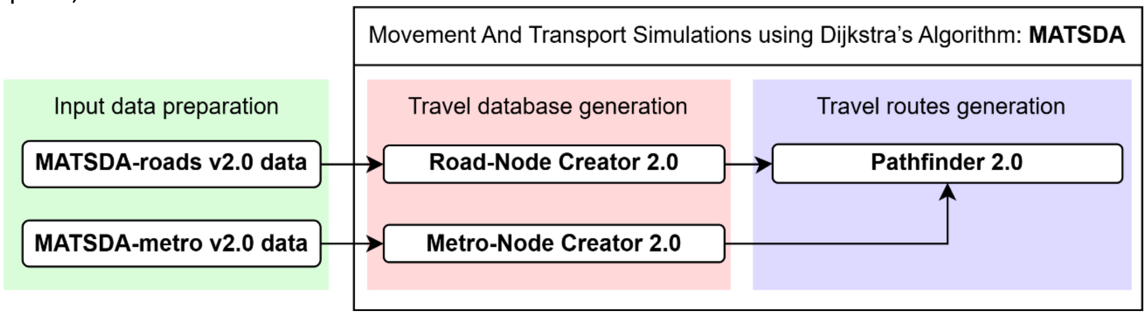
We would like to thank Reviewer 1 for reviewing our manuscript and the positive comments. We appreciate you pointing out the potential for future work.

Please find below our point-by-point responses to each comment.

- Location of changes in blue
- Changes in the manuscript in response to issues raised are indicated in red
- Tracked changed version of manuscript will be submitted once the review period has ended.

	Reviewer 1 comments	
GENERAL	The paper presents a model for capturing car flow patterns by iteratively computing optimal routes within a simplified nodal configuration of the urban traffic network. Based on the authors' impressive work, the model is developed and implemented for the London urban network. It shows the spatial distribution and diurnal variability of urban road traffic flow, but is limited to a selection of car-commuter classes. The paper and the supplementary materials provide sufficient explanations of the model's development and validation. Therefore, the model could be replicated for other urban environments. Certainly, it is questionable if the validation steps followed for London would be sufficient for other urban cases. Nevertheless, the authors present appropriate indications and metrics to guide the validation process in other circumstances and specificities.	
		Author responses
R1.1	The authors appropriately emphasise the contributions of the proposed model compared to existing routing applications. Nevertheless, it would be worthwhile to have clearer explanations of how the presented model will address the stated goal of supporting urban climate modelling and environmental exposure assessments.	We add the following statement (includes part of response to R1.2) to clarify the mechanisms bridging MATSDA to climate and exposure applications Following added to Section 1 Introduction, lines 57-59 (NB: also includes some of R1.2 response): To address the need for dynamic urban climate modelling, MATSDA-roads provides foundational spatial and temporal distributions of traffic flow. By providing realistic travel durations and road-level route trajectories, this framework can be directly used with speed and road-type dependent emission factors to calculate transport anthropogenic heat fluxes, for example with agent-based models (Hertwig et al. 2025; Lin et al. 2025). Such modelling frameworks also allow to combine the MATSDA routing information with travel demand aspects driven by human behaviour (timing of travel, trip purpose, car occupancy, etc.).
R1.2	In the model evaluation, the route selection is limited to car commuters. The temporal and spatial evaluations are calibrated using historical traffic data from Google Maps. No correlations between person movements and traffic flow are discussed (e.g., modal share, car occupancy). Additionally, no impact of other types of road vehicles (e.g., freight vehicles, etc.) is considered.	MATSDA-roads v2.0 is a physical routing algorithm and travel database generator. Variables such as modal share and vehicle occupancy belong to the "demand" side of transport modelling, which is handled through coupling MATSDA with our agent-based model (DAVE) in subsequent work. The data obtained for this paper is for passenger cars, as at this point, we are only demonstrating and evaluating car commuters, so the Google Maps data ensures a robust, like-for-like comparison. Clarification added to Section 3 MATSDA-roads v2.0 setup and evaluation cases for Greater London, lines 170-171: In this evaluation, the route selection and evaluation are specifically limited to cars, with a focus on realistic commuting routes to ensure a robust, like-for-like comparison with the Google Maps data. Included in R1.1: Such modelling frameworks also allow to combine the MATSDA routing information with travel demand aspects driven by human behaviour (timing of travel, trip purpose, car occupancy, etc.).

R1.3	The model is calibrated and validated based on historical traffic data from Google Maps. It is not demonstrated that it functions as a simulation model under changes to the considered urban structure or multimodal urban transport system (i.e., changes in modal choices for diurnal journeys).	While this paper focuses on introducing the model and evaluating its baseline physical realism, MATSDA is designed to function dynamically under structural changes by modifying its nodal database. Furthermore, it fully supports multimodal assessments: walking and cycling are incorporated into MATSDA-roads, while public transport is handled by the MATSDA-metro module. Evaluating large-scale multimodal shifts and structural disruptions under ongoing scenario simulations is the focus of our current coupled-model research. Following added to Section 5.1 Limitations and future directions, lines 606-610: MATSDA inherently functions as a simulation model capable of adapting to changes in urban structure due to its dynamic nodal database. Alterations such as road closures, speed limit changes, or the introduction of low-emission zones can be simulated by modifying the respective journey weights or removing node edges before recalculating paths.
R1.4	The paper is well structured, and the flow of the model description and implementation is coherent. Nevertheless, it would be useful to provide a synthetic overview of the methodology (before the model description), eventually including a flowchart of the study's main steps.	We add a new Figure 2, as an overview of MATSDA workflows in Section 2 MATSDA-roads model description. This figure is adapted from the MATSDA User Manual Fig 1.2 (https://doi.org/10.5281/zenodo.17736682), but refined to focus exclusively on the v2.0 framework components relevant to this manuscript and our ongoing multimodal research. It illustrates steps between input data preparation to travel database generation (via the Node Creators) and the final optimal route calculation (via the Pathfinder). NB: subsequent figure numbers will all be adjusted Figure caption, line 90:  **Figure 2:** Overview of the MATSDA v2.0 transport modelling framework showing both MATSDA-roads and MATSDA-metro. The shared workflow includes input data preparation and travel database generation, from which optimal travel routes are derived. This paper focuses on MATSDA-roads. Cross-reference text in paper, lines 79-80: MATSDA v2.0 (Figure 2) workflow has three stages: input data preparation, travel database generation via the Node Creators (for both road and metro networks), and the final optimal travel route calculation via the Pathfinder. Line 96: Fundamental to both of MATSDA's modelling components (road, metro, Fig. 2) ….

		Lines 104-105: The generation of the complete nodal network, referred to as MATSDA's travel database, is done with MATSDA's Node Creator (Ma et al. 2025a, Fig. 2). In a second modelling step, the travel database is used to compute the complete travel route with MATSDA's Pathfinder (Ma et al. 2025a, Fig. 2)
R1.5	In the conclusion section, it would be helpful to explicitly redefine all the configurations referred to by #1, #2, … #7 (or at least add a reference to Table 3 for each of them).	We have revised Section 5 Conclusions by cross-referencing to Table 3. Lines 562-563: However, #1 and #2 (low-resolution road network based on road numbers, Table 3) perform well for short trips (e.g., below 30 min), which may be a good benchmark if generating new transport road network databases for a new city. Lines 574-575: The unconstrained pathfinding cases with routes across the full domain (#6 and #7, Table 3), achieve FSS values of ~0.7, indicating that MATSDA's route choices are spatially consistent with the GM reference data. Line 577: In addition, performances difference between #6 (with fixed local road length fraction, Table 3) and #7 (with a junction time penalty plus distance-varying local road length fractions, Table 3) suggest a simplified configuration may produce more spatially aligned routes.