

## SUMO 2020 – PROCEEDINGS

*“SABR KA FAL MITHA HOTA HAI” (the fruits of patience are sweet)*

Being inspired by the idea of ensuring balanced urbanization of the regions through sustainable urban mobility options the West Bengal Regional Chapter of the Institute of Town Planners, India was prepared to organize an international conference on 10-12 April 2020. The conference was deferred indefinitely due to the outbreak of Covid-19 pandemic. After awaiting 18 months, the chapter could manage to organize the international conference in online mode on 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> October 2021. Finally, the conference turned out to be a huge success with the participation of scholarly people and organizations from different parts of the world.



International Conference on Sustainable Urban Mobility happening online  
**SUMO 2020** On 01<sup>st</sup>, 02<sup>nd</sup> & 03<sup>rd</sup> October 2021  
Institute of Town Planners, India  
West Bengal Regional Chapter

**Knowledge Partners**

- Dept of Architecture & Regional Planning, Indian Institute of Technology, Kharagpur
- UNEP-OTU Partnership, Dept of Tech Management & Economics, Technical University of Denmark
- Centre for Transport System, Indian Institute of Technology, Roorkee
- Centre of Architecture & Planning, Maulana Azad National Institute of Technology, Bhopal
- Centre for Human Settlement Planning, Jadavpur University, Kolkata
- ICD School of Infra Design & Management, Indian Institute of Technology, Kharagpur
- School of Planning & Architecture, New Delhi
- Centre of Excellence in Urban Transport, CEPT University, Ahmedabad
- Institute of Transport Studies, University of Leeds, UK
- School of Ecology, Infra & Human Settlements, Indian Institute of Eng, Science & Technology, Shibpur

Submit Topics and Extended Abstract of Paper Within September 08, 2021

**Sub-themes**

- Land Use, Urban Morphology and Transportation
- Urban Mobility & Accessibility
- Non-Motorized Transport
- Shared & Personalized Transport
- Safety & Accessibility
- Integration of Multimodal Transport
- ITES for Sustainable Urban Mobility
- City Mobility Plan

With the support of  
**Ministry of Housing & Urban Affairs, Government of India**  
Urban Development & Municipal Affairs Dept.  
& Transport Department  
Government of West Bengal  
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The program was supported by the Ministry of Housing and Urban Affairs, Govt. of India as well as the Urban Development and Municipal Affairs Department, GoWB, and Transport Department, GoWB. Eleven eminent institutes – 8 national institutes and 3 foreign institutes (Denmark, United Kingdom, and Singapore) were the knowledge partners of the conference. The scholars from different countries all around the globe submitted their papers intending to present at the conference. After a peer-review, 29 papers were selected and the authors were invited to present the same in different sessions in the program. Twenty-eight articles were presented in 8 technical sessions according to the schedule for three days. The juries

headed by the chairman of each technical session selected the best papers. Apart from the presenters, there were 22 invited speakers in these sessions who were achievers in their fields especially in transportation planning, town and regional planning. There had been around 100 online attendees throughout the online conference. The conference came up with a lot of sustainable urban mobility options after a series of brainstorming sessions and threadbare interactions among the panelists and the online audience.

### Inaugural Session

The entire conference was managed from the ITPI, WBRC conference hall at IB-190, Salt Lake. On 1st October 2021, right at 4 p.m., the conference started with the inaugural session, which was presided by Dr. D. S. Meshram, the President of ITPI. Prof. Meshram congratulated the chapter for

organizing an international conference in a virtual mode. Mr. Pradeep Kapoor, the Secretary-General of ITPI, gave the welcome address and wished a grand success of the conference. Prof. G. Raghuram, Former Director of IIMB was the Chief Guest, who talked about the different urban mobility options, their strengths, and weaknesses in the light of socio-economic parameters. Dr. BimanBandopadhyay, Chairman, ITPI WBRC stated how the country had gone through for the last one and half years, how everything including urban mobility has been stalled affecting the rural and urban economy adversely. The organizing chairman of the conference, Mr. Dipankar Sinha further marked how the migrant workers faced inhuman hardships to reach their homeland. He requested the speakers and presenters to highlight some mobility solutions for the common man for sustaining in the difficult situations while presenting on the growth-oriented transportation options. Mr. ArabindaDebnath, the organizing secretary of the conference expressed his gratitude to all the members and partners for the support due to which the program got the desired shape.

### **Technical Session 1**

**Sub Theme:** Monorail - LRT – MRT – and Integration of Multimodal Transport

**Chairman:** Prof. Sewa Ram

Prof.ManoranjanParida and Prof.ShivanandSwamy, the invited speakers emphasized that though MRTS and BRTS are important for the city’s transport, still those must be assessed from a user point of view continuously. Mr.AlokTripathi talked about the advantages of the High-Speed Rail System (HSR) that helps the user to manage the time better and promote economic activity.

Three papers were presented by the scholars.

<b>Name of the Author</b>	<b>Name of the Institutes</b>	<b>Name of the Paper</b>
Payel Roy, Dr. Sudeep K. Roy	IEST	User Preferences in Surface Public Transport Modes: Case Study Kolkata Metro Users
Suman Mandal, Abhiroop Das, Dr. Sanjib Nag	Amity University, Om Dayal College of Architecture, Jadavpur University	Transport Systems and Urban Developments emphasizing Mass Rapid Transit Systems (MRTS): A Study of Kolkata
Dr. P.K. Sarkar,ArkoKanungo	SPA Delhi, PWC	A Techno-Economic Research Approach to develop a business case for feasibility of upgradation of existing Tramways to Light Rail Transit:Case study on Kolkata

Smt. Payel Roy presented a paper on user Preferences in Surface Public Transport Modes by the Kolkata Metro users belonging to different socio-economic groups. The paper inferred that the suburban rail and auto-rickshaw are preferred for travel time and cost. However, auto-rickshaws are a more convenient and reliable mode of transport, but they get back to app-cab, bus, or carpool in terms of safety, comfort, and convenience.

After that Ar. Suman Mondal highlighted the results of their study of the city's core areas in terms of traffic volume and pedestrian volume in peak and off-peak hours, in terms of land use, land value, and pattern of development along the transport corridor, building height, and high rise building density.

Mr. Arko Kanungo discussed a techno-economic research approach to develop a business case for the feasibility of up-gradation of existing Tramways to Light Rail Transit. He presented the route selection criteria based on PHPDT (peak hour peak direction traffic) of an LRT corridor, right of way, and junction spacing. The paper estimated economic benefits in LRT option compared to other modes in two routes Barrackpore-Baranagar and Gariahat-Esplanade in terms of savings in accident cost, capital cost, environmental cost, operating cost, and value of time savings. Finally, the paper proposed to create a special purpose vehicle named Kolkata Light Rail Corporation Ltd, along with its organizational structure.

The paper of Dr. P.K. Sarkar and Mr. Arko Kanungo is selected as the best by the juries of the panel.

### **Technical Session 2**

Sub-Theme: Safety and Accessibility'

Chairman: Dr Subhamoy Gangopadhyay.

The invited speakers Dr. Sewa Ram and Dr. Sudip Kr Roy, both marked that there is a lot of unanswered questions on safety and accessibility issues, which have to be studied in-depth. The technocrats should be trained to collect, interpret and address the accident-related data effectively and come up with implementable solutions, at the time of need. Dr. Ram marks there are variations in defining the Black Spots, the accident-prone areas worldwide, which make it difficult to study these issues uniformly.

Two papers were presented in this session.

Name of the Author	Name of the Institutes	Name of the Paper
Shuktika Sabharwal, Dr. Rutul Joshi	CEPT University, Ahmedabad	Barriers to women ridership in buses in Delhi - Womens perspective
Rituparna Das, Dr. Ankhi Banerjee	RCGSIDM, IIT Kharagpur	Rethinking Urban Mobility Plan for school-going children: A case of Kolkata

Studying the case of women riders of Delhi in the light of pink ticket (zero-fare) Smt. Shuktika Sabharwal mentioned women's ridership in public transport could be increased if better accessibility and companionship, safety, access to workspaces, and leisure are ensured.

Smt. Rituparna Das and Dr. Ankhi Banerjee focused on "Rethinking Urban Mobility Plan for Children – a case of Kolkata City" and mentioned the urgent need for developing children-friendly neighborhoods and city considering their current vulnerability.

According to the Juries, both of the papers are good and deserve acknowledgment.

### Technical Session 3

Sub-theme: Innovation in Data Analytics, ITES, Shared & Personalized Transport

Chairman: Prof. Ashoke Sarkar

While Prof. Ashoke Sarkar, the Chairman of the session marked the significance of the non-motorised transport including walking and paratransits in city's transportation, he mentioned that the data availability of these modal choice and distribution is scarce in any transport planning. Prof. Durga Toshniwal, Dr. Charisma Chowdhury mentioned utility of studying complaint types of people from different location, as well as their movement pattern by following mobile GPS. Action plan could be made based on the identified problem clusters and relevant/preferred modes and routes.

The following three papers were presented.

Name of the Author	Name of the Institutes	Name of the Paper
Rashmi Choudhary, Jogendra Kumar Nayak, Dr. Manoranjan Parida	Centre for Transportation Systems, IIT Roorkee	Service quality analysis of intermediate public transit
Preety Saini, Somnath Bhui	IIT, Kharagpur	Future of Automated vehicle in India: An Audit of Physical and social challenges
Manaswinee Kar, Dr. Shubhajit Sadhukhan, Dr. Manoranjan Parida	IIT Roorkee	Understanding Relevance of Park & Ride for Sustainable Urban Mobility in Indian Cities

Smt. Rashmi Chowdhury analysed the service quality of the intermediate public transport. She observes that connectivity between the two modes, safety and security, and the information system are the main issues of Delhi metro services. Attributes such as ease in buying tickets/cards for metro, ease in finding the metro station and, the comfort in egress are rated as possible overkill by passengers.

Smt. Preety Saini highlights the potential of automated vehicles as an efficient option that reduce congestion and accident in the city. Their paper tried to look into the physical and social challenges of future of autonomous vehicle in India.

Smt. Manaswinee Kar observed park-and-ride is a useful strategy to reduce traffic congestion and on-street vehicular pollution, urban parking burden ensuring desirable savings in travel time and costs. However, location and sizing of park-and-ride based on several planning criteria is important for the success of the strategy. She commented that substantial private vehicle share and presence of excellent quality transit systems provide opportunity to implement P&R for sustainable mobility in urban Indian context.

The juries considered the paper of Smt. Rashmi Chowdhury, Mr. J.K. Nayak and Prof. M. Parida as better among the others.

#### **Technical Session 4**

Sub-theme: E Mobility and Non Motorised Transport and Alternate mode of Transport

Chairman: Prof ShivanandSwamy

Dr. Swamy shared his experience on initiating the BRTS in Ahmedabad, Hubli-Dharwad and also Denmark. Dr. Rajesh Pandya, managing director of mentioned that the BRTS system in Surat Municipal Corporation, of which he is the managing director, is currently the largest BRTS system in India. Invited speaker Ms. Aditi Ghosh spoke about Electric buses in Kolkata moving towards roof top charging facility from the present day battery operated systems. While the transportation sector is one of the biggest contributor of CO<sub>2</sub>. Smt. Aditi Ghosh informed that West Bengal Government has already started e-buses, and is the 3<sup>rd</sup> in the rank in the world in implementing that. However, availability and charging of batteries was an issue. The availability of the local made batteries and the opportunity-charging as mentioned by Rajesh Pandya would reduce the problem.

Three papers were presented.

<b>Name of the Author</b>	<b>Name of the Institutes</b>	<b>Name of the Paper</b>
Dr. Dakshayini R Patil, Dr. Mamatha P. Raj	BMS College of Architecture, Bangalore	Sustainable Transport Systems and Walkable Neighborhoods: Overview of Urban Design Theories and Planning Principles
Anjali Saraswat, Dr. SatishPipralia	MNIT, Jaipur	Developing Aerial Ropeway Transit As An Alternative Mode of Transport for Sustainable Urban Mobility.
PranoyMondal, Dr. SoumenMitra	IEST, Shibpur	Planning for Green Urban Mobility: A Case Study of North Dum Dum Municipality, West Bengal

Dr.Dakshayini R. Patil discussed creating a walkable neighborhood referring SDGs of the United Nations and different urban planning theories.

Smt. Anjali Saraswat spoke about developing aerial ropeway transit as a means of transport for sustainable urban mobility. Such an alternative provided the opportunity of creating barrier-free movement, linking the physically separated areas.

Mr.Pranoy Kr. Mondal explained green mobility infrastructure for North Dum Dum Municipality, WB creating a weighted index from public transport, walkability, cyclability, Last Mile Connectivity, Flow index, Air quality, and Parking index and final recommendations for the study area.

The Juries adjudged the paper of Mr.PranoyMondal and Dr.SoumenMitra as the best in this session.

## Technical Session 5

Sub-theme: Mobility, Accessibility & TOD

Chairman: Mr. Hitesh Vaidya, didn't attend

In absence of the invited Chairman Mr. Hitesh Vaidya, Ms. Sarika Chowdhury, senior sector coordinator, NIUA acted as moderator, and she was accompanied by three experts - Laghu Parashar, Kanika Kalra & Ravi Gadepalli.

Four papers were presented in this session.

Name of the Author	Name of the Institutes	Name of the Paper
Ankita Bakshi, Dr. Jayita Guha Niyogi, Dr. Arup Guha Niyogi	Jadavpur University	A Logit model for work trips in Kolkata
Gaurav Verma, Jignesh Mehta	Indian Development Centre and CEPT University	Improving Land Value Capture Mechanism for Developing TOD Areas – A Case of Delhi
Smt. Abhinanda Chatterjee, Dr. Subrata Paul	IEST, Shibpur	Appraising opportunities for Transit Oriented Development, Case Study: Kolkata Metropolitan Area
Tanzeem Alam; Dr. Ankhi Banerjee	RCGSIDM, IIT Kharagpur	Rapid Transit Oriented Morphological Transformations in Indian Cities: A Case of Kolkata Metro

Smt. Ankita Bakshi has used the conditional logit model to assess the choice behavior of individuals. She finally showed that the utility decreases for slow and expensive travel modes, commuters choose their modes for work trips which have less in-vehicle travel time, less waiting time, and the inexpensive modal choice.

Mr. Gaurav Verma emphasized capitalizing the land value by using Delhi's land pooling policy and enhanced FAR for the transit-oriented development along the metro corridors of Delhi.

Smt. Abhinanda Chatterjee discussed that the TOD policy in the Kolkata metropolitan area would prove successful in not only integrating the land use with the transportation sector but also encouraging the use of public transport in a more efficient way. However, a homogeneous policy will not be a suitable one to cater the region, rather its location-specific strategies are required to formulate implementation strategies.

Smt. Tanzeem Alam explained the morphological transformations at the Kalighat metro station area and Kazi Najrul (Garia) metro station area. While the low-rise structure started transforming into mid-rise mid-density neighborhoods in Kalighat area in 2000, rapid urbanization occurred in Garia area since 2009. Transit-oriented development created pressure on land and open spaces, around the nodes, with high traffic and built density.

Their papers prompted serious discussions and debates among the panelists. The debates went to that level – TOD and the Dispersal mechanisms should not go parallel. Finally, the paper presented by TazyeenAlam and Dr.Ankhi Banerjee is adjudged as the best paper in this session.

### Technical Session 6

**Sub-theme:** Land use, Urban Morphology and Transportation

**Chairman:** Prof.SanjuktaBhaduri

Dr.Debashis Das of Jadavpur University acted as the moderator of this session. The invited speakers were Prof.Mahalaya Chatterjee, Professor of urban economics in Kolkata University, Dr.DebapratimPandit, IIT,Kharagpur and Ms. Uma Adusumili, Former Chief, Planning Division, MMRDA.

The four papers presented in this technical session are the following.

<b>Name of the Author</b>	<b>Name of the Institutes</b>	<b>Name of the Paper</b>
ManneManasa, Prof. ArulmalarRamaraj	Sri Venkateswara College of Architecture, Hyderabad; Faculty of Architecture,Sathyabama Institute of Science & Technology, Chennai	Urban Morphology, Transportation and its Impact on Land Use
NimishLaddha, Dr. PrasanthVardhan	SPA Vijayawada	Allocation of Urban Land use to Optimize the Travel Behaviour, through Simulated Annealing algorithm
Purba Biswas, ShambhaviVishwakarma	IIT Kharagpur, SPA Bhopal	Relationship of sustainable mobility and urban morphology of Delhi- Mumbai Industrial Corridor
Nunna Tagore SaiPriya, Dr. Ankhi Banerjee	RCGSIDM, IIT Kharagpur	Sustainable urban mobility for Inclusive Housing Affordability: An Indian Urban Context

Prof. M. Manasa presented on sustainable development and transportation with urban sustainability & described how land-use changes with the upcoming developments and challenges to the development of the city like pressure on infrastructure and services. Their paper also explained the elements of urban design with various case studies.

NimishLaddha described various existing methods/strategies/models adopted for land use allocations for different scenarios – sustainable transport scenario, business as usual scenario, optimal allocation-uniform density, and optimal allocation for Nashik municipal area, Maharashtra. Finally, the paper compared average trip length, vehicle run per day, carbon emissions per day, average travel time, total saved travel time, and annual economic savings for different scenarios. Optimal allocation of population density in different areas ranging between 350pph to 750pph has been observed to be the best model in terms of environment and economy.

Smt. Purba Biswas presented features of sustainable mobility and urban morphology of dedicated transport corridors along with case studies. She finally developed a framework for sustainable corridor development emphasizing equitable economic development, environment protection, regulated urban land use, and stakeholder participation.

Smt. Nunna Tagore talked about the significance of sustainable urban mobility to ensure housing affordability in the Indian context. Her presentation included the scenario of the housing shortage in India and the government intervention towards affordable housing. However, the convenience of reaching the workplace from home makes the housing affordable, otherwise, low-cost accommodation far away from the workplace and deprived of affordable efficient transport would increase the travel cost and time and thus defeat the purpose of affordable housing.

The two papers of Mr.NimishLaddha and Smt. Purba Biswas respectively were selected as the joint-best in this session.

### **Technical Session 7**

Sub-theme: Energy, Environment & Economic issues of Mobility

Chairman: Prof. ManmohanKapshe

The invited Speakers were Dr. Amit Garg and Mr. Ajay Singh Nagpure

The following four papers were presented in this session.

<b>Name of the Author</b>	<b>Name of the Institutes</b>	<b>Name of the Paper</b>
Dr.Neeru Bansal, Dr.R.Parthasarathy, Akila.S	Cept University, Ahmedabad and Gujarat Institute of Development Research, Ahmedabad	Impact of Metro on Air Pollution and Vehicular Emissions: The Case of Chennai
Ranjanakumari, Arkopal K. Goswami, Dr. Ankhi Banerjee	RCGSIDM, IIT Kharagpur	Developing a Method to Remotely Estimate On-Road Vehicular Stream Emissions in Mixed Traffic Conditions
Dr. Aparna Das, PrabodhBajpai, SaswatBandyopadhyay	Sister Nivedita University, Kolkata, IIT Kharagpur, CEPT University	Solar photovoltaics in green mobility: A case study of metro rail in the Indian context
MithilaRele, Dr. Arindam Biswas, Prof. Dipl-ing Irene Lohaus	Masters of Urban and Rural Planning, Indian Institute of Technology, Roorkee	Sustainable and Accessible Mobility in Eco-sensitive towns

Akila. S talked about the vehicular emissions and the infrastructure changes that followed up with the development of MRTs in the city. She explained how the Chennai metro had improved the air quality of Chennai city.

RanjanaKumari presented a paper describing a method of estimating vehicular emissions along the urban street using ground-level air quality measurements. In doing so, the research develops Spatio-temporal relationships between the concentration of pollutants and factors including classified vehicle volume, road type and geometry, and meteorological factors such as temperature and humidity



Dr.Aparna Das discussed on energy consumption of metro rail, analyzed the applicability of solar PV potential, and discussed PV energy generation in relation to CO2 emission reduction.

MithilaRele presented a case study of Matheran in which she explained city transportation, road condition, and their problems and related to land use. She also explained the transportation and mobility measures adopted in Zermatt, Switzerland.

The paper of Dr.Aparna Das had been adjudged as the best paper in this session.

### Technical Session 8

Sub-theme: Comprehensive City Mobility Plan

Chairman: Prof. ManoranjanParida

Name of the Author	Name of the Institutes	Name of the Paper
Rahul Ganguly and Eshanpreet Kaur Khalsa	Knight Frank, Gurgaon, Architect	Need for Traffic Management and Safety Improvement Plan for Indian cities; Case Example: Gurgaon, Haryana
SayantaniSaha, Dr. Shivashish Bose	Jadavpur University	Proposal for Decongestion and Facility Upgrade of Urban Activities of the Gateway City, Siliguri
A. M. Pitale, S. Sadhukhan, Dr. ManoranjamParida	Centre for Transportation Systems, IIT Roorkee	Investigating the Need of Regional Transport Systems for Sustainable Decentralized Development of Metropolitan Regions in India
J Ravi Kiran, Ekta, Sandeep Budde	IIT, Roorkee	Understanding the Gender Differences in Travel Behavior: A Case Study of Vijayawada

Rahul Ganguly raised the issue of the necessity of traffic management and safety improvement plan for the Indian cities, in the scenario of rapid urbanization and outpaced supply of transport options. He suggested appropriate planning and policy adjustments to complement the pattern of the current traffic scenario.

SayantaniSaha came up with an urban design solution to decongest the Siliguri city, including reorganization of urban spaces for optimum utilization targeting social and commercial upliftment of the city, and creation of better urban connectivity.

Manish Pitale marked that in spite of improvement and extension of suburban rail in MMRDA, the booming number of ownerships of private vehicles in suburbs have outnumbered the ridership of the suburban rail. His presentation indicated that the sprawling effect of Mumbai city has outpaced the process of decentralization. Possibly the decentralized small urban centers lacked interconnection among themselves by a regional transportation system; thus they didn't grow sufficiently but remained dependent on the main city.

Sandeep Budde argued that the varied perspectives of different genders that influence the travel behavior of the general public in the city are mostly ignored in the transport planning practices in India. Their presentation compared the outlook of different genders to the common parameters that influence travel behavior in two neighborhoods – one at the central business district (CBD) of Vijayawada and another in the peri-urban area. Their study proves that amidst safety and security parameters, there are several other parameters, majorly distance from the CBD, that are affecting the gender during their travel towards various urban opportunities.

The two papers of A.M.Pitale and Sandeep Budderespectively were selected as the joint-best papers in this session.

### **Valedictory Session and Conclusion**

After an absorbing 14 hours program went through for consecutive 3 days, the valedictory session transformed into a virtual get-together. The distinguished panelists of the earlier sessions joined in the session to recapitulate the entire conference. Mr. Dipankar Sinha appeared to be satisfied with the effort of his team winning overall odds towards organizing the conference. However, he pointed out that the discussion on mobility options for the common man as well as the migrant laborers remained missing. Dr. D. S. Meshram, President of ITPI announced the name of the best papers of every technical session. He and Mr. Pradeep Kapoor, Secretary-General of ITPI, being enthralled by the success of the online international conference, announced to support such programmes suitably in future and to publish the papers in a special journal of ITPI. The conference ended with the vote of thanks given by Dr. Soumendu Biswas, Secretary of ITPI, WBRC.



The conference had many points for which the organizers, ITPI, WBRC might feel pride. Possibly this was the first time ITPI has gone online to organize an international conference. The conference had been deferred multiple times while the world was fighting the pandemic. While the discussions on planning for the future is getting reduced to the struggle for existence at present due to health and related economic crisis, the chapter succeeded and thus learned to hold the torch of hope and inspire the young minds to think for a better future.