Kapil **Meena**

Transportation Researcher · Discrete Choice Modelling · Urban Mobility

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"Towards sustainable urban mobility through behavioural modelling, causal inference, and real-time routing systems"

Summary

A transportation researcher with expertise in discrete choice modelling, latent class behavioural analysis, air quality–travel behaviour interactions, and real-time routing systems. Developer of DRUM (Dynamic Routing for Urban Mobility), a patented, open-source web application that provides pollution-aware route options to urban commuters. Research featured in *The Hindu* and recognised with institutional awards. Pursuing scalable methods at the intersection of econometric theory, causal inference, and deep learning for robust transport policy evaluation.

Highlights

- Published across refereed journals including *Transport Policy* (Elsevier), *Transportation Research Record* (SAGE), *Int. J. Sustainable Transportation* (T&F), *J. Transport & Health* (Elsevier), and *Urban Climate* (Elsevier).
- Developer and maintainer of open-source tools: **DRUM** (pollution-aware routing), **India AQI Dashboard**, and **Travel Survey Platform**.
- Patent filed: "Personalized dynamic route planning system for sustainable urban mobility" (Pat. #202631018379).
- Media feature in *The Hindu* (June 2025) on the DRUM web application's contribution to sustainable urban mobility.
- Invited talk at **Google India** (2025) on pollution-aware dynamic routing.
- Reviewer for *Transport Policy*, *Transportation Research Part A & D*, *RTBM*, *J. Transport & Health*, *TRR*, and *Transportation in Developing Economies*.

Field of Interest

My research interests include, but are not confined to:

- Discrete choice modelling and latent class behavioural segmentation
- Air quality–travel behaviour interactions and pollution exposure assessment
- Real-time routing systems for sustainable urban mobility
- Causal inference methods for transport policy evaluation
- Machine learning and deep learning for transport prediction and scene understanding
- Stated and revealed preference survey design and analysis

Education

University of California, Los Angeles (UCLA) — *Los Angeles, CA, USA*

Postdoctoral Researcher (Incoming, Summer 2026) — *Summer 2026 –*

- Advisor: Prof. Youngseo Kim, HuMAN Lab

Indian Institute of Technology Kharagpur — *West Bengal, India*

Ph.D. in Transportation Engineering — *Jan. 2022 – Present*

- Dissertation: "Developing an integrated framework for pollution-aware urban mobility using discrete choice modeling and real-time routing algorithms"
- Advisor: Prof. Arkopal Kishore Goswami

Indian Institute of Technology Roorkee — *Uttarakhand, India*

M.Tech in Transportation Engineering — *2019 – 2021*

- Dissertation: "Impact of negative externalities on travel behavior"
- Advisor: Prof. Amit Agarwal

Rajasthan Technical University — *Kota, India*

B.Tech in Civil Engineering (Honors) — *2015 – 2019*

- Graduated with Honors | Top 5% of class

Work Experience

IIT Kharagpur & IIT Roorkee — *India*

Teaching Assistant — *2019 – Present*

- Courses: Multimodal Urban Transport (NPTEL), Intersection Design (CEN 662), Engineering Drawing (CE13001).
- Mentored students in laboratory sessions, simulation tools, and geospatial analysis.

World Resources Institute (WRI) India *Remote*

Research Intern | Electric Mobility *Nov. 2021 – Mar. 2022*

- Conducted comparative analysis of inhaled pollution dose for commuters across EV and ICE modes, contributing to data-driven policy frameworks.
- Developed recommendations for deploying electric mobility solutions in Tier-2 cities, bridging research and public sector implementation.

Patents

[P1] **K. K. Meena** and Arkopal Kishore Goswami. "*Personalized dynamic route planning system for sustainable urban mobility.*" (Pat. #202631018379)

Media Features

The Hindu (June 2025): "IIT-KGP app helps commuters pick 'greener' routes on the road." Feature article on the DRUM web application, highlighting its contribution to sustainable urban mobility and public health. [Read Article]

Publications

Journal Articles

1. **K. K. Meena**, A.K. Goswami. "Not all travellers think alike: Segmenting travel behaviour under air pollution exposure using a hybrid latent class and discrete choice approach." *Transportation Research Record (TRR)*, Accepted, In Press. 2026.
2. **K. K. Meena**, Subhrajyoti Basu. "Traffic Scene Understanding and Reasoning using Self-Supervised Representation Learning and Large Language Models (LLM)." *Transportation Research Part C: Emerging Technologies*, Under Pipeline, 2026.
3. B.S. Manoj, **K. K. Meena**, H. Panchal, G. Sharma, A.K. Goswami. "Modeling bicycle choice behavior and its potential health impact: Case of first/last mile access to suburban rail." *Int. J. Sustainable Transportation*, 2026. [DOI]
4. **K. K. Meena**, A.K. Goswami. "Beyond choice modelling: Bridging econometric theory and deep learning for robust route choice prediction." *Transportation Research Part D: Policy and Practice*, Under review. 2025.
5. **K. K. Meena**, A.K. Singh, A.K. Goswami. "Dynamic route planning for urban green mobility: Development of a web application offering sustainable route options to commuters." *Transportation Research Record*, 2025. [DOI]
6. A. Sumbhate, **K. K. Meena**, A.K. Goswami. "Assessing air pollution exposure to school children in different modes of transport while commuting to school: A case of Kharagpur, India." *J. Eastern Asia Society for Transportation Studies*, Vol. 16, 2025. [DOI]
7. B.S. Manoj, **K. K. Meena**, A.K. Goswami. "A prioritization framework to identify key attributes of transit-oriented development (TOD) using multi-criteria decision-making (MCDM) approach: An Indian context." *Sustainable Transport and Livability*, vol. 2, 2025. [DOI]
8. **K. K. Meena**, A.K. Goswami. "A review of air pollution exposure impacts on travel behaviour and way forward." *Transport Policy*, Elsevier, 2024. [DOI]
9. **K. K. Meena**, D. Bairwa, A. Agarwal. "A machine learning approach for unraveling the influence of air quality awareness on travel behavior." *Decision Analytics Journal*, vol. 11, 100459, Elsevier, 2024. [DOI]
10. **K. K. Meena**, R. Taneja, A. Agarwal. "Impact of air pollution on informed decision-making for choice of a travel mode." *16th Int. Conf. on COMSNETS*, IEEE, 2024. [DOI]
11. **K. K. Meena**, V. Singh, A. Agarwal. "Perception of commuters towards air quality in Delhi." *J. Transport & Health*, vol. 31, 101643, Elsevier, 2023. [DOI]
12. V. Singh, **K. K. Meena**, A. Agarwal. "Travellers' exposure to air pollution: A systematic review and future directions." *Urban Climate*, vol. 38, 100901, Elsevier, 2021. [DOI]

Conference Proceedings (Refereed)

1. **K. K. Meena**, A.K. Goswami. "Not all travellers think alike: Segmenting travel behaviour under air pollution exposure." *Transportation Research Board (TRB) 2026 Annual Meeting*, Washington, DC.

2. C. Gupta, A. Amitabh, **K. K. Meena**, A.K. Goswami. "A hybrid geostatistical and deep learning framework for urban pollutant concentration prediction from sparse data." *18th Int. Conf. on COMmunication Systems & NETworkS (COMSNETS)*, 2026. [DOI]
3. V. Joshi, **K. K. Meena**, A.K. Goswami. "GeoNBeats: Unified Spatio-Temporal Neural Basis Expansion for Air Quality Estimation in Sparse Sensor Network." *IEEE Int. Conf. on AI Engineering and Innovation*, 2026.
4. A. Singh, **K. K. Meena**, G. Sharma, A.K. Goswami. "Developing an integrated walkability score using image-based feature extraction and user preferences." *Transportation Research Board (TRB) 2026 Annual Meeting*, Washington, DC.
5. **K. K. Meena**, A.K. Singh, A.K. Goswami. "Dynamic route planning for urban green mobility." *7th Int. Conf. of Transportation Research Group of India (CTRG-2023)*, SVNIT Surat, India, 2025.
6. A. Sumbhate, **K. K. Meena**, A.K. Goswami. "Assessing the air pollution exposure to school children (EASTS)." *EASTS*, 2025.
7. B.S. Manoj, **K. K. Meena**, A.K. Goswami. "A prioritization framework to identify key attributes of transit-oriented development (TOD)." *1st World Symposium on Sustainable Transport and Livability (WSSTL-2025)*, IISc Bengaluru, 2025.
8. R. Kodukulla, **K. K. Meena**, G. Sharma, A.K. Goswami. "Accessibility assessment of urban public transit to key facilities through spatial analysis: A case study of Delhi." *Transportation Infrastructure Projects: Conception to Execution (TIPCE)*, IIT Roorkee, 2025.
9. S. Dasgupta, **K. K. Meena**, D. Majumdar, A.K. Goswami. "Air pollution exposure among Kolkata's auto-rickshaw drivers: PM variability, health risks, and predictive modeling." *Energies, AEEE India*, 2025.
10. A. Sumbhate, **K. K. Meena**, A.K. Goswami. "Breathable modes to school: Assessing the air pollution exposure of travel choices for school children in urban environments." *52nd Urban Affairs Association (UAA) Annual Meeting*, Nashville, USA, 2024.
11. P. Mohanty, **K. K. Meena**, A.K. Goswami. "Analysing user behaviour along dedicated bicycle facilities in an urban environment." *52nd Urban Affairs Association (UAA) Annual Meeting*, Nashville, USA, 2024.
12. B.S. Manoj, **K. K. Meena**, H. Panchal, G. Sharma, A.K. Goswami. "Assessing the willingness to bicycle for the first mile to the Mumbai suburban rail." *17th Int. Association for Travel Behaviour Research (IATBR)*, Vienna, Austria, 2024.
13. **K. K. Meena**, A.K. Goswami. "A review of air pollution exposure impacts on travel behaviour and way forward." *16th World Conference on Transport Research (WCTR)*, Montréal, Canada, 2023.
14. **K. K. Meena**, R. Kumar, A.K. Goswami. "On-road pollution exposure in multiple transport micro-environments: A case study of tier-2 and tier-3 cities in India." *14th TPMDC*, IIT Bombay, India, 2022.

Major Open Source Contributions

- **DRUM Web Application Tool** | *React, Python, Vercel* — Pollution-aware dynamic routing for urban commuters.
- **India Real-Time AQI Dashboard** | *Streamlit, Plotly* — Interactive city-level air quality analysis across India.
- **Custom Travel Survey Design Platform** | *React, Node.js* — Revealed and stated preference survey tool with dynamic choices and real-time analysis.
- **$PM_{2.5}$ Forecasting** | *Python, Scikit-Learn* — ML models for next-day pollutant concentration prediction.
- **Cycling Tool** | *Tableau, Streamlit* — Spatial analytics for cycling and motorcycle mode share.
- **India Viz** | *D3.js, JavaScript, GitHub Pages* — Interactive district-level visualization platform for demographic and spatial exploration across India.

Technical Expertise

Programming & Web	Python, React JS, Vite, Vercel, MongoDB, Git
Geospatial Tech	QGIS, Mapbox API, GraphHopper API, Spatial Data Mining
Analytics & Viz	Tableau, D3.js, Streamlit, Plotly, SPSS, Minitab
Modelling & Tools	Machine Learning, R, Discrete Choice Modelling, LaTeX

Awards and Achievements

	Best Presentation Award, Research Scholar Day	*IIT Kharagpur*
2023	**Best Poster Presentation,** Cyber-Physical System Summit (CyPhySS 2023)	
	Institute Travel Grant, TRB Annual Meeting (Washington D.C., USA) and IATBR (Vienna)	
	International Research Exchange Grant, University of Leeds, UK	*UK*
2019	**GATE Qualified (Rank 559),** Civil Engineering	*India*
	MHRD Fellowship, PhD Research Fellowship	*India*
	Winner, Regional Level, National Children Science Congress (DST, Govt of India)	*India*

Leadership & Service

Eastern Asia Society for Transportation Studies (EASTS) Conference

Technical Session Chair *2025*

Annual Conference on Infrastructure (IBSR), IIT Kharagpur

Overall Coordinator *2023 & 2024*

Reviewing Services

Journals: Transport Policy, Transportation Research Part A & D, Research in Transportation Business & Management (RTBM), Journal of Transport & Health, Transportation Research Record (SAGE), Transportation in Developing Economies.

Memberships: ASCE T&DI, TRG India, WCTR Society, IATBR.

Invited Talks & Workshops

2025 **Google India** — DRUM: Pollution-aware Dynamic Routing for Urban Mobility
2022 **NIT Calicut** — Transportation Data Analysis using Real-world Mobility Data
2022 **Swastik Edustart** — Data Visualization and Decision Support using Tableau
2020 **IIT Roorkee** — Quality Control and Performance Evaluation of Road Infrastructure
2019 **Wonder Cement Ltd.** — Practical Aspects of Concrete Mix Design and Quality Assurance

Referees

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