

IISc Open Day 2024 @ IISc Sustainable Transportation Lab. (IST Lab.)



Picture 1: IST Lab Group Picture After Wrapping a Successful Open Day 2024.

The IISc Open Day 2024 was marked by a remarkable display of public participation and enthusiasm. Thousands of individuals thronged the campus, eager to gain insights into the forefront of science and engineering research underway at the institute. Among the highlights of the event was the active involvement of the IISc Sustainable Transportation Lab (IST Lab.), which organised a diverse array of activities, demonstrations, and presentations. These initiatives were aimed at showcasing the instrumental role of scientific decision-making in addressing pressing transportation challenges with societal implications. From climate mitigation and sustainable mobility to road safety, disaster resilience, and enhancing quality of life, the IST Lab presented innovative approaches and solutions that contribute to a more sustainable and resilient future.

A major centre of attraction was the pedestrian and traffic simulation studies demonstrated by **Kishore** and **Aswathy**. The studies, related results, and video-graphical representation were points of great appeal among visitors as they enquired to know more about the behind-the-scenes. The audience found the **KME Simulation** videos unique and eager to know in detail about data collection methods, types of data collected, parameters obtained from the model, and the different crowd management measures that were finalised based on the model outcomes. There were **VISSIM** simulations for different infrastructure planning scenarios. The audience was able to relate them to real-life operations and were happy to know that intelligent traffic solutions are more efficient in reducing traffic congestion than traditional approaches like road widening and underpass construction. There were also visual aids displaying the adaptation of bicycle culture in Amsterdam, and visitors resonated with the need for coming out with similar facilities in our country to promote more usage of bicycles. Another point of appeal was the unique **wooden cycle** and its working mechanism. People found

it unique when they heard about the reverse pedalling braking mechanism. Many visitors also requested an elaborate brochure from the lab's side so that it would be convenient for them to know more about the lab activities in detail.



Figure 2: Kishore and Aswathy Explaining the Simulation Studies of IST Lab

The next source of attraction was the lab's work on Electric Vehicle (EV) research. **Furqan** shed light on the pivotal role Electric Vehicles (EVs) play in the realm of sustainable urban mobility. The depth of Furqan's research was showcased during a detailed poster presentation, which served as a visual and informational complement to his verbal exposition. This presentation offered a granular view into the meticulous process undertaken by him, covering the breadth of data collection methods, the methodological framework guiding the research, the analytical techniques employed to dissect the data, and the consequential results derived from such rigorous scientific inquiry. His insightful presentation meticulously unpacked the various elements that currently influence the broader acceptance and adoption of electric vehicles within the Indian context.



Picture 3: Furqan explaining the elements of EV dashboard to the visitors

Taking his analysis a step further, **Furqan** introduced a model he has been developing, aimed at determining the most effective strategy for the placement of public electric vehicle charging stations. This model stands as a cornerstone of his research, promising to optimise the accessibility and functionality of EV charging

infrastructure within urban landscapes. Moreover, one of the highlights of Furqan's demonstration was the unveiling of an innovative EV charging infrastructure dashboard. This digital platform offers a dynamic visualisation of the proposed locations for EV charging stations across Bengaluru, informed by a thorough analysis of traffic patterns and the capacity of the city's electrical grid. The dashboard serves as a vital tool for urban planners and policymakers aiming to enhance the EV charging network in Bengaluru, thus facilitating a smoother transition to electric vehicle usage in pursuit of sustainable urban development.

Alvin presented the engaging research and findings around the Kumbh Mela experiment to the visitors. This joint venture, funded by the Netherlands Organization of Scientific Research and the Government of India Department of Electronics and Information Technology, aimed to meticulously model crowd dynamics during the 2016 Ujjain Kumbh Mela as part of an Indo-Dutch collaboration. The primary objectives were to develop a comprehensive crowd risk model and formulate crowd management guidelines for event organisers. Utilising a diverse array of sensors, including video cameras, smartphones, drones, and GPS devices, strategically deployed in one of the world's largest religious gatherings, the project captured intricate pedestrian movement patterns involving participants from diverse regions. Visitors displayed great enthusiasm in learning about the project and understanding the challenges faced by the team. **Alvin** detailed the data collection process for the experiment and explained the microscopic experiments conducted in a controlled environment. Additionally, he provided insights into the IISc PedSense software, the Leader-Follower model, and the various walking strategies observed in microscopic studies. The visitors flocked in large numbers to see the KME work and asked several pertinent questions. In the end, they appreciated the utility of KME research in crowd dynamics and developing a decision-support framework for crowd flow management.



Picture 4: Visitors flocking to Understand the KME Work

Continuing on the topic of flow management, **Aitichya** discussed the concepts of air traffic flow management. Visitors were treated to a live demonstration showcasing air traffic over the Bengaluru and Indian airspace, with detailed explanations on data processing facilitated by Automatic Dependent Surveillance and Broadcast (ADS-B) systems across the world. Aitichya further elucidated on his PhD research, which uses such data and attempts to propose optimal strategies for gate-to-gate air transport operations. The aim is to minimise operational delays, enhance airport efficiency, and prioritise passenger safety. Discussions delved into the potential of mathematics and engineering in tackling such real-life complex problems. Visitors were keen to know the future landscape of Indian aviation and how the research at IISc can help the Indian aviation community leaders, stakeholders, and, most importantly, the passengers.



Picture 5: Discussing the Ideas of Air Traffic Flow Management with Visitors

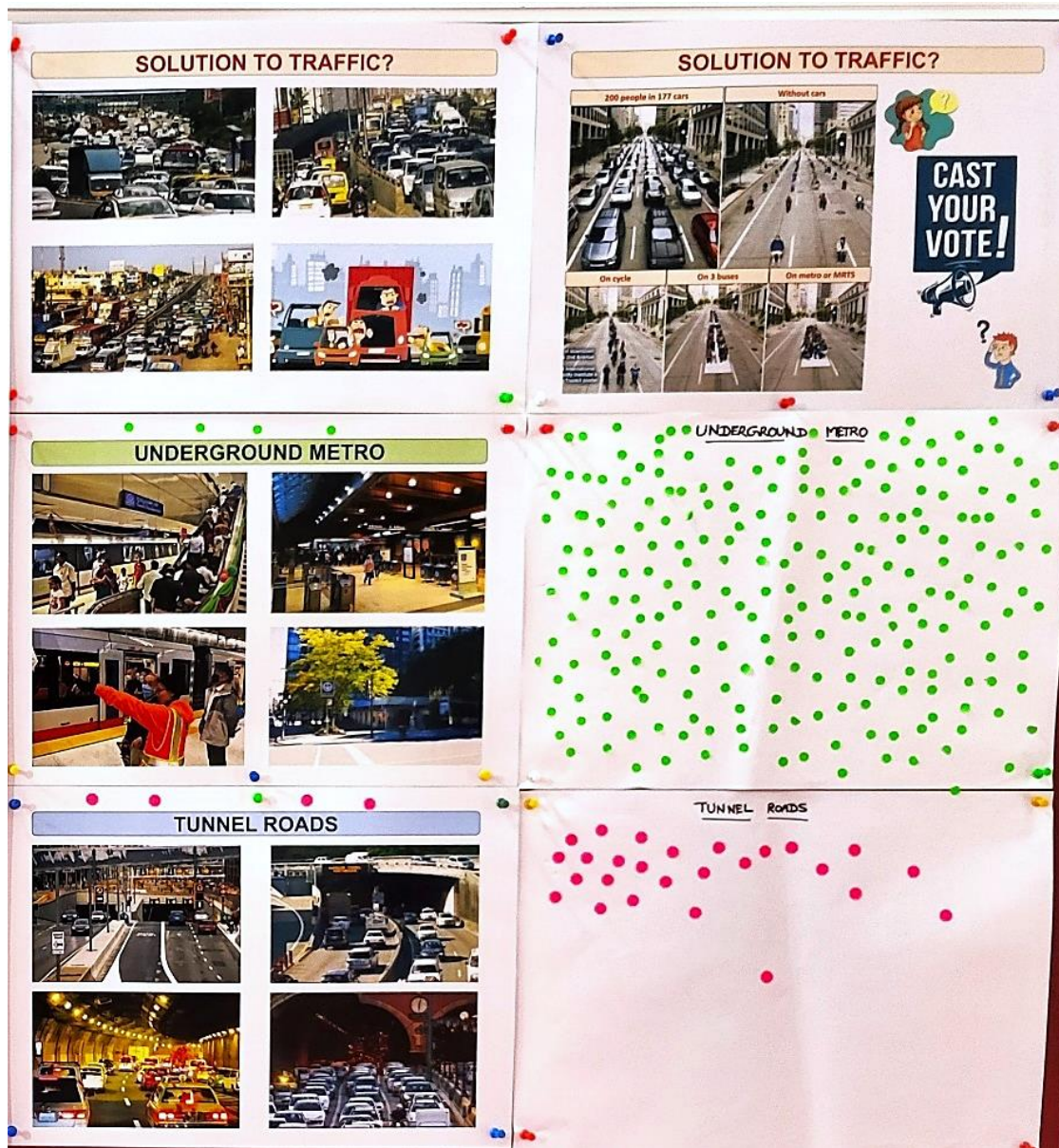
Further, visitors observed the research aiming to understand the interaction between sustainable transportation measures and Quality of Life (QOL) by combining subjective and objective indicators. This work was presented by **Hemanthini**. The study involves two levels: (1) Local level - understanding the impacts on QOL due to pedestrianisation of urban streets (2) Metropolitan, regional level - evaluating the network level effects on QOL due to sustainable transport measures. There was a poster presentation demonstrating the framework and a few results from the local-level study. Visitors showed great interest in understanding the framework, different data sets and methods used for analysis. Also, enquired about the dissemination of results and how the government and society will benefit from this research.



Picture 6: Hemanthini explaining the interaction between sustainable transportation measures and Quality of Life.

In addition, a unique poll was conducted, “Vote!!! Your Voice Matters”, among visitors of IST Lab on different transportation options, in particular, Tunnel roads Vs. Underground metro from the perspective of sustainable mobility and transportation systems engineering, and people gave their vote by placing a dot against their preferred choices. **Hemanthini** and **Aswathy** explained the two choices to the public. The aim was to understand the public view of Tunnel roads Vs. Underground metro, which has been a matter of public debate as well. Nearly 249 votes were received for each scenario. Polling results: 84% gave their vote in favour of the underground metro, 2% considered that both scenarios have a significant role, so they voted for both,

and 5% did not cast their votes as they felt that the excavation of earth for the construction of both would disrupt the environment. People actively participated in the event of voting, which then led them to give us suggestions in some areas, which are as follows: People suggested promoting access to mass transit more than constructing new roads for private vehicles. Better accessibility and a good network were suggested to improve mass transit usage. Also, the need for last-mile connectivity (one way through clean and improved footpaths with shades and periodic maintenance) was mentioned by many. People also suggested the Bus Rapid Transit System (BRTS) as an alternative to reduce congestion.



Picture 7: Photo of Activity board with votes

Dr. Punyabeet interacted with the open-day audience about the focus of ITES, its conceptualisation, challenges & opportunities for the centre and how the IfCa project led the path towards the inauguration of ITES. The poster presented by Punya focused on the work carried out under the umbrella of the IfCA project. It focused on two aspects: 1) EV infrastructure modelling and the need to identify innovation areas to enable mass adoption of EVs; 2) Clean Air Street. The first objective focused on the implementation of 221 fast charging stations for electric vehicles across Bengaluru and how the dashboard with all the information related to the charging infrastructure can be accessed by the public. The second objective of the poster highlighted the exclusive benefits in terms of qualitative and quantitative measures related to improvement in air quality, reduction in noise pollution, decrease in congestion and an overall improvement in the quality of life of people due to the pedestrianisation of Church Street. In addition, Punya showcased videos on the eventful inauguration of ITES and the opinion of its stakeholders from Catapult, UK. The audience acknowledged the work done by the IST lab on the pedestrianisation of Church Street

and the intangible benefits it offered. Additionally, people were curious to know if ITES is going to focus on replacing Lithium-ion batteries with alternative fuel cells, such as liquid Hydrogen, in the near future and if the EV dashboard could be integrated directly into their EVs.



Picture 8: Dr. Punyabeet explaining the outcomes of IfCA project to Open day audience 2024

Subsequently, **Rohit** presented a poster titled: “Methodological Framework for Evaluating Sustainable Transport Measures Towards Achieving Sustainable Development Goals”. The poster depicted the importance of sustainable development and sustainable development goals. The main focus of the poster was to showcase and explain how transportation helps achieve these UN SDGs. Details related to transportation being a major contributor to global GHG emissions and other externalities, such as traffic accidents, Bengaluru floods, etc., were explained. The linkage between the United Nations’ Sustainable Development Goals (SDGs) and transportation was discussed. It was intriguing to see many relevant news clippings of Bangalore’s past rankings in CO2 transport emissions, Bangalore urban flooding, etc. This was used to make people aware that the transportation system not only acts as a service to people for mobility but has many externalities to society. This is one of the main reasons why the transportation system is required to move towards sustainability. **Rohit** explained his research framework, which he used to form a Composite Sustainable Transportation Index (CSTI). This framework was applied to the Bangalore Metropolitan Region (BMR) to obtain the CSTI for the target year 2031. The scenario analysis done to compare the business-as-usual (BAU) with the sustainable transport (ST) scenario was explained using the traffic assignment map of BMR. Along with the research contributions, the poster also showcased a few sustainable transportation solutions to some of the UN SDGs.



Figure 9: Rohit Explaining His Work on Open Day

Additional presentations were done by **Harendra Pratap Singh**, who demonstrated varied road safety campaigns targeting the entire audience. It emphasises immediate safety measures, such as awareness of rules and regulations, including the use of seatbelts, wearing helmets, and refraining from using mobile phones while on the roads. Additionally, it highlights engineering safety treatments such as road marking, signage, and intersection provisions. Finally, the road campaigns discuss the golden hour, stressing the importance of receiving emergency treatment within one hour after an incident.



Figure 10: Harendra explaining about road safety campaigns and vulnerable road users' safety

Coming to the Safety of vulnerable road users (VRUs), he is identifying the fatality hotspots and their associated most influential variable. Based on these variables, a risk index for the BMR region was developed. For the hotspots region, develop microscopic analysis, i.e., driver behaviour and conflict prediction model. Ultimately, he showcases the functioning of the Advanced driver assistance system (ADAS) to get the warning-influenced driving behaviour while interacting with VRUs, along with the categorisation of these warnings. Generally, ADAS-equipped vehicles reduce all kinds of accidents by up to 80%. He engaged in discussions regarding the footpath facilities in Bangalore city with the visitors, who expressed concerns about the inadequacies of footpaths. Issues were also highlighted, including the merging of bicycle and pedestrian paths, as well as the absence of designated bicycle lanes in most locations in Bengaluru.



Picture 11: Demonstration of pedestrian collision warning in ADAS equipped vehicle

Next, the work presented by **Ms. Maneesha** talked about how introducing adaptive policies to urban transportation can help combat the effects of climate change. Focused on the recurring urban floods in Bengaluru, the research explained the application of Travel Demand Modelling in identifying the best

adaptation policy bundles through various evaluation parameters like Vehicle Kilometres Travelled (VKT), Vehicle Hours Travelled (VHT) and Cancelled Trips. The role of adaptation is crucial in enhancing disaster resilience by improving the adaptive capacity of systems. Under the same umbrella of disaster resilience, a social survey was conducted to understand how society adapts to urban floods in Bengaluru. This qualitative survey measured social resilience using indicators such as community participation, community competence, community leadership, and communication networks. The survey was accessible through both online and offline platforms and received 43 responses.



Picture 12: Visitors understanding the Adaptation Framework and participating in the Social Survey

To interest the public in various research works happening in IST Lab, a Transportation Bingo was available with pictures and keywords present on various posters around the venue. Attendees of all age groups eagerly participated in the game, scouring the venue and looking for the pictures and keywords in the posters. This, in turn, led to interactions between the presenters and the attendees to gain deeper insight into the featured research. The Bingo showcased the breadth of research happening in IST Lab and additionally encouraged active engagement and exploration from the attendees.



Picture 13: Visitors Engaged in the Transportation Bingo Game

A Traffic Scenario game conducted by **Aswana** was designed as an interactive and educational experience for children to learn about traffic signs and signals in a fun and engaging way. The main objectives of the game

were to enhance children’s awareness of traffic rules, promote safe behaviour on the roads, and instil a sense of responsibility while navigating through traffic scenarios. The game utilised a road network with various traffic signs and signals strategically placed throughout the route. Children were tasked with navigating through this virtual road network, reaching the end point while adhering to all traffic rules and regulations. This provided them with a practical understanding of how traffic signs and signals function in real-life situations. Furthermore, they were instructed to identify a set of traffic signs, and they were educated about those signs, which they were not aware of. This educational aspect of the game was crucial in promoting road safety awareness among children. To motivate and incentivise participant participation in the games and show our appreciation, they received gifts upon reaching the end point without breaking any rules and upon completion of the Bingo.



Picture 14: Traffic Scenario game conducted by Aswana

The transport mode choices in daily commutes have a profound impact on psychological well-being. In view of exploring this, i.e., how different modes of transport affect commuters’ mental health, a survey was carried out by **Ms. Ann Das** on Open Day 2024. The survey *“Travel Satisfaction Survey for Assessment of QoL”* conducted both online and in physical mode, was segmented into two parts. The first part of the questionnaire focused on knowing the socio-demographic and travel characteristics of the respondent with a set of six closed-ended questions. The sole part was conducted in the second segment of the survey with questions that assessed the travel emotions of commuters by investigating their overall travel experiences (subjective well-being) that they had witnessed during their previous day of commute. These emotions were measured using Satisfaction with Travel Scale (STS) with 12 pairs of statements on a five-point (-2 to 2) semantic differential scale. Respondents eager to share their varied overall travel experiences enthusiastically participated in the survey. A total of 205 respondents above 16 years of age were recorded both online and offline.

“Select (✓) the choice that best corresponds to your overall experience traveling on your most recent commute to work/ school/ college”

1) I was very distressed/content

Distress	-2	-1	0	1	Content
	Very much	Somewhat	Neutral	Somewhat	Very much

Picture 15: Questionnaire Structure of Travel Satisfaction Survey for Assessment of QoL



Picture 16: Conducting Travel Satisfaction Survey for Assessment of QoL on Open Day 2024

Another popular appeal was the “Roll and Travel” game, designed by **Almas Siddiqui** and demonstrated by **Sital** and **Vishwapriya**. It was planned to create awareness about general traffic signs and promote sustainable transport modes among all age groups, especially children. A mat was printed just like the “Snakes and Ladders” game with traffic signs on it, and six sustainable transport modes were printed on a big dice. The participants had to roll the dice and go all the way on a 4x4 mat, adhering to all the rules of traffic signals. As a result, they were able to comprehend both the importance of sustainable transport modes and standard traffic signs. They also gained an awareness of the significance of traffic signs and their initial necessity for them. After they reached the finish line, they were given gifts to encourage and reward their participation in the games and to express their gratitude. Approximately 500-600 participants played the game, and the whole day was filled with fun.



Picture 17: Sital and Vishwapriya demonstrating the game “Roll & Travel”

Finally, ms. Ambika collected feedback from the visitors. Overall, the IST Lab received excellent and appreciative feedback from the visitors who visited during the Open Day 2024. In fact, IST Lab received one of the largest footfalls in its 14+ years of involvement in IISc Open Day, with more than 3000 visitors engaging in various activities, demonstrations, and games. Visitors expressed their admiration for the way the sustainability-centred ideas were explained, the technologically driven research, and the interactive demonstrations, which allowed them to understand the ways to improve traffic conditions with minimum changes in infrastructure. Many appreciated the strong themes of sustainability amalgamated with the transportation systems research. The visitors’ overall positive, valued and appreciated comments show the

efficiency of the IST lab's communication and the good education efforts motivated and encouraged the people to promote sustainable behaviours.



Picture 18: Feedback Collection from Visitors



Figure 19: An Engaging and Successful IISc Open Day at IST Lab