car use budgeting* (Rode, 2024). Here, the budgets assigned to individual car users are based on the scarcity of urban street space, but they could also be based on carbon emission ceilings. The suggested core unit for car use budgets is the number of kilometres driven within a given urban cordon and time period. At various levels of granularity and complexity, these budgets are arrived at by analysing the total space available for circulating traffic within a given urban area or subdivision, the number of cars usually operating within that area, and assumptions for the temporal distribution of trips. The resulting average number of kilometres that can be travelled per day, for example, reflects a threshold use of road space by vehicles not exceeding acceptable levels of congestion.

Transport sufficiency and mobility budgeting have considerable social equity implications. We can directly detect the obvious distributional question of how limited transport resources are shared among different residents and societal groups. But equally, the distribution of negative externalities from travel needs to be considered alongside other fundamental aspects of absolute and procedural fairness.

2.2. *From transport equity to deliberation*

Aligned with rapidly expanding research on just transitions (Wang and Lo, 2021; Stark et al., 2023), transport justice and equity have emerged as a dynamic subfield in transport research (Ruiz-Pérez et al., 2023; Ternes et al., 2024). Leading scholars have shifted from more traditional transport equity concerns over who funds public transport and how to address basic mobility needs (Banister, 2018), to addressing discrimination and unequal distribution (Van Wee and Geurs, 2011; Pereira et al., 2017; Randal et al., 2020). There is a new focus on fair accessibility (Martens, 2016; Rode et al., 2016; Hine, 2008), and a more comprehensive consideration of the distribution of negative socio-economic and local environmental externalities (Martens and Lucas, 2018).

New frontiers of transport equity concerns have also appeared, including a needs-based perspective of mobility and access that aims to better distinguish “wants” from “needs” (Cooper, 2022). There are discussions about the justice of public (street) space use, which overlap with equity considerations in urbanism (Creutzig et al., 2020); the speed and distance bias of transport policy (Tranter and Tolley, 2020); how perceived fairness deficiencies in transport feed polarisation (Rode, 2023), and the implications of intrinsic values of mobility (Niblett and Beuret, 2021). However, transport equity remains mainly an academic field, with limited efforts to clarify and translate it into policy and practice (Linovski et al., 2018; Ternes et al., 2024).

When the concept of sufficiency is applied in transport and other policy sectors, it is usually associated with distributional fairness. From this perspective, in discussing justice in transport, Martens (2012) defines accessibility as the ultimate good to be distributed. Yet sufficiency in transport also touches on procedural and absolute fairness. Fig. 1 presents a simple taxonomy of different aspects of fairness.

Two prominent social justice perspectives underpin most transport equity framings to date: Rawls’ egalitarianism (Martens, 2016; Lewis et al., 2021) and Amartya Sen’s and Martha Nussbaum’s capability approach (Robeyns and Byskov, 2021). Under the first, fair transport policy is often interpreted as a preferential treatment of vulnerable people, such as children, the elderly and those with disabilities. Egalitarianism has also been used to call for minimum standards of accessibility to meet basic needs (Pereira et al., 2017). Under the capability approach, equity is achieved through context and culture-specific minimum levels – which Banister (2018) interprets as minimum levels of access to essential destinations. However, there is no consensus on acceptable minimums (Pereira et al., 2017; Banister, 2018) and there are challenges due to the complex combinations of personal abilities, transport and land-use interactions (Pereira et al., 2017).

For *operationalising fairness in the transport sector*, Martens et al. (2019) present a framework with three key components: (1) the definition of benefits and burdens, bringing together the transport and accessibility resources as well as its negative externalities, (2) the social characteristics to be differentiated, usually identifying the broader social groups for which different treatment is considered as fair, and (3) the allocation principle, which can include fairness approaches such as minimum standards and relative or proportional fairness. While this framework directly addresses absolute and distributive fairness for transport, procedural fairness, which tends to be domain agnostic, requires a separate discussion.

Procedural justice is currently underrepresented in transport equity studies and in transport policy (Verlinghieri and Schwanen, 2020; Karner et al., 2023; Ternes et al., 2024). Tyler (2000) suggests considering four key criteria: opportunities to participate, neutral authorities, trustworthy motives and respectful treatment. While recognising the political dimensions of participatory processes (Legacy, 2017, Klaever and Verlinghieri, 2025) and the interrelatedness of those four criteria, here we focus on opportunities to participate and collaborative governance innovation – above all, the fast-evolving field of deliberative mini-publics, such as citizens’ assemblies, panels and juries (Curato et al., 2021; Grönlund et al., 2014; Raisio and Carson, 2014). Unlike representative democracy with elected officials and bargaining among different interests, deliberative approaches rely on extensive public deliberation and reasoning among citizens (Bohman, 2000). Ambitions for deliberation outcomes may range from a consensus ideal to open disagreement and even antagonism (Mouffe, 1999, Gutmann and Thompson, 2009).

Unlike open participatory processes, deliberative mini-publics bring citizens together based on a process of sortition, the random selection of participants (Sintomer, 2023). They can range from small groups to over

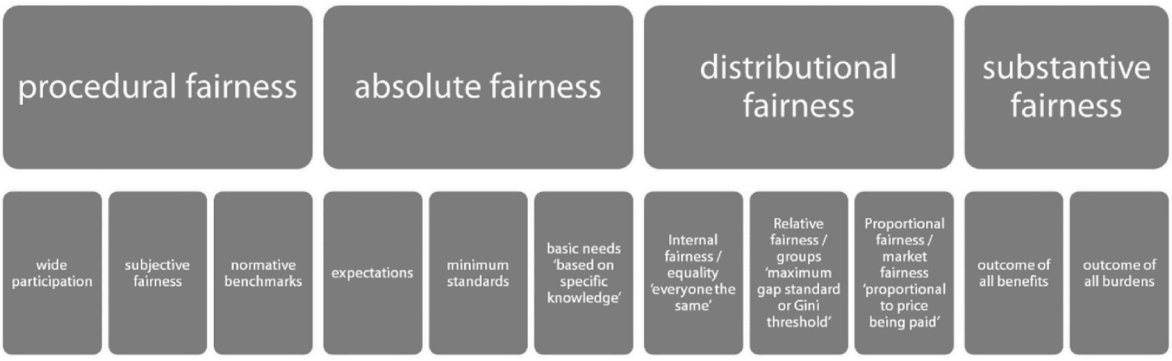

Fig. 1. A simple taxonomy of different fairness aspects.
Source: Rode (2022).

100 participants. After initial briefings to establish a common information base, they move to sharing views, debating and proposing solutions (OECD, 2020). Many mini-publics have been set up to address specific contested issues or complex challenges such as climate change. Sector-specific deliberative processes focused on transport have not received much attention to date and feature less frequently in the academic literature. One exception is Saarikoski et al.'s (2023) work with a transport jury in Finland, which they conclude led to "considered and well-balanced recommendations on complex environmental policy problems" (p14).

Among the key benefits of mini-publics that have been noted are higher-quality public decisions, a potential for greater legitimacy, inclusion and accountability (Fung, 2015, Jacobs and Kaufmann, 2021, Setälä, 2021). Key weaknesses that have been noted include cherry-picking, participants' behaviour, limited representativeness, and an only indirect influence on political decision-making (Setälä, 2021, Wells et al., 2021, Spada and Peixoto, 2025). The influence of deliberation on perceptions of policy and policy acceptance are burgeoning areas of research. Several studies indicate that people perceive policies crafted in deliberative settings as being more legitimate than those developed by policy-makers in isolation (Jacobs and Kaufmann, 2021). Even non-participants are more inclined to support specific political decisions made by mini-publics and deliberative forums than by other institutions (Boulianne, 2018, Werner and Marien, 2022).

Research has also begun on broader impacts of deliberation, with the majority focussing on political and citizenship engagement type outcomes (Ehsassi, 2024). For example, Knobloch and Gastil (2015) find that participants in the 2009 Australian Citizens' Parliament and the 2010 Oregon Citizens' Initiative Review demonstrated increased community and communicative engagement. Relatedly, Grönlund et al. (2010) find that readiness for collective action is positively impacted by engaging in a deliberative exercise. In a study investigating non-participants, Knobloch et al. (2020) finds that being made aware of a mini-public increased people's external efficacy – that is, their sense that governing officials listen to the public, and that there are legal ways to influence governing decisions.

This brief review of the literature reveals several knowledge gaps: First, there is a missing quantitative understanding of sufficiency and of how to frame the concept in engagements with the general public. Second, academic conceptualisations of transport equity, including how fairness relates to sufficiency, have not been applied much to policy and practice. Third, there has not been sufficient attention to creating fair transport policy design processes, including public participation. Fourth, there is a dearth of research into the impact of deliberative engagement on private sphere behaviours such as transport choices. These gaps guide our research interest and the design of our study, which is described in the next section.

3. Methodology

We addressed our research question and some of the above knowledge gaps through a mixed-method, multi-layer research framework with four research phases: A to D (Fig. 2). Alongside the sufficiency and fairness framings above, a review of the specific methods introduced below established the inputs for our living lab design for London (A). Two main research components, a survey and pilot experiment, generated the data collected (B). Both build on our literature review and preliminary research, but were developed and conducted separately from each other, as they address different samples. A third phase included a comparative analysis of attitudes and sentiments on the one hand, and travel behaviours on the other (C). A final phase established the key findings on deliberating fairness and operationalising car use budgets (D).

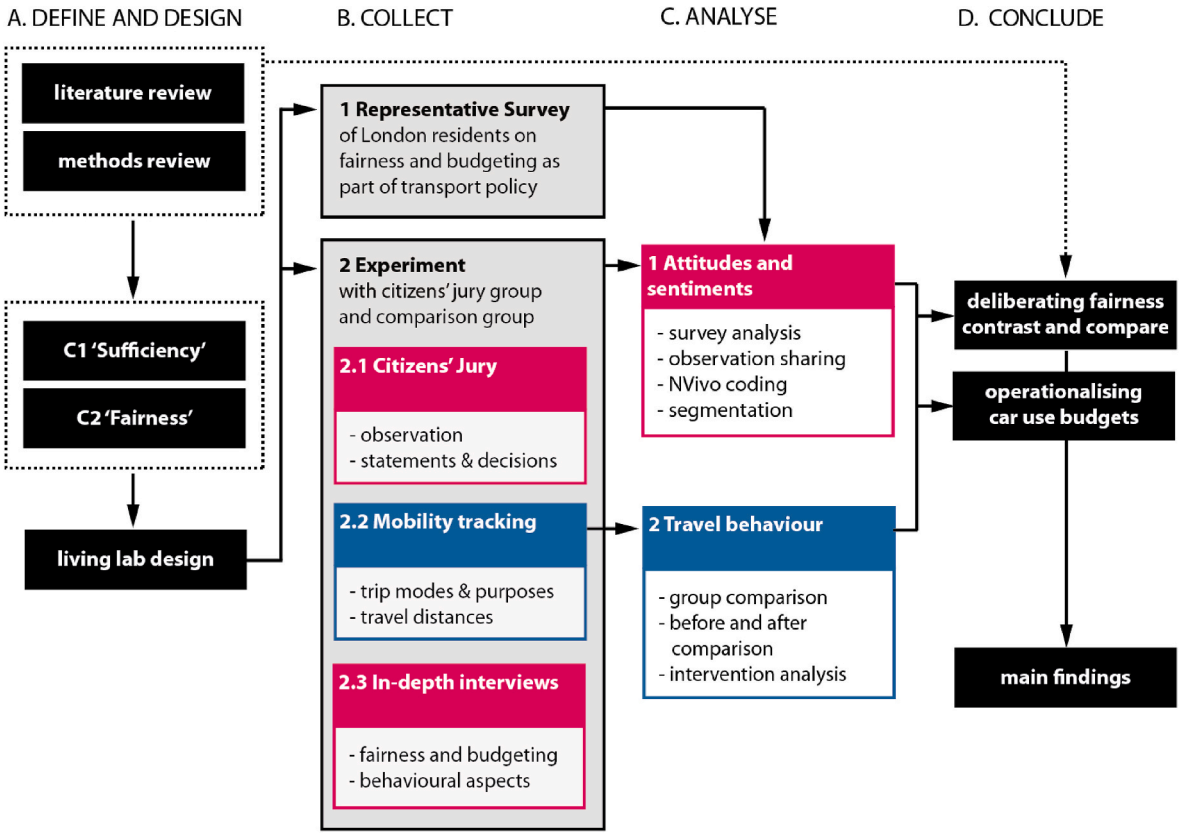

Fig. 2. Research framework.
Source: Authors

3.1. Representative survey

The first data generation component employed was a representative survey to collect data on transport equity attitudes from a diverse sample of Greater London residents aged 18–65. The survey sought to capture attitudes and perspectives related to personal mobility, environmental sustainability, different transport policy instruments and fairness approaches. A stratified random sampling technique was used to ensure that the sample accurately reflected the target population's demographics, including across age, gender and residential location. The survey was hosted via a third-party platform and ran from December 2023 to January 2024, with most responses collected during this time (79 %). Additional responses were gathered until April 2024 to correct the sample (21 %).

A total of 1247 people participated, and 1221 responses were deemed of the required quality and included in our analysis. The questionnaire consisted of closed questions, in which participants were asked to identify or rate agreement to different statements. To enhance reliability and validity, the survey instrument was pre-tested with a pilot group, and feedback was used to refine question wording and structure. This also led to adjustments to the survey to ensure an average completion time of 20 min to minimise the response burden. Data were analysed using descriptive statistical techniques based on weighted data to make it representative of the broader London population. The survey questions employed social group categories that were developed based on existing differentiation in the literature (Rode, 2022) and an international workshop in July 2021. Additionally, we carry out inferential analysis to examine the differences in responses to four survey questions using statistical tests appropriate to the nature of the data. Two survey questions considered the burden of reducing emissions from travel, asking people to identify groups which should be exempt and held responsible from a list of possible groups. In both cases we used Cochran's Q Tests to test for significant differences across proportion of affirmative responses to each of the listed group members and pairwise McNemar's tests to examine differences in responses across pairs of groups (McNemar 1947; Cochran, 1950). We also examine two further survey questions which explore perspectives on fairness in transport policy. These responses are on a six-point Likert scale, and we explore overall differences across responses to the statements using repeated measure ANOVAs and between specific pairs of statements using pairwise t-tests (Girden, 1992). We report Bonferroni adjusted p-values for all of the pairwise comparisons to account for multiple hypothesis testing (Bonferroni, 1936).

3.2. Pilot experiment

The second data generation component was an experiment with a diverse group of 19 Londoners who drive cars at least three days a week to/in Inner London. Given that car drivers are a central target of current and future policies to reduce transport emissions and address road space constraints in London, this choice follows the principle of moral plausibility and assigns a constitutive role to those most directly affected by a proposed intervention (Mau et al., 2023). The participants were randomly assigned either to a citizens' jury or to a comparison group (Fig. 3).

In order to avoid a selection bias, participants were recruited through a two-step process referring to a mobility study rather than a deliberation experiment. First, leaflets were put on the windscreens of cars in parking lots across Greater London. A total of 4000 leaflets resulted in the recruitment of 10 participants. Second, additional participants were secured with the support of a market research service provider. Participants were invited to a mobility study, with no mention of a citizens' jury. This resulted in an initial cohort of 20 participants; one withdrew at a later stage, so ultimately there were 19 participants (see full list in Appendix A).

Efforts were made to include individuals across various demographic categories, such as age, gender, socioeconomic status and education level. Still, this should be considered a convenience rather than a representative sample of London car drivers. Screening questions were used during the recruitment process to ensure that participants met criteria relevant to the study objectives. Tables 1 and 2 below provide an overview on participants across Oesch's (2006) eight-class scheme and in comparison to relevant London socio-demographic averages.

To incentivize participation, individuals were offered £40 for activating and updating a mobility tracking app and £40 for the final interview. Those selected for the citizens' jury were also offered a £40 participation stipend per session. Additionally, all participants who completed the entire process were entered into a prize draw for £1000.

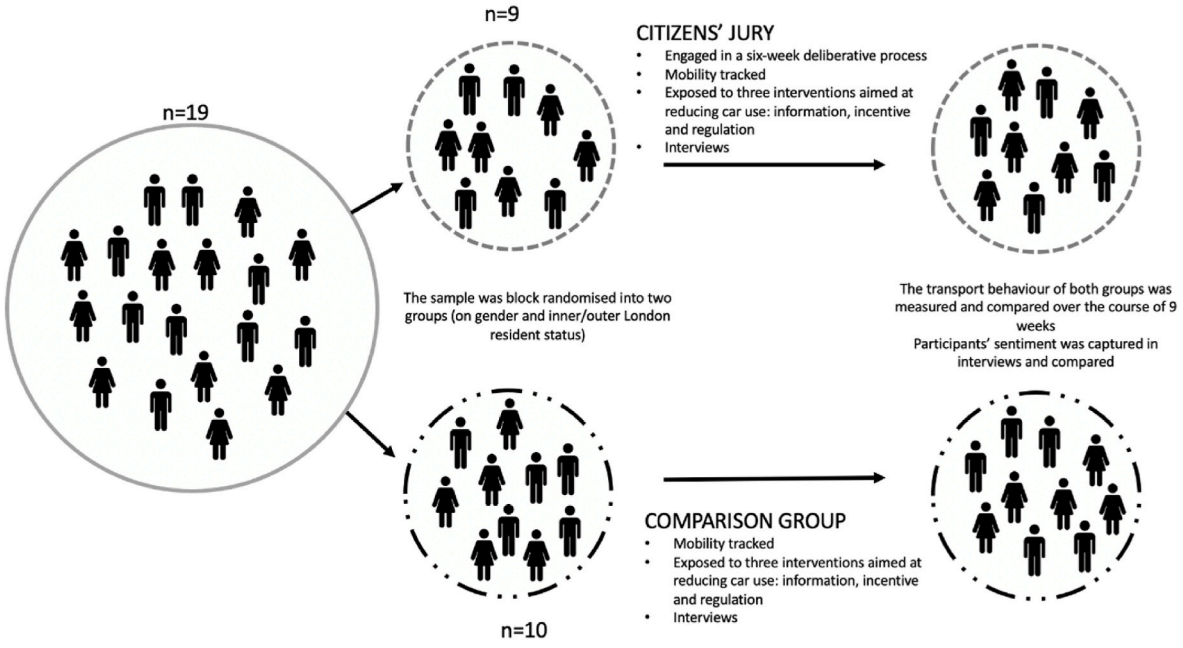

Fig. 3. Pilot experiment structure.
Source: Authors

Table 1
Participants across Oesch's 8-class scheme.
Source: based on Oesch (2006)

Self-employed	Employees		
Independent Work Logic	*Technical Work Logic*	*Organizational Work Logic*	*Interpersonal Service Work Logic*
1. Traditional bourgeoisie	**3. Technical specialist**	**5. Managers**	**7. Socio-cultural specialists**
		1 7 9 3 6 7 8	4 10
2. Petite bourgeoisie	**4. Production workers**	**6. Office Clerks**	**8. Service workers**
6	3 4 5 1	2 9	8 2 5

Citizens Jury Comparison Group

Table 2
Participants in comparison to London socio-demographic average.

	Citizen Jury (N = 9)	Comparison Group (N = 10)	London Average (Greater London)
Sex	56 % female	50 % female	51 % female
Age (Median, range)	46.4 (M = 49, 24–61)	37.8 (M = 34, 20–61)	36
Gross Income	2x less than £50.000 5x £50.000 - £100.000 2x more than £100.000	2x less than £50.000 5x £50.000 - £100.000 3x more than £100.000	£44,370 (£57,000 for London car drivers)

Table 3
Structure of the three Citizens' Jury Sessions.

Jury Session 01 'Key Challenges and Possible Solutions'	Jury Session 02 'Fairness for Urban Transport Policy'	Jury Session 03 'Interventions for Urban Transport Policy'
Multiple sessions 1–3 Nov 2023	Nov 17, 2023	Nov 29, 2023
1. Introduction (20 min) • Objectives of jury • Structure and schedule of three jury sessions • Ground rules 2. Challenge 01: Commitments reducing climate change (30 min) • Intro Presentation (10 min) • Clarification Q&A (10 min) • Possible Solutions – Discussion (10 min) 3. Challenge 02: Limited road space (30 min) • Intro Presentation (10 min) • Clarification Q&A (10 min) • Possible Solutions – Discussion (10 min) 4. Closing (10 min)	1. Fairness in transport policy (20 min) • Survey questions via mentimeter • Key fairness situations • Discussion 2. Differentiating social groups (30 min) • Breakout group – round 01 • Plenary discussion & agreement 3. Fairness principle (30 min) • Breakout group – round 02 • Plenary discussion & agreement 4. Closing (10 min)	1. Recap and Introduction (10 min) 2. Information-based policy (25 min) • Breakout group – round 01: brainstorm, prioritise, link it back to social groups • Plenary discussion & agreement 3. Economic policy (25 min) • Breakout group – round 02: brainstorm, prioritise, link it back to social groups • Plenary discussion & agreement 4. Regulatory policy (25 min) • Breakout group – round 03: brainstorm, prioritise, link it back to social groups • Plenary discussion & agreement 5. Closing (5 min)

This compensation approach was designed to motivate engagement without introducing coercion. Participants were informed of their rights, including voluntary participation and the ability to withdraw at any time, ensuring that ethical standards were upheld throughout the recruitment process.

The *citizens' jury* took place throughout November 2023 and consisted of three 90-min group video calls. The group broadly followed established definitions and features of citizens' juries (Smith and Wales, 1999; OECD, 2020), bringing together members who are well informed and have first-hand experiences (Purdam, 2012; Local Government Association, 2019). It also reflected our ambition to pilot the format with the population group most exposed to potential demands of sustainable transport policy for behaviour change.

The citizens' jury sessions included nine jurors and four members of the research team who facilitated deliberations in plenary and breakout sessions. Jury sessions were supported by briefing presentations and the use of virtual whiteboards (Figs. 7 and 8 in Appendix B). The lead researcher has extensive experience in hosting and facilitating workshops, and all the researchers had previously facilitated group sessions. For "discussion" and "agreement" components, the researchers acted as moderators. The structure of the three jury sessions (Table 3) was informed by an operationalisation of mobility budgeting by Rode (2022) and the transport equity framework by Martens et al. (2019).

Beginning in week 6 of the study, all participants in the experiment were exposed to weekly *interventions* aimed at shifting their mobility choices (Appendix C). These interventions were developed by the citizens' jury with the goal of testing different options for operationalising car use budgets. Information-based, economic and regulatory interventions were differentiated and applied for a period of one week each. The interventions were carried out with the aim of observing how the instruments defined in the citizens' jury resonated with the participants in both study groups in real life. This was done both at the level of mobility behaviour tracking and by capturing sentiments in the interviews. The specific interventions are detailed in the findings sections below, as they were a direct output of our study via the citizens' jury.

All participants' mobility patterns were tracked using a GPS-enabled smartphone app (Motiontag) over nine weeks, from 20 October to December 22, 2023. During this time, their location data were continuously recorded and processed. A travel diary was automatically created, including location data, start and end times of trips, modes used and trip purpose. The app assigned journeys based on GPS speed, acceleration and known infrastructure data. To ensure accuracy, the app was calibrated through user feedback, with participants confirming the

data recorded for each day. Before installation and throughout the study, participants were instructed by a member of the research team on the correct use of the app. Data privacy was prioritised; all location data were anonymised and securely stored. The collected data provided insights into mobility patterns, which were analysed to understand travel behaviour of the participants in both groups throughout the study. Due to the sample size, the results are not statistically robust but could assist advancing hypotheses and methods for future research. The use of the app also aimed to increase involvement of the participants based on gamification elements.

Following the completion of the experiment, 45-min *interviews* were conducted with all 19 participants during individual video meetings. These semi-structured interviews followed an interview guideline and were tailored for either citizens' jury or comparison group participants (Appendix D). The interviewers followed the structure of the guideline and asked follow-up questions or slightly adapted the order of the questions depending on the flow of the conversation. The first half of each interview focused on factors influencing transport mode choice behaviour and included questions designed to reflect on behaviour change, incorporating participants' self-reflections from app tracking and insights gained from the three trials. The second half explored the concept of citizens' juries as a potential enabler for change. Interviews were conducted between 01 and 12 February 2024. All interviews were conducted by members of the research team. The interviews were transcribed anonymously with an online transcription service and have been checked for accuracy before further coding and analyses using the qualitative data analyses software NVivo.

4. Perspectives on fairness in transport policy

This section details the first set of key findings from our survey and experiment. It examines attitudes and sentiments about fairness in transport policy in London, contrasting surveyed, deliberated and stated perspectives. All relate to employing a sufficiency principle for London's transport domain considering two pre-determined consumption ceilings: carbon emission caps for Greater London's transport system and road space availability for driving in Inner London.

4.1. Differentiating social groups

Fairness perspectives related to the differential treatment of different societal groups revealed a clear pattern across the employed empirical methods. The survey asked which groups should be held more responsible for having to reduce local transport emissions as much as possible, offering five options (Table 4). The most widely selected were "rich London residents with good public transport" (56.7 %) and "Inner London residents (living within current ULEZ Zone) with good public transport" (40.2 %). The least-selected was "older London residents that no longer need to travel as much" (14.3 %). Statistical tests identified significant differences in the response proportions across the different target groups (see Appendix E1).

Table 4
London Group Differentiation for priority behaviour change – Survey results
Survey Question: For the case of London, which of the following people should be held more responsible for reducing their local transport emissions?

London Group	Agreement (%)	Rank
Rich London residents with good public transport	56.7	1
Inner London residents (living within 2023 ULEZ Zone) with good public transport	40.2	2
People who are using transport for leisure	31.6	3
People who can work from home	29.8	4
Older London residents that no longer need to travel as much	14.3	5
Don't know	13.2	6
Other	5.3	7

The survey separately asked which groups should be exempt from having to reduce local transport emissions as much as most other people, with 10 options listed (Table 5). Three were chosen by more than half of respondents: "people with physical impairment" (55.6 %), "older people (e.g. above 65)" (50.6 %), and "people living in areas with no alternative to car use" (50.5 %). The least-selected options were "women" (6.5 %) and "ethnic minorities" (5.7 %). Again, statistical tests identified significant differences in the response proportions across the different target groups (see Appendix E2).

Table 5 also shows that the citizens' jury made similar judgements, assigning little or no responsibility to the physically impaired and elderly for reducing car use in Inner London. Participants were asked not only to assign more or less responsibility in the abstract, but also to assign car use reduction targets to different groups, as a percentage and in kilometres. The citizens' jury deemed it fair to expect car use reductions of more than 45 % by "access-rich" groups with good public transport, particularly when affluent or living in Inner London; one juror even endorsed a wealth tax for transport. For the target ratio of car use reduction expected of groups with the most and the least obligation to cut driving (excluding the fully exempt), the plenary discussion settled for a factor of 10.

Citizens' jury participants identified people with care responsibilities as deserving to be exempt. Similarly, a comparison group member said in an interview: "If you need to visit patients, which I often do, you need to go to different places" (CG_10). The citizens' jury assigned minimal responsibility (less than 5 %) to people on low income, and explicitly endorsed both means testing and social class consideration. Broad agreement also emerged that young people should have above-average obligations; one person suggested "phasing out" driving for them altogether.

In discussing key workers, the deliberations distinguished between "normal" and "affluent" categories. The former, deemed to include nurses and firefighters, for example, were assigned minimal responsibility (<5 %), while the latter were assigned as much responsibility as young people (30–40 %). "I'm talking plumbers, electricians, and things of that as well," one juror said in an interview (CJ_6), adding: "They should still be treated as essential. … I know plumbers can take a specific job, specific tool and go and do it on a bike, …on a train, but they're turning up the job, no idea what it's going to be."

A notable difference from the survey findings is that, although 50.5 % of survey respondents had deemed people living in areas with no alternative to car use as less responsible for reducing emissions from car use, this population did not come up in the deliberations. This may be due to the widespread availability of transport alternatives in Inner London. Overall, however, even at high levels of granularity, a relatively consistent perspective emerges of who should be most heavily targeted by sufficiency-oriented transport policies.

4.2. Judging different approaches to fairness

An exploration of attitudes towards different approaches to fairness in transport policy revealed a greater diversity of sentiments. The survey asked respondents to rank from most to least, the relative importance of several possible criteria for ensuring transport policies are fair, with 6 as the most important. Fig. 4 shows the mean ranking for each option and the distribution of rates. The top-ranked options were "If it secures minimum standards and protects basic needs for all citizens" (mean = 4.38) and "if it treats everyone in exactly the same way regardless of personal circumstances" (mean = 4.06). The popularity of minimum standards aligns with the findings of a survey across five European countries conducted for the umbrella programme of this research (MyFairShare, 2024). The lowest-ranking was "if it makes people pay for behaviours that impact negatively on others" (mean = 2.94). Statistical tests confirmed that there were significant differences in the importance

Table 5
Social Group Differentiation – Survey results for exempting groups and deliberation results of citizens' jury
Survey Question: For the case of London, which of the following groups should be exempt from having to reduce local transport emissions as much as most people?
Deliberation result: Ranking for exempting groups and fair reduction of driving by day in % and kilometres to achieve sufficiency goals.

Social Group	Survey agreement (%)	Survey agreement ranking	Citizen Jury ranking	Citizens' Jury suggested driving reduction (%)	Citizens' Jury suggested driving reduction (km)[a]
People with physical impairment	56.6	1	1	0 %	0 km
Older people (e.g. above 65)	50.6	2	2	<5 %	<1 km
People living in areas with no alternative to car use	50.5	3	n/a	n/a	n/a
People with care responsibilities	44.1	4	1	0 %	0 km
People on low income	43.9	5	2	<5 %	<1 km
Key workers (e.g. nurses, firemen, etc.)	40.2	6	2	<5 %	<1 km
Key workers/Jury: affluent key workers	40.2	6	5	30–40 %	5–7 km
People with mental impairment	38.4	7	n/a	n/a	n/a
Young people (e.g. under 25)/Jury: young and school run drivers[b]	18.6	8	5	30–40 %	5–7 km
Women	6.5	9	n/a	n/a	n/a
Other/Jury: trade workers	6.3	10	3	16–22 %	3–4 km
Other/Jury: taxi drivers/passengers[b]	6.3	10	4	30 %	5 km
Other/Jury: wealthy residents and people with excellent public transport	6.3	10	5	>45 %	>8 km
Ethnic minorities	5.7	11	n/a	n/a	n/a

[a] From an average of 18 km per day.
[b] "School run drivers" (typically parents driving their children to school) and "taxi passengers" were categories proposed by jury members. These refer more to trip purposes rather than social groups but were included for completeness of representing jury deliberations.

placed on these criteria by the respondents (see Appendix E3).

Table 6 compares survey responses with deliberated perspectives, with both similarities and striking differences. The top-ranked fairness approach in the deliberations was "fair process", which came third in the survey. However, the approach of "everyone the same", which ranked second among survey respondents, was not only deemed the least-fair approach by the citizens' jury, but identified as the only one to be rejected altogether. Notably, the distribution of survey ranks (D in Fig. 4) shows it was the most polarising of the approaches. Further analysis shows that frequent car users, driving at least three times a week (n = 449) were far likelier to rate this approach highly than other survey respondents (n = 772).

The lowest-ranked option in the survey, "paying for use/impact", was judged the third most attractive during the deliberation – though citizens' jury members also expressed some equity-related concerns. Similarly, reflecting on the recent expansion of London's ultra-low emission zone (ULEZ) and its surcharge on more polluting vehicles, a comparison group member said: "It'll harm the people who are poorest and can least afford a brand-new car" (CG_06). Another noted: "Where does it end? We already pay road tax. We already pay MOT maintenance [annual vehicle safety test], things like that, petrol or whatever charging. It is just we're in a time where people are struggling … everybody is feeling the pinch, and this just made things worse" (CG_05).

The survey also asked for responses to a final statement (Fig. 5): "People who drive with their cars in cities require significantly more space than those that take public transport, walk or cycle." Of the four options given, the top-rated were "I don't mind as long as drivers pay for the use of streets and parking" (mean = 3.20) and "I don't care as there is enough space in the streets I use" (mean = 3.04). These findings are notable when compared with the low rating of "pay for use/impact" as a fairness approach and given that London is considered Europe's most congested city (INRIX, 2024). A statistical test indicates that there were significant differences in the importance placed on these criteria by the respondents (see Appendix E4).

Process-oriented observations that people who could afford or require a car were being granted an "unfair privilege", and that "it upsets me and I don't understand why this is being tolerated" rated third and fourth, respectively, with the distribution of scores indicating more polarisation than with the top-scoring responses. Notably, frequent car users gave higher scores to "I don't care as there is enough space in the streets I use" and lower scores to the "unfair privilege" perspective than other survey respondents.

4.3. Procedural fairness and the role of a citizens' jury for transport

The study also explored attitudes towards citizens' juries as a means of achieving fairer transport policies. Table 7 summarises the perspectives of citizens' jury participants and members of the comparison group, noting the most important points made by members of each group. Overall, positive perspectives prevailed (85 of 124 comments); almost half of interviewees only shared positive views. Not one interviewee was only negative about the jury, and just over half submitted mixed views.

Interviewees from the citizens' jury and comparison group broadly held similar views. Positive comments most commonly referred to better access to local knowledge, greater representation through random selection, and opportunities for learning. Concerns and negative statements relate to limitations in jury time, risk of manipulation, and compromising principles of representative democracy. Notably, members of both groups expressed greater levels of trust for the juries than for politicians and found the deliberation approach superior to survey-based resident feedback.

Reflections by jury participants said it had created a "team feeling" that motivated them to think about policy and individual change. Discussing daily routines and life circumstances was considered particularly helpful to build a common understanding, making people less judgmental toward other positions. While formal presentations were widely appreciated, some participants also found the information difficult to understand. All jurors said they felt "more or less" comfortable with the jury outcomes.

Almost all reflections on a citizens' jury for transport policy deliberations referred back to policy- and domain-agnostic aspects of mini-publics. The use of a citizens' jury as a mediator for change was described by both the citizens' jury and the comparison group as a tool that is perceived as fair – so long as people were chosen randomly to ensure diversity of voices and had a local connection with knowledge of local factors influencing the choice of transport mode. Both groups also shared a sentiment that their support for policy measures would increase if they knew that a citizens' jury discussed and helped to decide on them.

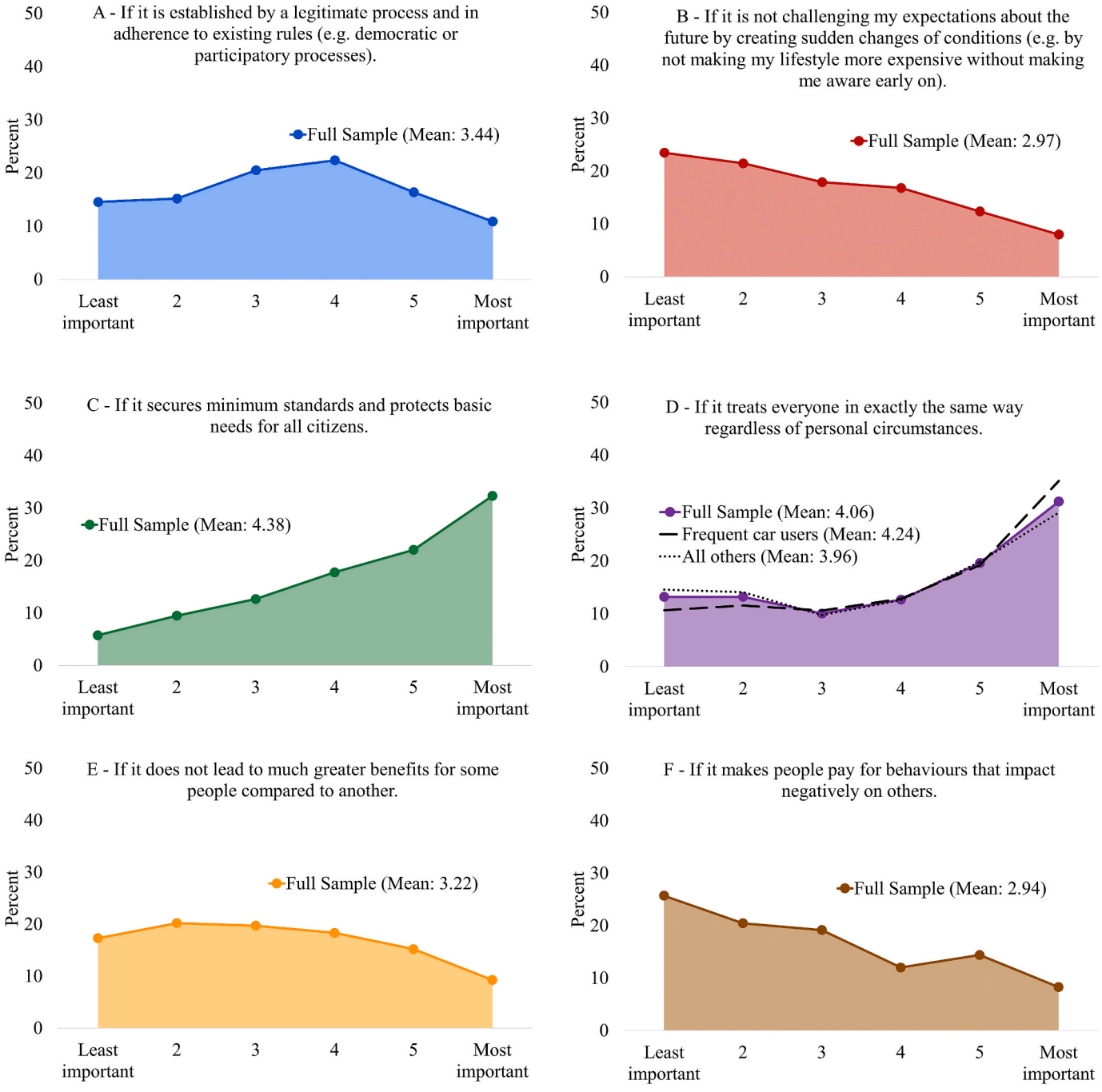

Fig. 4. Fairness Approach – London-wide survey
Survey Question (ranking): How important, do you think, are the following criteria to ensure new transport policies are fair? Distributions for the sub-groups "Frequent car users" and "All others" are shown when the means of the sub-groups are significantly different to each other.
Source: Authors

Table 6
Fairness Approach – Surveyed (London Survey) and deliberated (Citizen Jury).

Fairness Approach	Details for public communication	Survey score	Survey ranking	Citizen Jury ranking
Minimum standards	If the policy secures minimum standards and protects basic needs for all citizens.	4.4	1	2
Everyone the same	If the policy treats everyone in exactly the same way regardless of personal circumstances.	4.1	2	6
Fair process	If the policy is established by a legitimate process and in adherence to existing rules (e.g. democratic or participatory processes).	3.4	3	1
Benefits not too different	If the policy does not lead to much greater benefits for some people compared to another.	3.2	4	5
Fulfilling expectations	If the policy is not challenging my expectations about the future by creating sudden changes of conditions (e.g. by not making my lifestyle more expensive without making me aware early on)	3.0	5	4
Paying for use/ impact	If the policy makes people pay for behaviours that impact negatively on others.	2.9	6	3

4.4. Cross-cutting fairness in transport

The final analysis of attitudes towards fairness again compared the views of citizens' jury members with those of the comparison group. Table 8 summarises general points and those concerning space consumption or emission/pollution. Most sentiments referred either to how different social groups are treated – with general support for wealthier people doing more, as well as recognition of the economic challenges that many people already face – or the process through which decisions in transport policy are reached.

Fairness considerations regarding the use of scarce street space revealed three main sentiments: First, as in our survey, several participants did not see it through a fairness lens and were quite agnostic when it came to how much space different people use for their travel. Second, a recognition that car use in inner city areas does not reflect a fair share of space and being charged for it should be considered a fair compensation. Third, intuitive fairness judgements based on observing everyday street use. One interviewee noted that bus lanes keep drivers in congested lanes, and getting rid of them would solve it. Another said: "We basically rigged our entire transport system in London to support 30-something men in Lycra to help them get to work a bit faster. It's an incredibly socially inequitable way of doing public policy" (CG_05).

It is worth noting that while all interviewees accepted the notion of the transport sector as its own justice domain, several noted limitations, including a concern about focussing only on local transport and not, for example, the impact of "private jets" (CJ_5) and the view that fair individual emission reduction targets would only work if other sectors were also considered.

5. Operationalising fair car use budgets

The study also examined the specific case of car use budgets and their

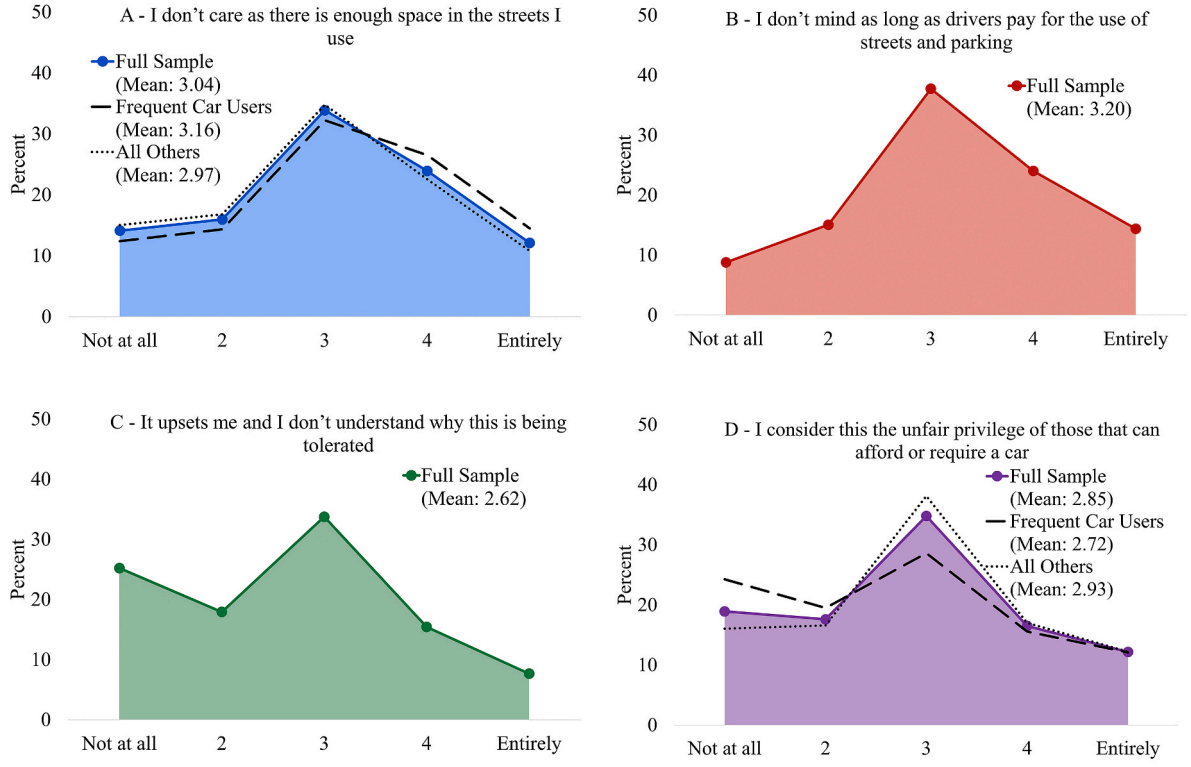

Fig. 5. Views on space consumption through car use in cities – London-wide survey
Survey Question (rating): People who drive with their cars in cities require significantly more space than those that take public transport, walk or cycle. How well do the following statements represent your views on this? Distributions for the sub-groups 'Frequent car users' and 'All others' are shown when the means of the sub-groups are significantly different to each other.
Source: Authors

Table 7
Perspectives on citizens' jury for urban transport policy
Number of interviewees expressing either only positive, only negative or mixed reflections. In brackets are the number of comments in each category.
Citizens' Jury: reflections on jury trial and usefulness for transport policy
Comparison Group: reflections on reaction to hearing ideas came from jury plus general views on legitimacy.

Group	Positive	Negative	Mixed/Depends
Citizens' Jury Group	3 (37)	0 (12)	6 (9)
Key Points CJ	Diverse range of participants contributing (4) Opportunities to learn new information (4) Well-structured and balanced sessions (3) Breakout sessions and group discussions (3) Consensus-building and compromise (2) Effective use of technology and visual aids (2) Surprise and new perspectives (2) Interesting and engaging format (2)	Not enough discussion time (2) Limited involvement in discussions (1) Need to do additional research (1) Overwhelming information (1) Difficulty retaining long questions (1) Intimidation and confusion during interactions (1) Preference for deeper discussions (1) Information overload in initial session (1) Time constraints limiting detailed exploration (1)	Fair but incomplete discussion on implementation (1) Lack of detailed discussion on road design (1) Mixed feelings about the presentation style (1) Quick prioritizing process felt insufficient (1) Hesitation to fully contribute to discussions (1)
Comparison Group	6 (48)	0 (8)	4 (10)
Key Points CG	Public involvement leads to better understanding and access to local knowledge (18) Better representations, randomized, fair selection (7) Jury offers more valid points, much better than surveys (4) Trust in assemblies over politicians, overcoming vested interests (3) Creative counterbalance of expert knowledge (2) Education and learning (2)	Concerns about leading the jury with biased information and risk of manipulation (1) Consider principles of representative democracy: Politicians should be accountable for decisions and worry about abdication of responsibility by politicians (1) Caution against starting with a predetermined outcome (1)	Limited time commitments and ability to participate due to life circumstances (2) Complexity of process and questioning applicability of direct democracy in diverse societies (2) Distrust of political figures involved and rigging the process (1) Direct democracy risks divisiveness (1) Legitimacy concerns without ability to vote leaders in and out (1) Support for the jury as part of decision-making but final say with elected officials (1)
Total	9 (85)	0 (20)	10 (19)

operationalisation with the above fairness perspectives in mind. Below, we present broader sentiments on a budgeting approach, the design of fair interventions developed by the citizens' jury, and behavioural and attitudinal responses to our pilot experiment.

Table 8
General fairness reflections post experiment
Number of interviewees expressing views. In brackets are the number of comments in each category.

Group	General	Space	Pollution/ Emission
Citizens' Jury Group	7 (7)	1 (1)	4 (4)
Key Points CJ	Fairness really important, particularly for disadvantaged (2) Fairness perspectives are difficult to translate to behaviour (2) Fairness is complicated and hard to define (1) Unfairness not seen (1) Captive car use (1)	All about the choice and personal preference where to live (1)	Global CO_2 emissions are not stopped by London drivers (1) Fairness as behaving in a considered way and turning off engine (1) Unfairness of who pollutes and who is impacted (1) Costs is the driving factor of behaviour (1)
Comparison Group	7 (8)	5 (5)	5 (5)
Key Points CG	Fair to pay for negative externalities (3) Fairness in transport not thought about by participants (2) Unfair perception of how transport policy is agreed (2) Car use not fair or unfair, paying more taxes (1) Life is not fundamentally not fair (1) Possible unfairness of urban driving not stopping to drive (1) Intention vs behaviour gap (1) Cycling as unfair clientelism (1) Unfairness of not knowing about negative effects of driving at moment of purchase (1)	Fairness of space use not thought about (2) Driving is beyond a fair amount of resources, but behaviour change is difficult (1) Fair to charge for driving in Inner London (1) Bus lane perceived as waste of space and leading to congestion (1)	Other broken things more important than air pollution (1) Air pollution reduction not fair or valid policy objective (1) China and US matter more (1) Unfair to guilt trip drivers (1) Change needs to start with the privileged (1)
Total	14 (15)	6 (6)	9 (9)

5.1. Attitudes and sentiments on budgeting

Our sentiment analysis regarding car use budgets builds on comparing interview statements of jurors and the comparison group (Table 9). With regard to mode-specific budgeting in the transport domain, six interviewees were entirely positive, four negative, and eight expressed the need to clarify key characteristics of the concept. Positive statements total above half of the comments and include key points such as greater awareness and "eye-opening" that could translate to behaviour change. Privacy and surveillance concerns, as well as richer populations "gaming" the system, are among the key negative sentiments.

Notably, perhaps reflecting the nuances raised during deliberations, members of the jury group were likelier to highlight the complexity of the approach and the need to address a range of critical points. The

Table 9
Perspectives on budgeting car use
Number of interviewees expressing either only positive, only negative or 'depends' reflections. In brackets are the number of comments in each category (statements that are qualified are also considered under key points).

Group	Positive	Negative	Depends
Citizens' Jury Group	1 (11)	1 (5)	6 (7)
Key Points CJ	Greater awareness linked to behaviour change (2) Better than nothing (1) Potential for gamification (1) Interesting novelty (1) Intervention type required for sustainable world (1)	Privacy and surveillance concerns (2) People exploiting and budging system (1) Implementation challenges, complexity of monitoring and technical limitations (1) Emergency situations (1)	As long as fair budget distribution is considered to account for different need level (2) Important budgets can be traded (1) Difficult to operationalise car use budgets (1) How to relate transport carbon budgets to other carbon budgets (1) Ensure there is full uptake otherwise unfair (1) Trusted data partner key (TfL better than Google) (1)
Comparison Group	5 (12)	2 (5)	3 (3)
Key Points CG	Big eye-opener incentivising change (1) Balancing car users and non-car users (1) Incentivising modal shift (1) Fair as everyone has the same limit (1)	The rich will game the system or benefit unfairly (2) Disagreeing with the idea of getting cars off the road (1) Concerns about administering car use budgets (1) Risk of becoming a controlled society (1)	Hard to make it fair (1) Special circumstances need to be considered (1) Important to avoid judgement and shaming (1)
Total	6 (23)	3 (10)	9 (10)

comparison group featured more direct, spontaneous and positive responses such as "it makes sense" (CG_9); "I would be in support of that for sure" (CG_08); "I think it's good because I think for myself it might help me to reduce my non-essential journeys" (CG_05), and "you have a limit, and then if you reach a limit then you have to use other forms. Yeah, I think it sounds good" (CG_01).

5.2. Designing fair interventions employing car use budgeting

Acknowledging budgets for car kilometres driven in London and the implied need for reducing aggregate car kilometres, jurors initially developed a long list of policy approaches and instruments that could be employed (Appendix F1). The ideas were organised by the three broad categories of information-based, economic and regulatory policy instruments and developed further in the third jury session in a series of break-out groups and plenary discussions (see Appendix F2 for ideas by breakout group). This process identified preferred instruments for fair car use budgeting that also met the criteria of directly addressing ceilings for car use in Inner London and being capable of changing behaviours within the next 12 months.

Among the *information-based instruments*, the breakout groups and plenary all favoured an awareness and information campaign. The deliberation further revealed a preference for highlighting London-specific problems, including congestion and local climate change impacts such as floods and heatwaves. The group also saw considerable opportunities using personal statements of "average Londoners" related to their experience with travel behaviour change as an important campaign addition. There was also broad support for highlighting the personal advantages of not having to drive, such as health and savings, and providing information on travel alternatives, employer support for changing travel modes, and safe cycling routes.

Considerable agreement also emerged on *economic instruments*: All breakout groups identified differential kilometer-based road pricing as the "best bet". In plenary they then supported an average of 10p per km and up to 30p per km fee for "access rich" social groups. Supplementary ideas that were broadly welcomed include further adjustments to parking fees, road pricing adjusted to vehicle size or emission levels, as well as company-level incentives for cycling (e.g. more holidays) and grants to support sustainable travel choices. Free public transport, direct tax incentives to reduce car use, and increasing existing congestion or ULEZ charges were considered politically less feasible than a new, fairer road pricing approach.

Deliberating on *regulatory instruments* resulted in the greatest level of diversity of preferred options within the breakout groups. There were some overlaps for extending low traffic neighbourhoods (LTNs) and enforcing speed limits of 30 km/h. Additionally, groups separately proposed car-free days or weeks, zero parking provision for new flats, delivery restrictions and blue badge driving permits for disabled people. Judged as lower impact interventions were driving restrictions based on license plates, HOV driving, engine size restrictions and school zones. Discussions on how to apply regulatory instruments to different social groups aligned with the broader sentiments discussed above. Exemptions for disabled people were most clearly supported, and driving restrictions for the young proved popular.

Across these policy instruments, the jury chose to not literally work with car use budgets in the form of rationing or trading, but rather to consider the average ceiling as a central reference for a key performance indicator of bringing down the average kilometres driven in Inner London. A direct approach to car use budgeting only featured as part of information-based instruments where apps could provide details on budgets of individual users.

5.3. Behavioural and attitudinal responses to the interventions

Our interventions were structured around the above ideas of implicitly operationalising fair car use budgets. Following the six-week travel behaviour observation period and the deliberations of the citizens' jury, we conducted three intervention trial weeks, each attached to the most preferred while feasible information-based, economic and regulatory instruments.

Below follows a discussion of the qualitative behavioural and attitudinal responses of the individual trials (also in Appendix G). As indicated in Fig. 6 which reflects the objectives above rather than reflecting a statistically relevant finding, none of the interventions led to a clear behavioural response at the aggregate level. No reduction in car travel was observed for either the citizens' jury or the comparison group

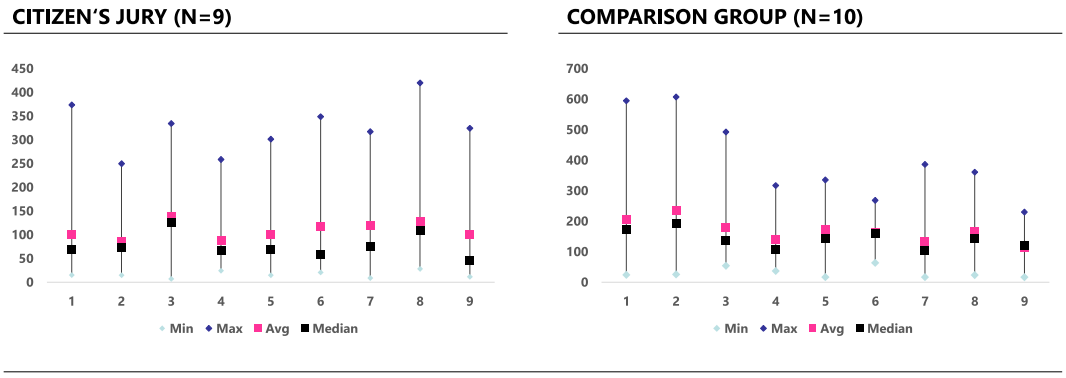

Fig. 6. Overview of weekly kilometres driven by citizens' jury (l) and comparison group (r) across the nine pilot experiment weeks (week 7–9 are intervention weeks).
Source: Authors

during trial weeks 7–9, relative to baseline measurements in weeks 1–6.

The *first trial* focussing on information-based instruments utilised an awareness campaign informed by ideas of the citizens' jury. During the interviews, the value of increased consciousness was emphasised in many instances, but no participant suggested that this alone translates to direct actual change. In particular, the function of "making a first step/talking about it" (also telling their social environment about it) and education, also in the context of the link between climate change and car use, was mentioned as very important.

For both groups, educational elements of the information campaign were welcomed. Images of London flooding and fires during the 2022 heat wave, as well as travel behaviour change testimonials, created a personal and direct connection. The information on travel alternatives and app applications was equally considered as valuable. Yet, more explicit personal messaging also intensified feelings of "helplessness", "frustration with politicians" and guilt. In the comparison group, references were made to an "incomplete picture" of the information provided, with smaller existing efforts not acknowledged. While generally raising the right issues, the messaging was also considered by some as too populistic and oversimplified.

Focussing on economic instruments, the *second trial* put forward a 30p payment as incentive for every saved km over a period of one week (compared to previously recorded averages). While considered a promising and impactful measure, participants were willing to forgo the financial gain, possibly due to the limited time and constraints linked to the Christmas period. This trial was referred to as "nice challenge" for many, but its December timing made it difficult to follow through and participants were willing to "pay the price" for the convenience of car use. However, it was widely considered a good measure, though some said it felt wrong to be incentivised to change something that should be changed without an incentive. Concerns were also raised that it would target people who might be more interested in a financial reward, creating too much social inequality.

The final and *third trial* focussing on regulatory instruments had to operate with a non-enforceable, simple request to reduce the number of hours or days of car travel. While easier to implement and allowing for potentially reorganising daily or weekly routines, concerns were raised regarding emergencies and personal situations requiring compromising such a rule. For many, this was a measure that is easy to implement and provides an incentive to reorganise everyday life. Both groups emphasised that the measures seemed tailored for individuals driving in Inner London and those with the ability to work remotely. However, some participants described the measure as restrictive of individual freedom.

Across all three trials and based on the in-depth interviews with participants, the observed broader enablers of behaviour change include:

- Improved understanding of personal circumstances and needs
- Discussions on fairness and effective policy tools for equitable policy implementation
- Data on personal travel behaviour impact – in the London case some participants continued to use the tracking app even after the trial
- Presentation of alternative lifestyles or travel modes as options for consideration

By contrast, entrenched barriers of behaviour change cut across:

- Work-related activities: Involves carrying heavy materials and traveling to various scattered locations within Greater London
- Personal reasons: Includes caring duties
- Comfort and flexibility of personal use: Refers to the convenience and adaptability of using personal vehicles
- Willingness and ability to pay for driving in London: Includes the readiness and financial capability to cover the costs associated with driving in London

Both enablers and barriers to change cut across the jury and comparison group. Both groups recognised the legitimacy of a citizens' jury and stressed the relevance of appreciating that ideas were developed through a forum of 'representative' citizens rather than by politicians and experts.

Among the citizens' jury participants, it was highlighted that the information presented during the jury sessions and the discussions with other participants led to a higher awareness and understanding of the interrelated effects of car driving and environmental consequences. While also feelings of guilt intensified as they heard others talk about their daily routines and reflected on their own, how this translated to actual behavioural change remained unclear. On an interpretative level, it can be concluded that jurors exhibited an intention-behaviour gap.

For the participants of the comparison group, a critical factor for potential change was the fact that interventions were designed by a citizens' jury made up of other car drivers. They also suggested that the experiment led to subconscious influence in decision-making situations, but not to direct behavioural change. Several comparison group participants felt that they would have been likelier to change their behaviour if they had been part of the jury.

6. Next steps and potential for broader application

This study was both a pilot experiment testing several methodologies, and an opportunity to gain some insights on perceptions of fairness

in the context of urban transport policy. It is important to stress that on both counts, in order to make more general inferences about effects of deliberative processes, and the efficacy of behavioural interventions, our experiment would have to be scaled to a larger group of participants. Future work could test whether the consensual dynamics we documented may be disrupted by including more diverse and statistically relevant mobility groups beyond directly affected car users.

Several elements of the pilot experiment were identified as suitable for scaling. The employed smartphone tracking proved to be an effective tool capturing mobility behaviour and successfully met three objectives during the experiment. First, participants were able to get a more direct impression of their everyday mobility behaviour evidenced by proactive engagement and confirmation of tracked data. Second, using the app had a positive effect on the participants' engagement in the experiments, as participants reported the benefit of being able to relate their mobility behaviour to broader policy questions as confirmed in the interviews. Third, researchers could reliably measure whether there was a change in mobility behaviour associated with the interventions.

The chosen approach for deliberating and establishing differentiated car use budgets for different social groups allowed for an engaged and productive exchange. Useful elements included an initial live surveying of participants individually on which groups they would want to differentiate, and an initial ordering of social groups based on pre-established and common categories also used in our representative survey. Continuing the brainstorm in separate breakout sessions, identifying the groups with the highest and lowest car use budgets and based on this distributing all other groups proved equally effective. Moving from breakout to plenary was supported well by digital white boards instantly shareable with all participants. Equally, the ideation of policy interventions based on all-ideas-welcome brainstorming and their refinement in breakout groups allowed identifying the most consensual ideas by instrument type.

Besides opportunities for scaling, our pilot also revealed how to improve future pilot experiments. By considering a control group with different rather than no participatory engagement, experimental comparison could include other formats which either just deliver information or focus primarily on individual experience and pre-existing opinions. Most importantly for capturing behavioural effects of the chosen interventions, these would have to be tested over a longer period. Not only were our week-long approaches too short, but it also overlapped with pre-holidays travel behaviours. We would also reconsider how to test the effect of economic instruments, which ideally should directly charge for driving or find appropriate proxy simulations, rather than opting for payouts for reducing car use, as we did. Finally, future experiments will benefit from better differentiating different social groups and trip purposes as part of testing and refining approaches to car use budgeting.

The pilot experiment also raises questions that our research did not address, particularly with regard to the politics of setting-up mini-publics and critical decisions on its remit, formats and information provided. The level of trust which participants have in the process and its main actors also needs to be better understood. In our study, the researchers appear to have been granted a trust premium by participants in relation to factual data and information provided. In order to contribute to real-world policy and planning processes, future applications of this methodology are likely to require partnerships with government entities engaged in transport policy-making and planning, and this could affect trust.

It is also important to note that the favourable views of citizens' assemblies and juries shared in our study may relate to their relative newness, which means they remain more insulated from negative experiences and associations. Inevitably, higher-profile and more influential deliberation forums will translate to more scrutiny of their legitimacy and process and even more pressure on individual assembly members. This points to the need for further research on the potential role of mini-publics relative to technocratic processes and representation-based decision-making. Action research with deliberations on actual transport policy questions thus constitutes a major opportunity for refining the concept and its application.

Empirical testing of car use budgeting as part of official transport-focused citizens' assemblies can also assist proof-of-concept efforts. Potential refining may focus on the distributional side with a better understanding of the efficacy and deliberative method of developing budget proportions across different social groups and trip purposes. Such work may involve utilising more sophisticated digital tools, potentially borrowing from structured decision-making associated with multi-criteria analysis. More work will be required on translating deliberated car use budgets to specific policy instruments if they could play a role beyond deliberating differentiated treatment principles. There could also be value in testing similar deliberative approaches with elected politicians.

Finally, recognising the robust fairness sentiments and prioritisation of securing minimum standards, which our study also confirmed, establishes a critical point of departure for more applied research associated with transport equity moving forward. As several authors have commented before, this remains an unsolved issue (Pereira et al., 2017; Banister, 2018).

7. Conclusion

Our research provides new insights into how fairness of transport policy underpinned by sufficiency objectives is perceived by the general public. Centrally covered is the role of procedural fairness and how the deliberative format of a citizens' jury may play a role for establishing fair car use budgets for London. Methodologically, the jury approach unveiled public sentiments and improving an understanding of trade-offs potentially useful for overcoming polarisation which more quantitative approaches may struggle to reveal.

Overall and across the employed research methods, fairness considerations emerged as something that frames and enables change in a positive way. We were able to identify the nuances with which the public engages with fairness questions which may suggest that there is a real opportunity to activate related latent sentiments for policy design. Fairness also provided an effective anchor for the exchanges and debate among participants of the citizens' jury.

Similarly, a sufficiency framing and the fundamental idea of car use budgeting resonated positively across our engagement with jury members and the comparison group. While London and its street space constraint are an extreme case of scarcity many cities and towns experience, carbon consumption ceilings are more universally applicable across settlement types. Disaggregating abstract political targets and relating these in an understandable way to individual behaviours and budgets was seen as advantageous for deliberating, learning, engaging with fairness, and potential behaviour change. But rather than a direct application of car use budgeting, particularly as a regulatory policy instrument, an indirect use informing other policy instruments and assisting deliberative efforts was preferred.

While broadly accepting transport as separate justice domain within which dedicated fairness considerations should be advanced, our findings also repeatedly identified boundary concerns of sufficiency. Most of these reservations focussed on individual carbon budgets translated to car use budgets with questions about non-local travel, above all flying,

individual emissions in other sectors, the responsibility of corporations and other countries. By contrast, car use budgeting based on space consumption in inner city areas was not perceived as being compromised by geographic, sectoral or temporal boundaries. Yet, space consumption of transport modes does not appear to be an explicit category of framing fairness in transport by the general public which may point towards an opportunity of doing so more directly. Perhaps surprisingly, references to the role of markets and price signals as coordinating a fair distribution of transport goods were the exception and mostly coming from only one participant.

Finally, an important policy implication of our analysis suggests that operationalising fairness in urban car use will continue to struggle with the "pre-paid" nature of car ownership due to upfront expenditures and fixed costs which locks-in behaviour rather than enabling more dynamic changes of car use intensity at the individual level. Decoupling car use from car ownership is arguably an important pre-condition for a fairer use of scarce urban street space.

CRediT authorship contribution statement

Philipp Rode: Writing – review & editing, Writing – original draft, Visualization, Validation, Supervision, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Alexandra Gomes:** Writing – review & editing, Visualization, Validation, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Jannis Linke:** Writing – review & editing, Writing – original draft, Visualization, Validation, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Kate Laffan:** Writing – review & editing, Visualization, Validation, Supervision, Methodology, Investigation, Conceptualization. **Charlie Hicks:** Writing – review & editing, Visualization, Validation, Investigation, Formal analysis, Data curation.

Acknowledgements

This paper was prepared as part of the European research project "MyFairShare". Its UK contribution was funded by the Economic and Social Research Council, United Kingdom (Grant No. ES/W000512/1) as part of the JPI Urban Europe, European Research Area Network Cofund Urban Accessibility and Connectivity (ENUAC). In-kind support was provided by the Institute for Mobility at St Gallen University. The authors would like to thank Alexandra Millonig, Florian Lorenz and all collaborators who contributed to advancing our thinking and research approaches on transport fairness. We are grateful for the support of our praxis partner, Transport for London, represented by Kathrine Blair, our colleagues Mike Savage and Ben Plowden, students and research service providers who assisted with their invaluable advice and support. Akeem Akintoye ensured that our survey was accessible for its target group. Special thanks all representatives of the general public who supported this work with their input to the survey, the citizens' jury, the behavioural experiment and follow-up interviews. Any findings, interpretations, and conclusions presented in this research are exclusively by the authors and should not be attributed to any of our interviewees or supporting organisations.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.tranpol.2025.06.005.

Appendices.

Appendix A. Participants in Experiments and Interviews

#	Date	Duration (mm:ss)	Location	Title (code)	Class Category (based on Oesch)
1	05 February 2024	40:32	Online video call	CJ_1	Managers
2	05 February 2024	40:06	Online video call	CJ_2	Office Clerks
3	01 February 2024	47:39	Online video call	CJ_3	Production workers
4	01 February 2024	47:21	Online video call	CJ_4	Production workers
5	31 January 2024	46:55	Online video call	CJ_5	Production workers
6	08 February 2024	54:23	Online video call	CJ_6	Petite bourgeoisie
7	13 February 2024	44:08	Online video call	CJ_7	Managers
8	02 February 2024	51:13	Online video call	CJ_8	Service workers
9	07 February 2024	51:27	Online video call	CJ_9	Managers
10	02 February 2024	34:09	Online video call	CG_1	Production workers
11	01 February 2024	49:07	Online video call	CG_2	Service workers
12	07 February 2024	36:13	Online video call	CG_3	Production workers
13	07 February 2024	39:02	Online video call	CG_4	Socio-cultural specialists
14	06 February 2024	49:07	Online video call	CG_5	Service workers
15	08 February 2024	55:10	Online video call	CG_6	Managers
16	12 February 2024	39:24	Online video call	CG_7	Managers
17	12 February 2024	39:12	Online video call	CG_8	Managers
18	01 February 2024	41:01	Online video call	CG_9	Office Clerks
19	08 February 2024	39:28	Online video call	CG_10	Socio-cultural specialists

Appendix B. Citizens' Jury Mural Boards

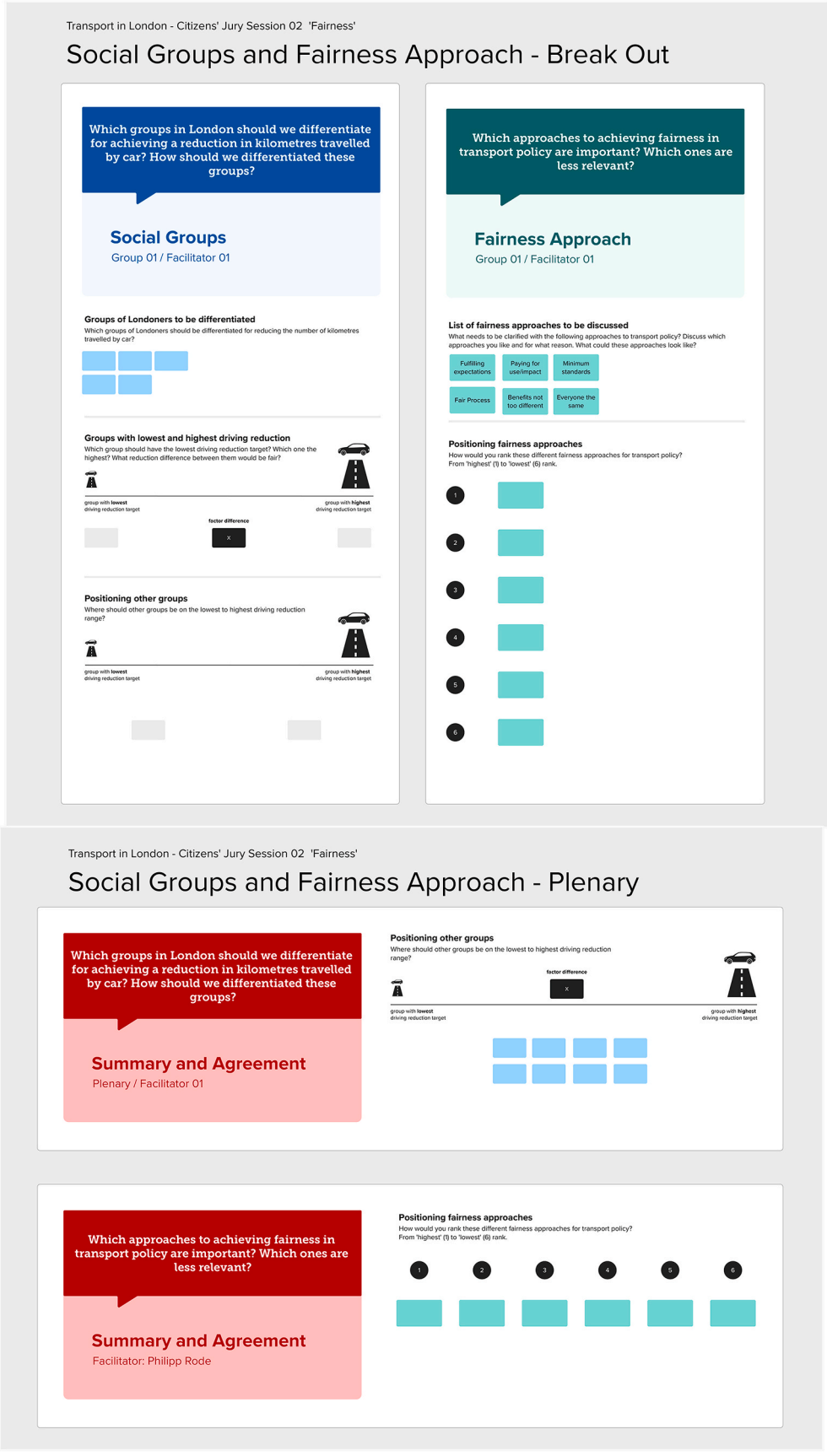

Fig. 7. Digital White Boards for Citizens' Jury Session 02 'Fairness for Urban Transport Policy'.

Transport in London - Citizens' Jury Session 02 'Interventions'

Policy Instruments for Car Use Budgets - Break Out

What type of information-based policy instruments should London employ to achieve a significant reduction in kilometres travelled by car in the short-term? How should these policies differentiate different groups?

Information-based Instruments

Group 01 / Facilitator 01

A. Brainstorming information-based policies

List any ideas that come to mind for the following four categories.

Awareness campaigns e.g. direct marketing campaigns promoting sustainable travel choices	**Information provision** e.g. providing real time passenger information
Standards (voluntary) e.g. introducing voluntary fuel efficiency labelling	**Education** e.g. training programmes for municipal transport planners

B. Prioritise information-based policies

Move any ideas above the the fields below

Moonshots High impact, but not as feasible	**Best bets** High impact and feasible
Low priority Low impact and low feasibility	**Low-hanging fruit** Lower impact, but feasible

Impact — Ignoring feasibility, how impactful would it be to implement each idea?

Potential feasibility — Ignoring impact, how feasible is each idea? (Cost, time, effort, complexity, etc.)

C. Tailored information-based policies by social group

Trade workers/people Lower reduction of 3 to 4 km (16-22% reduction)	**Young people** Higher reduction of 5 to 7 km (30-40% reduction)	**People with excellent public transport links for their journeys** Highest reduction above 8km (>45% reduction)

What type of economic policy instruments should London employ to achieve a significant reduction in kilometres travelled by car in the short-term? How should these policies differentiate different groups?

Economic Instruments

Group 01 / Facilitator 01

A. Brainstorming economic policies

List any ideas that come to mind for the following categories.

Taxes e.g. increasing vehicle ownership taxes	**Pricing** e.g. road user charging, parking fees

B. Prioritise economic policies

Move any ideas above the the fields below

Moonshots High impact, but not as feasible	**Best bets** High impact and feasible
Low priority Low impact and low feasibility	**Low-hanging fruit** Lower impact, but feasible

Impact — Ignoring feasibility, how impactful would it be to implement each idea?

Potential feasibility — Ignoring impact, how feasible is each idea? (Cost, time, effort, complexity, etc.)

C. Tailored economic policies by social group

Trade workers/people Lower reduction of 3 to 4 km (16-22% reduction)	**Young people** Higher reduction of 5 to 7 km (30-40% reduction)	**People with excellent public transport links for their journeys** Highest reduction above 8km (>45% reduction)

What type of regulatory policy instruments should London employ to achieve a significant reduction in kilometres travelled by car in the short-term? How should these policies differentiate different groups?

Regulatory Instruments

Group 01 Facilitator 01

A. Brainstorming regulatory policies

List any ideas that come to mind for the following categories.

Vehicle access restrictions e.g. traffic bans, license plate restrictions, high-occupancy-lanes	**Other operational codes** e.g. speed limits, right-of-way regulation

B. Prioritise regulatory policies

Move any ideas above the the fields below

Moonshots High impact, but not as feasible	**Best bets** High impact and feasible
Low priority Low impact and low feasibility	**Low-hanging fruit** Lower impact, but feasible

Impact — Ignoring feasibility, how impactful would it be to implement each idea?

Potential feasibility — Ignoring impact, how feasible is each idea? (Cost, time, effort, complexity, etc.)

C. Tailored regulatory policies by social group

Trade workers/people Lower reduction of 3 to 4 km (15-22% reduction)	**Young people** Higher reduction of 5 to 7 km (30-40% reduction)	**People with excellent public transport links for their journeys** Highest reduction above 8km (>45% reduction)

Fig. 8. Digital White Boards for Citizens' Jury Session 03 'Interventions for Urban Transport Policy'.

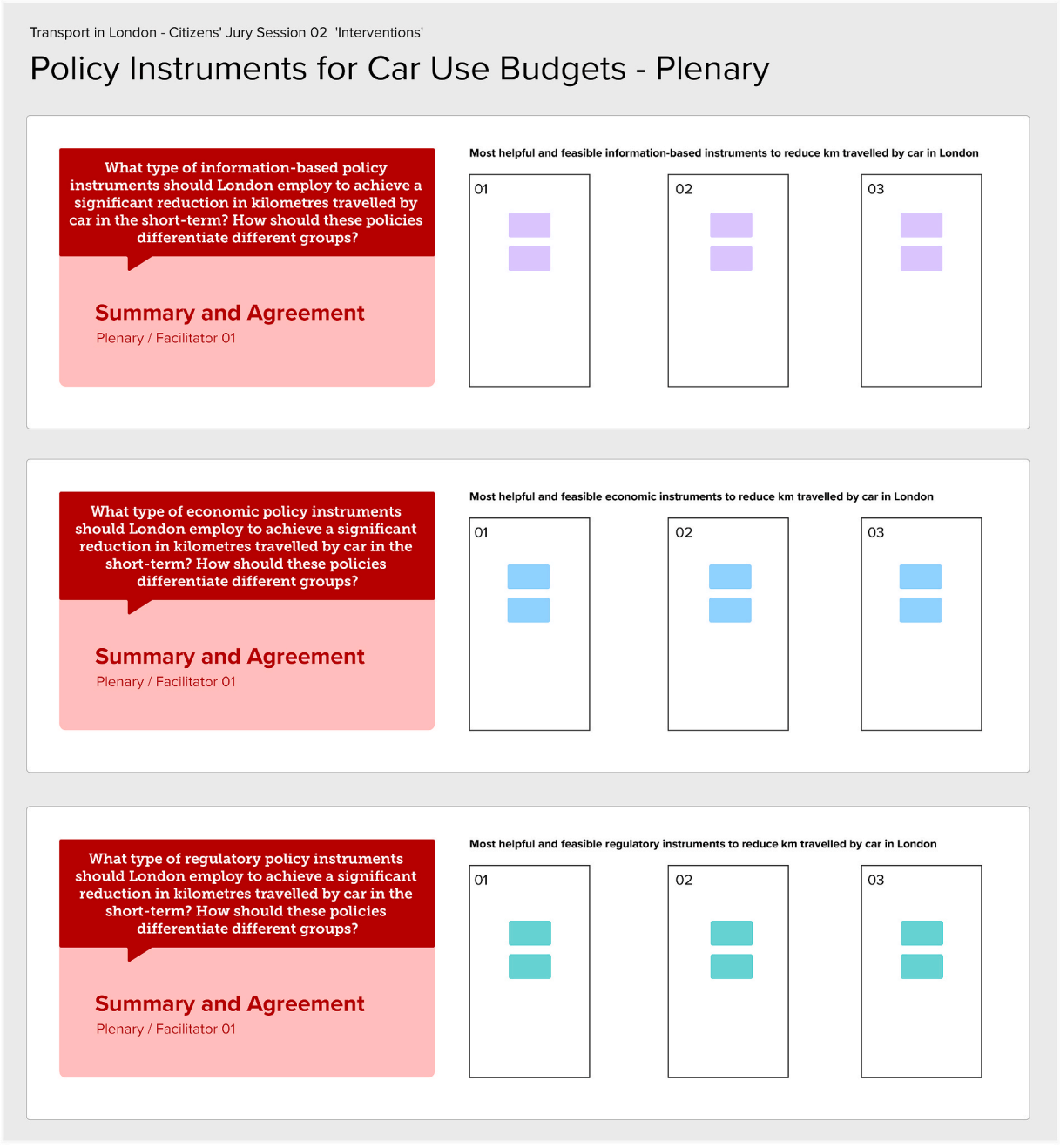

Fig. 8. (*continued*).

Appendix C. Instructions on the trials

Intervention	Instruction sent to participants
Information	For Citizens Jury: Dear [participant] Thank you very much for joining our final jury workshop on Wednesday. As promised, we are now following-up with a few interpretations of your ideas on information-based policy instruments which you will find attached. We would very much appreciate if you could have a look at the set of six slides which should take you less than 3 min. Ideally, we would like to have a look at this immediately or over the next 24 h. This is important for our study and we are also keen to get your feedback on the shared material as part of our interview. As always, please let me know if you have any questions. Have a nice weekend. For comparison group: Dear [participant] I am writing with a further update on our transport study and to share with you the latest input by our citizen's jury of London car drivers. The group worked on ideas for an information and awareness campaign which you will find attached. We would very much appreciate if you could have a look at the set of six slides which should take you less than 3 min. Ideally, we would like to have a look at this immediately or over the next 24 h. This is important for our study and we are also keen to get your feedback on the shared material as part of our interview. I am also again sharing the information on your travels by car in relation to required average driving reductions. Of course, I send the overview containing your current travel pattern solely to you. As always, please let me know if you have any questions. Have a nice weekend.
Economic	Dear [participant] We are now entering a second week of trialling ideas for urban transport policy in London. We are excited to share a different approach that came up at our Citizens' Jury. Essentially, this links driving in Greater London to financial incentives/disincentives. On this occasion, we will only focus on incentives. We will pay you £0.30 (thirty pence) for every km you are driving less within Greater London (defined as within the M25 motorway, including km driven on the M25) between Saturday, 09/12/23 starting at 00:00 to Friday, 16/12/23 ending at 24:00. Your saved km of driving will be calculated based on your weekly average of 144 km driven within Greater London over the first weeks of tracking. For example, if your weekly average was 83 km and you reduced this by 43 km, we will pay you £12.90. Payments will be made as Sainsbury's Vouchers with a code posted to you until the end of January. To process the vouchers, we would need you to do the following: 1. Continue keeping your mobile app tracking on for all journeys. We can only integrate you into the trial if you follow your regular mobility patterns and have spent most of your days in Greater London with recorded stays or tracks. 2. Send us a short statement by the end of the trial (after Friday, 16th of December) of how many km you think you reduced driving within Greater London and one sentence on how you did this. 3. When closing this e-mail, you will be asked if you read it. Please confirm if you want to participate in the trial. If you have any questions, please do not hesitate to contact me.
Regulatory	Dear [participant] We are now entering the final week of trialling ideas for urban transport policy in London and would like to share with you a final approach identified at our Citizens' Jury. This approach addresses driving in Greater London through a regulatory method which is used by some cities abroad. As we can only simulate this type of intervention, we would like to kindly ask you to comply with the following instructions. Please note that this instruction is based on fairness criteria for different social groups our jury developed over the last weeks: 1. Either select 2 days between Saturday, 16/12/23 to Friday, 22/12/23 on which you usually drive in London and commit to not using your car on the selected day(s). 2. Or alternatively, select an AM/PM period (12AM-12PM mornings or 12PM-12AM afternoons and evenings) during which you normally drive and commit to not using your car. This commitment would be required for 4 day(s) between Saturday, 16/12/23 to Friday, 22/12/23. Please do reply to this email, briefly indicating which option you would like to go for. During our interview, we will share the level of your compliance compared to other (anonymous) participants trialling the above ideas. As before, sharing your experience with following this instruction and how this may present challenges and opportunities during our upcoming interview will be of enormous value to our study. Many thanks in advance and please do get in touch if you have any questions.

Appendix D. Interview guidelines

Part	Text/Question for Participants of CJ	Text/Question for Participants of CG
Opening	- Welcome: ".thanks a lot for your time today." - Initial audio/video check-up: Can you hear me/see me without any restrictions? - Do you feel comfortable, do you have some water or something to drink?	*Identical to Text/Question for Participants of CJ*

Agenda	- **Today:** Closing/Recap interview of our London mobility study.
	- **Important:** There are no wrong or right answers. We are interested in your honest views and perspectives on different facets of this study and transportation in general.
	- **Agenda:** I will first briefly recap the last months, after this, there is time for any questions you may have in advance of the interview, then we will start the recording, which means that I will ask you questions, and we will have a conversation-style dialogue.
	- **Brief Recap:**
	  - **App-tracking:** Mid-October to 22nd of December.
		- **Today:** *Identical to Text/Question for Participants of CJ*
		- **Important:** *Identical to Text/Question for Participants of CJ*
		- **Agenda:** *Identical to Text/Question for Participants of CJ*
		- **Brief Recap:**
		  - **App-tracking:** *Identical to Text/Question for Participants of CJ*
		  - **3 Trials (each one week)**: *Identical to Text/Question for Participants of CJ*

(*continued on next page*)

(*continued*)

Part	Text/Question for Participants of CJ	Text/Question for Participants of CG
	- **Three workshops:** 1st on general information, 2nd on first concepts of differentiating between groups, 3rd on operationalisation as a basis for the trials in December. - **3 Trials (each one week):** 1st information-based; 2nd with economic incentives (0.3£ for every km reduced of weekly average); 3rd regulatory-based with driving restrictions for hours or days.	
Ready to go?	- Are there any questions you would like to ask before starting the interview? - Do you agree that I can record the session and use the anonymised audio file of the recording for analysis?	*Identical to Text/Question for Participants of CJ*
Opening	Please tell me how you would describe your current mobility behaviour, especially regarding mode choice and why you choose respective modes (in general, for mobility in Greater London).	*Identical to Text/Question for Participants of CJ*
Continu-ation & Change	Can you tell me your decision process when deciding on a transport mode? - What criteria are you looking for when deciding on a transport mode? *(For interviewer: aiming for routine)* - How would you describe change for this decision process? (e.g. how difficult is it to reduce car use in the immediate future (2 weeks)?) *(For interviewer: aiming for change)* - What are differences in influential criteria depending on the trip purpose (e.g., commute/work, leisure, errands) *(For interviewer: aiming for current behaviour and change)*	*Identical to Text/Question for Participants of CJ*
New Mobility Services	What do you think about, so-called, (New) Mobility Services to change your mobility behaviour? *Explanation for interviewees: New mobility services are understood as a service where instead of buying a vehicle, you buy services, often shared services,* e.g. *(e-) bike, e-scooter, car-sharing, ride-pooling, all in combination with public transport.* In which situations would you/do you already use mobility services (and which mobility services) as a substitute for driving with your own car?	*Identical to Text/Question for Participants of CJ*
Influence of trials	How would you describe the influence on your decision process/outcome considering the three different measures in our mobility trials? (Information, economics, regulatory) - Information *(Slidedeck with information on consequences of climate change, testimonials, and alternative for car use)*: oHave you seen the slidedeck? o*For interviewer: Show slidedeck if not seen by participant* oHow would you describe the influence of this measure on your mode choice? oDid the information change your decision process for mode choice? *(must not be the actual outcome)* - Economic *(you were incentivised to receive 30 pence for every km you drive less with your car based on your weekly average during the study)*: oHave you seen the call for the trial? oHow would you describe the influence of this measure on your mode choice? oDid the information change your decision process for mode choice? *(must not be the actual outcome)* - Regulatory *(you were asked to choose if you would rather go for 2 days where you do not use your car or 4 days where you only drive in the mornings or in the evenings)*: oHave you seen the call for the trial? oHow would you describe the influence of this measure on your mode choice? oDid the information change your decision process for mode choice? *(must not be the actual outcome)* - How would you describe change due to/influence of the three measures? - Was this change deliberate? (e.g. ordering online; changing routines/ sequences) - Across all three trials: How did you go about alternatives, i.a., mobility services?	*Identical to Text/Question for Participants of CJ*
Fairness	How would you -as a car driver- describe the influence of fairness dimensions (i.a. carbon emissions and spatial equity) on your willingness to change to other transport modes? - What are your thoughts on individual budgets for mobility? *(For interviewer: this means bringing strategic issues down to individual behaviour and measurement)* - How acceptable do you find it to work with individualised information on transport behaviour?	
Intro	We will now talk about the concept of Citizens Juries. We will first focus on our Citizens Jury, then discuss the general concept and then focus on implications for your individual behaviour.	
Evalu-ation of Citizens Jury	What was your reaction to hearing a Citizens Jury came up with the respective ideas for the trials and alternatives? - Does it make a difference to ideas coming from experts/governmental institution/TfL?	What was your reaction to hearing a Citizens Jury came up with the respective ideas for the trials and alternatives? - Does it make a difference to ideas coming from experts/governmental institution/TfL?

(*continued on next page*)

(*continued*)

Part	Text/Question for Participants of CJ	Text/Question for Participants of CG
	- Looking into the future: Imagine we would conduct a Citizen Jury again – how would you like to participate or not to participate to have the most positive influence on you changing your mobility behaviour?	Looking into the future: Imagine we would conduct a Citizen Jury again – how would you like to participate or not to participate to have the most positive influence on you changing your mobility behaviour?
The concept in general	Under what circumstances would you consider the ideas of a Citizens Jury as legitimate for directly advising and informing London policy? - How do you see the "fairness" of a Citizens Juries decision when being part of it vs. not being part of it?	
Social conformity	How did you experience social conformity/peer pressure?	
Influences on behaviour	How would you describe the influence of the Citizens Jury on your mobility behaviour/decision-making? - Do you see a change in your willingness to change to other transport modes/ new mobility services? *(due to the Citizens Jury)*	
Closing	Thank you for all your views provided. I will now stop the recording.	
Final information	Thanks again for your time invested in our study, participating over the whole study term and sharing your views in today's interview.	
Debriefing/next steps in the project	I want to state a few last things about our mobility study as a debriefing: - The study included people who drive by car in Greater London regularly. - There were two groups, the workshop group and a group that only received the information/results discussed by the workshop group as instruction for the trials. - The study aimed to shed light on analysing different mobility behaviours and purposes of people regularly driving in Greater London, operationalising the concept of Citizen Jurys for questions in transportation, and gaining insights into how fairness and social equity can be a moderator to change mobility behaviour.	
Final information	- Today's interview marks the end of the study. - Your allowances will be transferred within the next two weeks. You will receive a payment over £XX - We will also send you a code for a Sainsbury Voucher over an amount of £XX as compensation for the second trial.	
Final questions	Do you have any questions unanswered?	

Appendix E. – Statistical Tests

Appendix E1. Differences in responses on responsibility to reduce emissions from travel

Given the nature of the statistical tests, inferential analysis is based on the original unweighted dataset.

A Cochran's Q Test identified significant differences in the response proportions across the different target groups (p-value<0.001). Follow-up pairwise McNemar tests, with Bonferroni adjustments applied to the p-values, identify significant differences at $p < 0.001$ across the groups in 9 out of the 10 comparisons, the exception being responses to "People who are using transport for leisure" compared to "People who can work from home", for whom the results were statistically equivalent. The greatest difference was across the high level of responsibility identified for rich Londoners compared to older residents.

Pairwise comparison	Bonferroni adjusted p-value
Inner city/For leisure	4.68E-08
Inner city/Older	3.4E-54
Inner city/rich	9.66E-19
Inner city/Work from home	5.03E-09
For leisure/Older	1.06E-27
For leisure/Rich	7.52E-44
For leisure/Work from home	1
Older/Rich	5.42E-107
Older/Work from home	1.07E-25
Rich/Work from home	2.47E-48

Note. Based on pairwise McNemar's tests.

Appendix E2. Differences in responses on exemption from responsibility to reduce emissions from travel

A Cochran's Q Test identified significant differences in the response proportions across the different target groups (p-value<0.0001). Follow-up pairwise McNemar tests, with Bonferroni adjustments applied to the p-values, identify significant differences across the groups in 36 out of the 45 comparisons at $p < 0.001$. There were substantive differences in the level of exemption applied to people with physical constraints that affect their travel options, including living with physical impairments or in areas with no alternatives to car use, who were afforded exemptions at a higher rate than more general social groups like women and ethnic minorities.

Pairwise comparison	Bonferroni adjusted p-value
No alternative in area/Caring responsibilities	0.029
No alternative in area/Impaired mental	1.00E-11
No alternative in area/impaired physical	1
No alternative in area/Key worker	2.92E-05
No alternative in area/Low income	0.00173
No alternative in area/Ethnic minority	2.75E-144
No alternative in are/Older	1
No alternative in area/Women	6.35E-139
No alternative in area/Young	1.99E-70
Caring responsibilities/Impaired mental	0.000365
Caring responsibilities/impaired physical	3.25E-08
Caring responsibilities/Key worker	1
Caring responsibilities/Low income	1
Caring responsibilities/Ethnic minority	3.01E-123
Caring responsibilities/Older	0.072
Caring responsibilities/Women	1.42E-121
Caring responsibilities/Young	4.43E-55
Impaired mental/Impaired physical	1.44E-38
Impaired mental/Key worker	1
Impaired mental/Low income	0.037
Impaired mental/Ethnic minority	9.05E-95
Impaired mental/Older	2.69E-11
Impaired mental/Women	2.96E-92
Impaired mental/Young	2.53E-33
Impaired mental/Key worker	2.26E-11
Impaired mental/Low income	2.96E-08
Impaired mental/Ethnic minority	8.24E-154
Impaired mental/Older	0.914
Impaired mental/Women	3.89E-152
Impaired mental/Young	2.70E-82
Key worker/Low income	1
Key worker/Ethnic minority	8.19E-109
Key worker/Older	0.000311
Key worker/Women	1.61E-105
Key worker/Young	2.84E-42
Low income/Ethnic minority	2.85E-119
Low income/Older	0.00522
Low income/Women	1.57E-119
Low income/Young	1.96E-57
Ethnic minority/Older	4.55E-140
Ethnic minority/Women	1
Ethnic minority/Older	1.16E-25
Older/Women	3.05E-140
Older/Young	1.16E-81
Women/Young	1.13E-21

Note. Based on Pairwise McNemar's tests.

Appendix E3. Differences in responses on fairness principles in transport policy

A repeated measures ANOVA indicates there are significant differences in the importance placed on these criteria by the respondents (p-value<0.001). When we apply pairwise *t*-test results with Bonferroni corrections, all but one of the 15 comparisons are significant at $p < 0.05$. The exceptions is the importance placed on not challenging expectations and making people pay for behaviours with negative impacts.

	Treats people equally	No challenge to expectations	Legitimate process	Minimum standards	No greater benefit
No challenge to expectations	2.4858E-51	NA	NA	NA	NA
Legitimate process	1.0759E-17	2.1837E-13	NA	NA	NA
Minimum standards	0.01680251	7.7771E-84	2.5049E-41	NA	NA
No greater benefit	3.4298E-31	6.8804E-05	0.0424675	6.315E-53	NA
User pays	4.303E-49	1	3.7818E-12	1.7109E-80	0.00013586

Note. Based on pairwise t-tests.

Appendix E4. Differences in responses to inequality in road space for cars

A repeated measures ANOVA indicates there are significant differences in the importance placed on these criteria by the respondents (p-value<0.05), but follow up pairwise t-tests indicate that only two of the six differences in average responses are significantly different: the difference between the statement about adequate space and pay for use/impact and separately adequate space and unfair privilege.

	Pay for use	Sufficient space	Unfair
Sufficient space	0.000106303742152843	NA	NA
Unfair	6.563E-15	0.00273106346403849	NA
Upset	1.0736E-33	4.933E-13	8.118E-11

Appendix F. Jury ideation

F1 - Jury ideation long list of sustainable travel interventions targeting the reduction of car kilometres travelled

Information-based	Economic	Regulatory
• Information about carbon emissions and congestion • Fines only when breaches of law are clear • Awareness courses • Letters through the door • Big signs for driving restrictions • Discourage driving • Encourage walking • Retraining driving instructors (predictive driving) • More questions on emissions in driving tests • Paper and maps are key • Building confidence for riding scooters • Culture of helping others/shopping for elderly neighbours	• Congestion charging • Tunnel system for cars • Incentives for electric cars • Incentives for smaller cars • Intelligent signals • Dial-a-van for elderly • Cycle lanes separate from road traffic • Cycling hubs and safe cycle parking • Orbital public transport • Safer cycling • Electric buses • Building more tram lines • Greater difference between costs of driving vs public transport • Roll-out of Dockland Light Railways (DLR) • Simpler public transport • Bus stops at the centre of car parks • More cycle superhighways • Staff at train stations • Free public transport • More trains and buses • Financial incentive to shop for neighbours • Adjust insurance payments to vehicle size	• Restrictions by time and day • School streets • Car-free areas • Restrict Uber • Don't allow new parking • Improve range of electric cars • Improve safety of electric cars • Safer scooters • Local services and amenities within walking distance • Better servicing of cars and vehicles • Car-free days • 4-day work week • Get SUVs under control • Reserve driving to people who need it • More working from home

F2 - Citizens' Jury Outputs by Breakout Group

Group 01 – Information-based Instruments	Group 02 – Information-based Instruments	Group 03 – Information-based Instruments
- co2 emission in insurance report - guided ceiling for co2 emission within company car travel - investment in keeping messages salient - co2 estimates from driving in the car - per jouney, culmulative - fuel consumption - direct feedback as in electric car- miles range left over – co2 and traffic- related campaigns - will maybe reach some - Info tailored to size of car type of car - lots of signage - regular refresh - awareness course - advanced driving test - trees planted- co2 equivalent	- This is affecting your children but also you! - Car pooling is saving money - cigarrete style, negative images at petrol - deterring from buying petrol - Idling cars awareness - government led info - voluntary use - understand better meaning of these metrics - education - use promotions about the environment - driving affect environmnent by X - drop of necessary at schools, messages - app - real time info - kms driven - Do you need to come by car? in shops - fire safety type for driving - educating employees - volunteering - car pooling - graph that explains what emission mean/km mean - emissions are not clear enough - link to travel! - testimonials - as with loosing weight - market leaders and apps/companies to be self aware - team up with apps we use - Ways/google maps - active info about current travel fuel - learning to be drivers - driving habits - test and module to discuss that - organise car pooling in work place - school campaings in schools - cycling and less driving	- something more social - profiles of individuals: who feel passionatly doing something (the grand mother) - Encourage PT and Bus, Night Trains, Cycling - Userfriendly times using PT (not so busy, cheaper) - Maps of cycle friendly roads - enable companies to take up bikes with loans - focus on emissions and related information - Youth engagement officers with ZIP card - Tik tok videos - When Oyster came: focus on easier way of paying fares - Safe cycling streets - activate existing standards by schools on walking - User fee friedlyness - link behaviour back to changes in UK/London such as flooding, fires etc. - companies to adopt what schools are doing/ business centres/offices - walking to school campaing - positive messsages - Maps of cycle friendly roads - Infor on Safe cycling streets - walking to school campaing - Tik tok videos - positive messsages - connect to local incidents - focussing on specific demographics- following road safety videos (shocking, short, sharp)
Group 01 – Economic Instruments	**Group 02 – Economic Instruments**	**Group 03 – Economic Instruments**
Best bets: high impact and feasible - road tax based on mileage - subsised parking at transport hubs - car parking charges in central london Moonshots: high impact but less feasible - congestion charge increase - Ulez charge increase	Best bets: high impact and feasible - Pricing per mile - long distance - gradually - Incentives within the taxing system - staggered system - in terms of emissions - rebalance the taxes for driving - Size of vehicles/taxing Moonshots: high impact but less feasible - Size of vehicles pricing	Best bets: high impact and feasible - addiss: high impact but less feasible - free public transport - subsidise school buses Low-hanging fruit: lower impact but feasible - higher price on purchace - Parent car pooling incentives

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(*continued*)

Group 01 – Economic Instruments	Group 02 – Economic Instruments	Group 03 – Economic Instruments
- extending zones Low-hanging fruit: lower impact but feasible - tracking per km Low priority: low impact and low feasibility - combining charges - increase daily charges 100 % petrol cars - extra fuel duty	- Train pricing per km/fares compared w car/airplanes - Lower pricing for freight transport - eco friendly - Subsidise PT & rail - higher - Tax relief for people using the car less - or using the bike	Low priority: low impact and low feasibility - Get rid of freedom pass for people that drive

Group 01 – Regulatory Instruments	Group 02 – Regulatory Instruments	Group 03 – Regulatory Instruments
Best bets: high impact and feasible - low traffic schemes extended – 20 km/mile an hour cities - more cameras, more monitoring of km, speed - fixed speed limits on cars - driver safety regulations - more dangerous driving regulations/tailgaters - driving test scores threshold higher Moonshots: high impact but less feasible - restriction on engine sizes and car type based on use purpose	Best bets: high impact and feasible - lanes for electric vehicles/mixed with bus lanes - Car free day/week - Uber occupancy – enforce speed limits that exist today - fines - ULEz adjust to different levels of emissions Moonshots: high impact but less feasible - traffic lights/speed camera - turns red - High Occupancy lanes for all cars Low-hanging fruit: lower impact but feasible - school zones and other non-driving zones/roads - modulate CC modulated per hour of day/rush hour vs other hours - 30 p and 15 Low priority: low impact and low feasibility - even and odd number plates	Best bets: high impact and feasible - Blue Badge driving - car parking for free next to rail stations - delivery vehicels only coming in during evenings - no parking for new flats - LTN in affluent areas Moonshots: high impact but less feasible - licence plate driving (no driving for certain hours) - Low Traffic Neighbourhoods without increasing on main roads - restrict cars by using a permit within certain area Low-hanging fruit: lower impact but feasible - traders not allowed in certain areas at certain times - speed limits already in place so needs to be better enforced - HOV driving

Appendix G. Perspectives on each trial

Number of interviewees expressing either only positive, only negative or 'depends' reflections. In brackets are the number of comments in each category (statements that are qualified are also considered under key points).

Information-based instruments

	Positive	Negative	Depends
Citizens' Jury Group	3 (22)	2 (16)	4 (10)
Key Points CJ	Strengthens the establishment of subconscious knowledge (7) Educational for individuals with limited prior knowledge (3) Presented information is consistently positive and valuable for public education (2) Images of fires and flooding effectively link various topics (4) Testimonial evoked a sense of community responsibility (2) Information on alternatives and the app proved very helpful (4)	Repeated information may become annoying (2) Information heightened feelings of helplessness (3) Information amplified frustration with politics (2) Information placed pressure on the individual (4) Information increased feelings of guilt (3) Information reinforced the sense of personal responsibility (2)	Information is already familiar, making its impact questionable (3) Call to action can be interpreted in varied ways (2) The analogy to reducing meat consumption, rather than to fully stop driving would be better (1) Information places pressure on the individual (2) Information reinforces the feeling of sole responsibility (2)
Comparison Group	3 (8)	4 (8)	3 (7)
Key Points CG	Information on alternatives and the app was very helpful (3) Pictures of fires, flooding, and the testimonial strengthened the connection to the topic (3) Generally interesting and a good prompt to reconsider mode choice (2)	Information is already known, and the message feels personal as the individual identifies as a car driver (2) Pictures of flooding evoke unpleasant memories (1) Has already reduced driving, but feels further pressured without recognition (1) Provides an incomplete picture (3) Posters are offensive, similar to reactions to COVID campaigns (1)	The general message is acceptable, but more context would reduce its populistic tone (2) Information alone is insufficient; a combination of all three interventions could be effective (2) The information is generally adequate but overlooks minorities and special needs groups (3)
Total	6 (30)	6 (24)	7 (17)

Economic instruments

	Positive	**Negative**	**Depends**
Citizens' Jury Group	3 (11)	0 (0)	6 (9)
Key Points CJ	Generated a lot of discussion (2) Encourages reflection, with initial positive reactions followed by deeper considerations (4) Generally a good push, as it introduces something new in the toolbox (3) Gamification is a good approach (2)	/	Highly dependent on timing; not ideal during the Christmas season (3) Fun for one week, a good initial push but not viewed as a sustainable long-term solution (3) Good concept, but realization emerges that it should be driven by intrinsic motivation, not incentives (2)

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Economic instruments			
	Positive	**Negative**	**Depends**
			Mandatory appointments (e.g., doctor) can negatively impact your score (1)
Comparison Group	1 (4)	2 (7)	7 (8)
Key Points CG	Served as a push to reduce car usage and assess the benefit of each trip (2) Encouraged good reflection on what is a viable measure (2)	Unfairness in social justice dimensions (2) Measurability is challenging, as the baseline could be intentionally manipulated (2) Uncertainty about the source of funding (1) Life's interdependencies are more complex than a simple 30 cents per kilometer model (2)	Had an impact, but mainly due to the current financial strain (1) Initially seemed like a great idea, but the reality of driving kids to school for time-saving reasons emerged (2) A longer trial period would be better to assess actual earnings (2) Only practical for specific trips; otherwise, public transport costs are too high (2) A nice incentive for some, but difficult to scale effectively (1)
Total	4 (15)	2 (7)	13 (17)

Regulatory instruments			
	Positive	**Negative**	**Depends**
Citizens' Jury Group	3 (7)	1 (5)	5 (10)
Key Points CJ	Easy to comply with for those working remotely, as no changes are required (3) Working days using public transport are feasible as long as leisure trips aren't restricted (1) Coincidentally aligns with participants' schedules, requiring no effort to comply (2) Suitable for certain trips, like school runs, rather than time slot restrictions (1)	Concerns raised about handling emergency situations (2) Feels authoritarian, with uncertainty about its overall impact on reducing traffic (1) AM-PM does not really make sense as it could better be peak, off-peak (1) Forces a shift to transport modes that may cause anxiety or further unpleasant issues (1)	Similar to ULEZ; it works for some but not all, which may be seen as unfair (4) Socially challenging, as office workers and affluent can opt-out financially (2) The measure is generally acceptable but highly dependent on jobs and employers (3) AM-PM does not really make sense as it could better be peak, off-peak (1)
Comparison Group	2 (4)	2 (5)	5 (7)
Key Points CG	Easy to go without a car for two days, as its easily implementable (2) Simple to comply for those living and commuting within central London (2)	Restricts the population's freedom (1) Feels very totalitarian, similar to Singapore (1) Not feasible due to work commitments (2) Not inclusive of minorities who rely on their cars (1)	Works for some but not all, which may be perceived as unfair (2) Could work if there were a reliable alternative, but public transport currently isn't (2) Needs to be communicated well in advance of actual implementation (1) Too one-size-fits-all; would be better if tailored to urban, rural, and personal circumstances (2)
Total	5 (11)	3 (10)	10 (17)

Data availability

Data will be made available on request.

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