The National Urban Transport Policy (NUTP), 2006 of the Government of India, inter-alia, lays strong emphasis on building capabilities at the state and city level to address the problems associated with urban transport and lays down the guidelines for developing sustainable urban transport systems as well. As part of the NUTP enunciations, the Ministry of Housing and Urban Affairs (MoHUA), Government of India has taken the initiative to organize an annual Conference-cum-Exhibition on Urban Mobility India (UMI) to disseminate information, facilitate exchange of ideas and provide update on best urban transport practices.

The 15th Urban Mobility India (UMI) Conference 2022 was organized by MoHUA during 4 – 6 November, 2022 at the Grand Hyatt, Kochi (Kerala) with focus on the theme "**Azadi@75 : Sustainable AatmaNirbhar Urban Mobility**". The conference was structured into 2 plenary sessions, one conclave, 10 technical sessions and 5 round table discussions.

Theme based specific urban transport topics were deliberated on sustainable zero emissions, inclusive mobility – sabka sath, sabka vishwas, sabka prayas, Future Mobility – safe, affordable, accessible and efficient. A session was organized by France as French Country Seminar, One Round Table each was organized by USAID, Chalo, WRI, PwC and GIZ. About 1,200 delegates registered in the Conference comprising of senior officers from the Centre and State Governments, Union Territories, Managing Directors of Metro Rail Companies, Urban Transport Experts and Planners from 23 states and UTs, as well as foreign delegates and experts from 9 countries, Academia from India and abroad participated through video conferencing from remote locations. All the sessions had presentations from eminent experts in the field and revolved around the live case studies. The sessions were lively and interactive.

In the Valedictory Session, awards for excellence in urban transport/ best practice projects to the winning States/ UTs and cities were given by Shri Arif Mohammed Khan, Hon'ble Governor of Kerala and Shri Kaushal Kishore, Hon'ble Minister of State for Housing and Urban Affairs, Government of India in the following 12 categories:

Category	Award Category	Winner	Commendation
i.	City with the Most Sustainable Transport System;	Ahmedabad – Ahmedabad Jan Marg	
ii.	City with the Best Public Transport System;	Navi Mumbai – Navi Mumbai Municipal Transport Undertaking	Thiruvananthapuram – Kerala State Road Transport Corporation
iii.	City with the Best Non-Motorized Transport System;	Kolkata - New Town Kolkata Green Smart City Corporation Ltd.	
iv.	City with the Best Safety and Security System & Record;	Davanagere – Davanagere Smart City Ltd.	
v.	City with the Best Intelligent Transport System (ITS);	Chennai – Metropolitan Transport Corporation Ltd., Chennai	
vi.	City with the Most Innovative Financing Mechanism;	Bhopal – Bhopal City Link Ltd.	
vii.	City with Best Record of Public Involvement in its Transport Planning;	Thiruvananthapuram – Kerala State Road Transport Corporation	
viii.	City with the Best Freight Transport System;	None	
ix.	City with the Best Green Transport Initiative;	Indore – Indore Municipal Corporation	
x.	Metro Rail with the Best Multimodal Integration;	Lucknow – Uttar Pradesh Metro Rail Corporation Ltd.	Delhi – Delhi Metro Rail Corporation Ltd.
xi.	Metro Rail with the Best Passenger Services and Satisfaction; and	Bangalore – Bangalore Metro Rail Corporation Ltd.	
xii.	Running Trophy for the State / UT, which has Implemented Best Urban Transport Projects during the previous year.	Bhubaneshwar – Capital Region Urban Transport (CRUT)	

The Conference, was well attended and appreciated by the participants and sponsors. Proceedings and outcome of the conference are presented in this document. Detailed presentation of technical papers UMI photos and proceedings of the conference are available at www.urbanmobilityindia.in.

(Jaideep)
Officer on Special Duty (UT) & Ex-Officio Joint Secretary
Ministry of Housing & Urban Affairs

Contents

Introduction

Urban Mobility India, an annual mega event of the Ministry of Housing and Urban Affairs, Govt. of India provides an excellent platform to the stakeholders to deliberate upon and share the national and international experience on urban transport issues. This year the 15th UMI Conference and Expo. 2022 was held during 4-6 November-2022 at the Hotel Grand Hyatt Kochi (Kerala) with focus on the theme "Azadi @75 Sustainable Aatma Nirbhar Urban Mobility". It was structured into 2 Plenary Sessions, one Conclave, 10 Technical Sessions and 5 Round Table Discussions. Theme based specific urban transport issues were deliberated on climate change and its impact on urban transport, planning for bus based public transport, Gati Shakti Master plan the role of cities, sustainable PPP in bus transport, gender inclusive mobility, smart mobility solutions, mobility as a service, common issues of Indian Metro System, transit oriented development, future fuels, multimodal integration, ecosystem to accelerate shift to public transport, urban mobility–vision 2047, vocal for local in sustainable urban mobility, urban transport startups, integrating urban and transport planning, collaboration between government and E.V. technology startups, street for all, etc. About 1200 participates, including high level officials from central and state governments, city and metro authorities, national and international experts from the field, academia and professionals participated in the three day conference and shared their experiences and best practices in the cities across the globe. All the sessions had presentations from eminent experts in the field and revolved around live case studies both national and international. The sessions were lively and interactive. The outcome of the conference is summarized below:

General Outcome

- The conference underlined the importance of cities as engine of economic development shaping the urban transport system. While planning for transport system due care be given to reduce the pollution and congestion in the cities particularly in big ones.
- Priority has to be given for improving the efficiency of public transport system and promotion of walkability and cycling as part of NMT infrastructure.
- In the context of climate change and its impact on urban transport the upcoming urban transport system in cities should be commuter centric / mobility centric to provide seamless interchange well integrated with last mile connectivity as well as integrated with the land use.

- For systematic planning and development of urban transport system there is an urgent need to amend the regulatory framework including amendment of section 67 of the Motor vehicle Act for effective transport management.

- Tier 2 and tier 3 cities be given priority for developing appropriate public transport system before the system go out of control.

- Urban Mobility should not be taken care of by the government alone rather private sector and public private partnership should equally be encouraged as has been done in Kochi, Hyderabad, Mumbai, etc.

- Learning from the experiences of other developed countries we have to make our system among the best in the world. By making the urban mobility Aatma Nirbhar we should aim at sharing our knowledge, experience, technology and services with other countries.

- With the increasing ridership in the present operational metro network although we have a sense of satisfaction, we should nevertheless develop our indigenous capabilities technically, engineering, operational and managerial aspects so as to make Mass Transit System fully Aatma Nirbhar by 2047.

- The recently developed Metro Neo and Metro lite suitable particularly for tier 2 and tier 3 cities need to be propagated widely to meet the requirement of public transport in these cities.

- Integration of water metro project with Metro Rail system as is being done in Kochi should be explored in other cities also wherever navigable water system exist.

- As part of national policy, bio blending in fuel and producing ethanol from waste and sugarcane and its blending with fossil fuel need to be promoted in a big way as alternative fuels.

- As per target set by the Hon'ble Prime Minister of India during the CoP-26 meeting held at Glasgow, efforts have to be made for increasing the use of electric vehicles both public and private so as to achieve the objective of developed country when India will celebrate its 100 years of independence in 2047.

- In all these years we have developed indigenous expertise for constructing metro rail system now the time is ripe to make efforts to cut the cost of construction, operation and maintenance of metro rail system and to strengthen the innovative funding resources as part of non-fare box revenue.

- Developing and investing in efficient public transport system is not enough but it is equally important to take measures to restrain the use of personal motor vehicles to bring about a major shift to public transport as achieved by Seoul and Singapore.

Specific Outcome

- **Climate Change and Urban Transport Impact**
    - In view of climate change, urban transport infrastructure increasingly be made climate resilient by incorporating appropriate engineering inputs, renewing urban planning and design concepts including green and grey infrastructure.
    - It may use readily available climate finance. In view of longer life line of urban transport infrastructure four fold approach need to be followed namely assessment of vulnerability of the urban transport infrastructure system, designing resilient infrastructure solution, building capacity and increasing post disaster resilience.

- **Bus Based Public Transport**
    - Sustainable planning for bus based public transport has the potential to contribute and assist in achieving the national targets of 50% energy demand from renewable energy by 2030, Carbon emission reduction by one billion tons by 2030 and target of net zero emission by 2070.
    - Challenges of urban buses in India in terms of regulatory framework, quality of buses, enhanced use of technology in operation and management of buses, reducing the wide gap in cost and revenue, availability of adequate skilled staff replacing overaged buses, sustainable finances, route rationalization, enhanced ITS application, etc. need to be addressed to improve the bus operation and efficiency of buses along with promotion of PPP model.
    - A full-fledged communication cell of Public Transport Corp. be set up to work in collaboration with operation team.

- **Gati Shakti Master Plan and the Role of Cities.**
    - Gati Shakti National Master Plan has to be holistic infrastructure development program with a focus on improving the productivity of industries and employment opportunities.
    - All the seven engines of transport system comprising Railways, Roads, Forts, Waterways, Airports, Mass Transport, logistic have to be part of integrated infrastructure for transformation of economic growth and sustainable development.
    - It should be collective efforts by Central Govt. + State Govt. + Local Govt. + Private sector for creating jobs and entrepreneurial opportunities for all.
    - Architecture of the Gati Shakti platform should ensure compatibility with the technologies being used by various Ministries.

Gender Inclusive Mobility.

- o Historical approach followed in design of public infrastructure including urban mobility system needs to be reoriented to provide equal benefits to male and female users.

- o For gender sensitive transport system, gaps need to be identified before changes in the system are introduced. It should follow four pillar approach comprising assessing the ground situation, building capacity and raising awareness, strengthening planning and policy framework and improving the infrastructure and services.

- o Gender inclusive mobility should concentrate both on comfortable and safe travelling of women in public transport and also involvement of women in mobility workforce

Mobility as a Service (MaaS)

- o MaaS as open mobility network is expanding widely across the country. It has made inroads particularly in Kochi, Mysore encompassing both formal and informal transit operations into a widely accepted multimodal service.

- o It has many options including plan, book and pay for multiple modes of mobility service. For developing MaaS the need is to have open data protocol but with secured architecture. It has to be adopted at mass scale to nudge out personal modes. The need is to plan infrastructure as per aggregator's requirement by collaborating with mobility service providers.

- o In MaaS strategy for wider application, initially one should learn from global experience, test at local level and then go global.

- o In India cities needs to develop MaaS toolkits, mobility data policy, data sharing standards and regulatory set up.

Metro Rail System

- o MRTS should be in position to leverage the acceleration and transformation of cities development as has happened in Kochi, Bangalore, Chennai, etc.

Transit Oriented Development

- o For realizing the potential of transit oriented development the approach should be outcome-based by preparing city level plan indicating the targets to be achieved spatially and temporally. Transit corridors as part of TOD should not compete between them rather complement each other.

- o Master Plan and Mobility Plans prepared in isolation need to be synchronized with TOD Plans and TOD Nodes development strategy. Institutional framework should follow integrated approach for land use planning, transport planning, infrastructure planning, etc. Similarly, land value capture be an outcome of good TOD implementation and not cause for it.

Future Fuels

- o As part of AQI measures, alternative fuels such as EVs should be promoted to reduce PM-10 and 2-5 and also to propagate Hydrogen fuel cells for wider applications.

Multi Modal Integration

- o Multi-modal integration should improve delivery of public transport services, passenger comforts and convenience, access to major facilities and activity centers to bring efficiency and enhanced revenue for public transport and facilitate shift to sustainable modes.
- o Short and convenient transfer between different modes and static and dynamic signages for information on feeder mode and supporting infrastructure are crucial for multi-modal integration. For this, single platform is required for integration of multimodal operation. Single app for one click solution connecting multiple operations will go a long way in success of multi modal functioning.

A.   Inauguration of the Exhibition

The exhibition is a special feature of the UMI conference to disseminate and showcase the latest development in urban transport technology, system and service, best transport projects and propagation of innovative ideas. The exhibition was inaugurated by Shri Hardeep Singh Puri, Hon'ble Minister of Housing and Urban Affairs and Petroleum and Natural Gas, Govt. of India. The latest technologies, urban transport startups, metro rail projects in operations, Kerala rail project, intelligent transport system etc. were of special interest to the delegates and visitors. Among others Shri Arif Mohammed Khan, Hon'ble Governor of Kerala, Shri Kaushal Kishore, Hon'ble Minister of State for Housing and Urban Affairs, Govt. of India, Adv. Antony Raju, Hon'ble Minister for Transport, Govt. of Kerala also visited the exhibition.

Visuals at Exhibition   site

B.   Inaugural Session

The 15ᵗʰ Urban Mobility India Conference & Expo 2022 was jointly inaugurated by the Hon'ble Chief Minister of Kerala Shri Pinarayi Vijayan and Hon'ble Union Minister for Housing and Urban Affairs, Petroleum and Natural Gas, Government of India, Shri Hardeep Singh Puri. Shri Elias George National Head, Govt. and Public Service KAMG, Secretary Transport, Govt. of Kerala , M.D. Kochi Metro Rail Corp. Ltd. and other dignitaries graced the inaugural session and enlightened the august gathering on the theme "Azadi @ 75 Sustainable Aatma Nirbhar Urban Mobility and the importance of annual international mega event on Urban Mobility India Conference cum Expo. An outcome of the inaugural session is discussed in the following section.

- Welcome Address by Shri Biju Prabhakar, Secretary (Transport) Govt. of Kerala.
- Key Note Address by Shri Elias George, National Head, Govt. and Public Service KPMG in India.
- Address by Shri Hardeep Singh Puri Hon'ble Minister of Housing and Urban Affair and Petroleum and Natural Gas, Govt. of India.
- Presence of Shri Surrender Kumar Badge Addl. Secretary, Ministry of Housing and Urban Affairs, Govt. of India.
- Inaugural Address (online) by Shri Pinarayi Vijayan, Hon'ble Chief Minister of Kerala.
- Vote of thanks by Shri Loknath Behra, M.D. Kochi Metro Rail Corporation ltd.

VIP's Lighting the inaugural lamp

Welcoming the dignitaries on the dais, delegates, participants, distinguished guests Shri Biju Prabhaker Secretary (Transport) Govt. of Kerala gave a brief background of the UMI Conference & Expo. He said that after two UMI conferences held online i.e. 13ᵗʰ & 14ᵗʰ UMI, we are having 15ᵗʰ UMI conference 2022 physically at Kochi. Annual UMI conference has its genesis in National Urban Transport Policy 2006, which emphasized on capacity building of states and cities in sustainable urban transport system. He expressed his gratitude for selecting Kochi for organising the 15ᵗʰ Urban Mobility India Conference cum Expo on an important theme on "Azadi @ 75 Sustainable Aatma Nirbhar Urban Mobility" coinciding with 75ᵗʰ year of country's independence. He mentioned that the 3 day conference will have 10 Technical Sessions on specific topic of Urban transport, 5 Round Table Discussion, 2 Plenary Session, One Conclave. Besides it will have 8 sessions of Research Symposium. It will dwell on climate change and its impact on Urban

Transport and Other important issues. All the sessions will be conducted parallely. He stated that the Exhibition as part of conference was inaugurated just before this session by the Hon'ble Minister of Housing and Urban Affairs, Petroleum and Natural Gas, Govt. of India. Outcome of deliberation in the conference will be useful inputs in making decision by the state and city authorities in urban transport planning and development making it sustainable and Aatma Nirbhar Urban Mobility. He thanked all the guests on and off the dias, delegates, participates and organisers of the conference.

In his keynote address Shri Elias George, National Head, Government and Public Service KPMG in India narrated the significance of urban mobility in urban development. About one third population of the country is urban and the satellite images show rapid growth of urban extent in the country. Cities being engine of economic development play important role

Keynote address by Shri Elias George

in shaping the transport system. For improving ease of living in cities particularly larger ones urban transport has a key role. But, dynamics of cities reflected in pollution, congestion infringing time and cost overrun in transport project need to be addressed in right perspective. The need is to reclaim the cities in terms of making it walkable, improving civic services, making the transport system efficient and comfortable. Utmost priority be given for improving the efficiency of public transport for curbing the pollution and reducing GHG emission. It is essential to make public transport financially viable, socially equitable, safe and sustainable, MRTS leverages the acceleration of development as has happened in Kochi, Bangalore, Chennai etc. For improving efficiency and ridership four fold challenges have to be addressed. The system has to be I) commuter centric (mobility centric), II) provide seamless interchange, III) develop last mile connectivity and IV) integrated with the land use. Another important action should be reforming the regulatory land scape by amending the section 67 of the Motor Vehicle Act, transport management, fiscal incentives ensuring transport system priority. Hyderabad, Chennai, Kochi have done so. Hence tier 2 and tier 3 cities should have appropriate public transport before the situation go out of control. Urban mobility should not only be taken care of by

the government alone rather private sector as well as public private sector participation should equally be encouraged as has been done in Kochi, Hyderabad, Mumbai, etc.

In his address Shri Hardeep Singh Puri Hon'ble Minister of Housing and Urban Affairs and Petroleum and Natural Gas, Govt. of India said that he was delighted to be in UMI Conference at Kochi which is a beautiful city and known as Queen of Arabian Sea. Kochi has effective and integrated public transport system. He noted the presence of many


Address by the Hon'ble Minister, MoHUA

distinguished guests in the hall which is the testimony for development of important Metro System in Kochi. Narrating experience of his first posting in Tokyo in nineteen seventies he mentioned about his thought of having metro system in Delhi and other cities in India. He was happy to say that today we have one of the best metro rail system in Indian cities. Although we embark on metro rail journey in 1984 it picked up significantly after 2014. As on today, metro rail network of 810 km is operational in 20 cities. India has surpassed in operational metro network of Japan, USA and other countries. No doubt we have learnt from the experience of other countries but today our system are among the best in the world and also sharing our knowledge, experience, technology and services with other countries. There is a sense of satisfaction in developing the metro rail system and having a ridership of about 85 lakh per day. Even in Kochi I am told that the ridership has gone up to 80000 per day.

There is a wide spread acceptance for rail based public transport and we have noticed a huge demand from state governments for the central assistance for metro rail projects. The recently developed Metro Neo and Metro lite suitable particularly for tier 2 and 3 cities are being encouraged. Kochi has developed water metro project which is being integrated with metro rail system to popularize it. It will serve well 10 islands around Koch by having 15 rounds per day. It has taken the clue from traditional water trade routes, inland water transport and road transport in harmony with ecology of the area. He stated that being a Minister of Housing and Urban Affairs and Petroleum and Natural he finds a kind of confluence between the two in terms of requirement of fuel and growth trends. There is a

silent revolution in 3 wheeler, E- rickshaw battery as 70% of traffic is by 2 wheeler and 3 wheelers. There is a huge demand for replaceable batteries in 3 W as well as for the charging stations. He stated about 1.4% bio blending in fuel in the past but now the situation is changed. As against the target of 20% of bio fuel by 2024-25, 10% target is already achieved. Blended fuel in petrol and ethanol from waste and sugarcane are emerging alternative fuels.
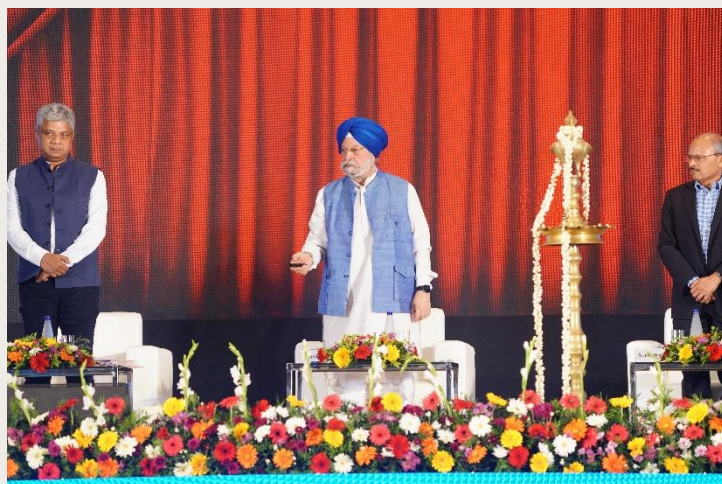
Release of short film on Urban Mobility by Hon'ble Minister

As regards metro rail system, it is emerging as an important public transport system which shows a sign of economic development. In Delhi, there is very efficient metro rail system. He mentioned that even earlier Housing and Urban Affair Minister usually travelled from Airport to his office in the ministry by metro. Once the last mile connectivity is improved many more senior officials and ministers would be frequent users of metro. As regards targets of electric vehicle set by the Hon'ble Prime Minister of India during the COP-26 meeting held at Glasgow, use of electric vehicle both public and private is progressing fast. In respect of Vision 2047 when India will celebrate its 100 years of independence we have set the objective to make India a "viksit" country/ developed country. Accordingly, in such conference we should set the target that what will be achieved in urban transport / kind of urban mobility in terms of growth in ridership, non-polluting fuels, technology, service efficiency etc.

Before delivering his address the Hon'ble Minister released some of the publications and inaugural video as under.

- Short film on "Sustainable Aatma Nirbhar Urban Mobility"
- Gati Dashboard on Urban Transport
- Kerala open mobility network launch
- Green Urban Mobility Program(GUMP) Newsletter
- Report- E- Auto Electrification Programme in Kochi

- Report- India's Electric Vehicle Transition: Managing fuel tax revenue.

In his inaugural address delivered virtually by Shri Pinarayi Vijayan, Hon'ble Chief Minister of Kerala, thanked Ministry of Housing and Urban Affairs for holding UMI-2022

Inaugural Address by Hon'ble Chief Minister, Kerala

Conference at Kochi. He said that he was happy to be a part of this conference. He stated that Kerala stands as the best in many aspects including urbanization level and growth

Release of Publications in the Inaugural Session

index in the country. Kochi is in the process of having a unified integrated transport system and also improving the first and last mile connectivity. The Kerala open mobility network helps to make the integration easier. He stated that many upcoming plans in the field of transportation like installation of around 1200 public charging facilities for electric autos across the state are progressing. He pointed out that gap between urban and rural areas is too narrow in Kerala. It is mostly semi urban and is inclusive society. For such type of situation out of box thinking is required for each of mobility mode in urban area and accordingly steps are being taken by Govt. of Kerala. As regards Kochi, it is one the biggest and ambitious city in the state. As such Kochi metro is being connected with water metro and to improve first and last mile connectivity. Efforts are also being made to cut the cost of construction and operation and maintenance. He mentioned that 2 months back third phase of Kochi metro was inaugurated. Transport system in Kochi is being improved in view of the importance of the city being queen of Arabian Sea. Various modes such as Air, Rail, Road, Water, Metro are being integrated providing easy connectivity to the beautiful inlands around Kochi. It will give a boost to economic development of islands and other cities near Kochi. KMRL has given major thrust to make various modes interoperable and sustainable. Hydrogen fuel and green mobility is being promoted by the Govt. of Kerala by providing subsidies. In another first

the state has embarked on providing electric charging stations and constitution of Unified Transport Authority for coordination of various activities under one roof. Kerala Infrastructure Investment Board and other agencies have combined sectoral plans to make them sustainable. Kerala is committed to have public transport in cities which will be sustainable, accessible, equitable, safe and affordable. This conference forum will help in achieving the objective. He expressed his gratitude to MoHUA in reposing the trust in Kerala by organizing this conference at Kochi.

In the end Shri Loknath Behera, Managing Director Kochi Metro Rail Corporation ltd. proposed a vote of thanks. He thanked the Hon'ble Chief Minister of Kerala, Hon'ble Minister of Housing and Urban Affairs, Petroleum and Natural Gas, Govt. of India Shri Hardeep Singh Puri, Additional Secretary MoHUA , Secretary Transport, Govt. of Kerala, keynote speaker Shri Elias George, all other dignitaries, delegates and participants as well the organising team of MoHUA, officers of KMRL and IUT.

Audience at the Inaugural Session

C.   Plenary session

The UMI-2022 hosted two plenary sessions to initiate and provide a platform for discussion on urban mobility needs and emerging trends. The first session on Strengthening the Ecosystem to Accelerate Shift to Public Transport underlined the efforts to be made to provide and strengthen the required infrastructure and facilities to attract more shift to public transport. The second plenary session on Urban Mobility – Vision 2047- focused on essential measures and strategies expected across India by 2047. These plenary sessions concentrated on the ways and means to strengthen the public transport system in cities taking the lessons from the best public transport system practiced across the globe and to set the objectives to be achieved by 2047when India will be celebrating 100th years of independence.

Plenary Session 1:- Strengthening the Ecosystem to Accelerate Shift to Public Transport.

The National Urban Transport Policy 2006 has recommended investments in public transport and infrastructure for non-motorized transport. In line with these recommendations large investments have been made in public transport systems both by way of building new metro rail systems in several cities and public bus systems. Unfortunately, despite these investments, ridership on transport systems has not been as high as anticipated.

Panelist expressing his views in the session

It is therefore essential that measures towards accelerating public transport are called for. Experiences from around the world indicate that only those cities that have not just invested in public transport but have parallely taken action to restrain the use of personal motor vehicles have been able to bring about a shift to public transport. Seoul and Singapore are two important examples to learn from. This session discussed the range of initiatives taken around the world for accelerating a shift towards public transport.

Chairperson   Dr. O.P. Aggarwal, CEO, WRI India

Panelists-

    i.   Dr. Brijesh Dixit, Managing Director, Maharashtra Metro Rail Corporation Ltd. (Maha Metro).

    ii.   Mr. Vinay Kumar Singh, Managing Director National Capital Region Transport Corporation Ltd. (NCRTC).

    iii.   Mr. Mihir Sorti, Senior project Officer (Transport) ADB.

    iv.   Mr. Mohammed Athar Saif , Partner, PWC, India.

    v.   Mr. Laghu Parashar, Deputy Project Head, SMART- SUT-GIZ.

    vi.   Mr. Thierry Desclos, Director of projects at CEREMA. France.

Rapporteurs -

Highlights of Discussion

- The session highlighted on designing and implementing efficient high quality and sustainable transport system in cities so as to attract the commuters using private vehicle.

- Rapid advances of information technology and innovations have led to a wide range of transport

Chairperson and the Panelists on the dias

options thereby widening the choice available to commuters.

- Cities are planning innovative circular services to serve local areas thereby obviating the need for personal vehicles.

- The need is to disseminate the information to cities and to keep the stakeholders updated to the latest development and best urban practices adopted globally.

- Innovative alternatives like Metro Neo and Metro lite more suitable to medium sized cities and cheaper in cost than traditional Metro rail will accelerate the shift from private vehicles to Mass Transit System.

- In all, the new technologies purpose is to eliminate the need for personal transport with a focus more on usage of public transport.

Outcome

+ Emphasis needs to be on making the public transport safe, comfortable, efficient, affordable and resilient to attract the ridership. Simultaneously efforts be made to restrict the use of private vehicles through regulatory measures.

Participants in the Session

Given the global concern on climate change and need to bring down carbon emissions, India has made several bold commitments at the 26th meeting of the conference of parties held at Glasgow in November 2021. These commitment inter-alia included:

- Installing non- fossil fuel electricity capacity of 500 GW by 2030
- Sourcing 50% of energy requirement from renewables by 2030
- Reducing 1 billion tons of projected emissions from now till 2030
- Achieving carbon intensity reduction of 40% over 2005 levels by 2030
- Achieving net zero by 2070.

Chairman sharing his views in the Session

The rapid pace of urbanization in India will mean that cities will have to be at the forefront of this thrust towards carbon neutrality. India will be able to meet its commitments only if cities are able to contribute towards these efforts in a big way.

This session dwelt on the following questions: What measures will help to reduce carbon emissions from the urban transport sector? How can these efforts be financed? What kind of institutional reforms will help in moving towards carbon neutrality in the transport sector?

Chairperson   Shri Jaideep OSD (UT) E.O. Jt. Secretary MoHUA.

Panelists-

i.   Ms. Anumita Roy Chowdhary. Executive Director Research and Advocacy. Centre for Science and Environment (CSE)

ii.   Mr. Subhash Dhar, Senior Researcher, UNEP Copenhagen Climate Centre

iii. Mr. Mukund Kumar Sinha. Transport Specialist ADB

iv.   Ms. Sarika Chakravarty. Sr. Sector coordinator, shelter & Transport). National Institute of Urban Affairs (NIUA)

v.   Mr. Abhay Bhakre DG. Bureau of Energy Efficiency, Government of India

vi.   Mr. Sushil Kumar. Managing Director. Uttar Pradesh Metro Rail Corporation Limited

Highlights of Discussion

- As per UN estimates by 2050 India will have about 874 million urban population of which 36% will be concentrated in million plus cities and the remaining 64% will be living in less than one million size cities and towns

- In sustainable urban mobility passenger transport demand in Public and Para Transit mode is likely to increase from 1,000 billion passenger kilometers (BPKM) in 2020 to 2500 BPKM by 2050.

- It will have systemic effect on the city form, reduction in GHG emission, walkability, accessibility, etc.

- All this suggest for decarbonizing transport technologies in terms of electric vehicles, hydrogen and biofuels, etc. as alternative to traditional fuels.

- Electric vehicle powered by low emission electricity offer a batter decarbonization potential for land based transport (IPCCS PM – C8).

- But, it also throws some

Panelists exchanging their experiences in the session

challenges like increasing cost of raw materials and disposal of batteries.

- The session covered all the essential measures and strategies to be expected across all over India by 2047.

- Huge demand in the global market for an efficiently implemented transport sector is extending opportunities in building a developed nation.

- Realistic transportation can be done interfacing with Metro necessities along with automation competence and scales of production.

- Need for bridging the gap between prevailing policy and implementation of projects. For implementing more integrated transport in the city, Aatma Nirbhar design of Metro is required.

- Nearly 20 lakh electric buses would be deployed by the target year 2047.

- To ensure manpower efficiency, govt. is planning effective ways to ensure effective mobility.

- Centralize the civilian structures to reduce the repeated design and also to reduce the cost of construction.

- Emphasis should be on developing projects of Metro Neo and Metro Lite for wider replication.
- Common specifications for improving vehicular mobility were pointed out with an emphasis on fair integration of technological development.
- Public transport be planned through strategic Master Plan which would improve access to transport system like cost effective production.

Outcome

- Electric vehicles and alternative non-fossil fuels be promoted vigorously in future urban mobility to achieve the set targets by 2047.

Delegates participations in Session

D.   Technical Sessions

In all 10 technical sessions covering a wide range of urban transport related issues were organized as part of the conference. Technical sessions provided a platform to the experts, professional and policy makers to share their experiences, best practices, issues and trends in urban transport with the distinguished participants and delegates. All the technical sessions were interactive and lively.

Technical Session 1:- Climate Change and Urban Transport Impact.

Cities in India are growing fast, boosting the country's economy; at the same time as they grow organically the spatial growth along with higher share of motorized personal transport is contributing exponentially to GHG emission and climate change.

Government of India has committed to reducing the GHG emissions intensity of GDP by 33-35% by 2030 (Nationally Determined Contributions (NDC) following the Paris Agreement) and net zero by 2070 (COP26). India's transport sector, the 4th largest contributor of GHG emissions (accounting for 265 million tons of CO_2 in 2019 [1]), has been identified as an intervention area towards this ambitious goal. Transport sector decarbonization as well as climate adaptation and mitigation are key priorities of the country.

This session discussed and captured the gravity of the concerns faced by Indian cities along with potential package of institutional, regulatory, and planning interventions aimed at achieving climate adaption and mitigation measures for sustainable urban development.

Chairperson -	Dr. Mangu Singh Ex- MD, DMRC
Co-Chair -	Mr. Gerald Ollivier (Lead Specialist, Transport), World Bank
i. Ms. Ritu Ahuja , The World Bank	
ii. Mr. Karthik Ganesan, Fellow and Director – Research Coordination, CEEW	
iii. Ms. Bianca Bianchi Alves, The World Bank	
iv. Ms. Rotini Balasubramanian, Sustainability Expert, ADB	
v. Prof Ashish Verma, Professor, Transportation Systems Engineering (TSE) Convener, IISc Sustainable Transportation Lab (IST Lab), IISC Bangalore	
vi. Mr. Ankush Malhotra, Urban Mobility Expert and Head of Department – Urban Planning and Transit Development – SYSTRA, Systra	

Rapporteur -	Ms. Himanthini A. R. IISC, Bangalore, Mr. Sumit, Mr. Rahul R.S.

Highlights of Discussion

↓ In view of the varied geography characterised by deserts, mountains, forests, a long coastline, tropical climate with monsoonal and other weather patterns- India is vulnerable to the climate change impact.

↓ India was ranked 7th as per the global climate risk index is 2019. Seventy five present districts are prone to hydro met disaster. It is estimated that India's 50% population will have lower living

Chairman giving his opening remarks in the Session

standards by 2050.

↓ In 2022 severe weather incidence of flooding have been witnessed in some cities which had devastating impact on transport service and infrastructure.

↓ In 2022 itself while average rainfall in the country was 8 % less but Bangalore received 368% more than average rainfall, Tamil Nadu and Pondicherry received 93% more rain fall then average, it affected public transport and related infrastructure badly.

↓ Extreme weather events impact not only physical transport infrastructure but also service delivery and associated opportunity cost.

↓ Between 1960- 2018 damage due to floods only significantly increased by about 240 %. It is estimated that in Kinshasa (Congo) due to extreme weather events daily total cost of flood disruptions to commuter trips is over USD 1.2 million.

↓ Existing transport infrastructure must be made increasingly climate resilient by incorporating stronger engineering components, renewing urban planning and design concepts especially including elements of green and grey infrastructure. It may use readily available climate finance.

- Climate resilient infrastructure requires 3% additional investment over and above the project cost but it provide a USD 4 benefit for each dollar invested in resilience. It needs three kind of financing namely readiness financing, risk mitigation financing and investment financing.

- A report on how urban India moves (2019) has revealed that about 63% of urban population walks (at least 500m) 51% rides personal motorbike and 37% use public transport. The major barrier in use of public transport mainly includes frequency of service, quality of infrastructure, lack of seamless travel, etc.

- The increasing passenger travel demand is expected to skew the modal share towards four-wheeler between 2020 and 2030. The report further states that the emission in four wheelers is estimated to increase by 2 times by the end of 2030. To meet the challenge of increasing emissions transition to electric vehicle do provide some solution but it also face the problem of inadequate charging infrastructure network and increased energy demand.

  - Measure are required to disincentivize private mode by imposing usages based taxation in terms of distance based tax, increased toll tax, fuel tax, annual fee on EVs etc.

- Demand for travel in India is low on per capita basis but growing steadily. Passenger traffic by public modes has reduced by half over 70 years but road share in freight transport has increased by 5 times during the same period. Transport contribute 12% to national GHG emission.

Speaker expressing his views in the Session

- India is severely at the risk of storm surges, heat waves and flooding. Coastal cities to face high level risk from sea level rise and may face a sea level rise of 0.1 to 0.3 m by 2050. Cities to face lethal heat and by 2030 2.5- 4.5% GDP at risk annually due to working hours lost.

- By 2050, 360 million people in 142 cities may be exposed to extreme heat and climate change. It will increase flooding impact in Indian cities and 3/4 of urban land will be exposed to high

frequency flooding by 2030. Inaction in the face of slow onset events like heat waves will cost India 34 million jobs by 2030. As part of AQI measurement promote alternative fuels, EVs Fuel cell to reduce PM-10 and 2.5.

✛ Effective traffic management to address traffic congestion in real time. Promote Mass transport to reduce traffic density. ELVs (Extra Low Voltage) to eliminate polluters and promote circular economy. Climate change is to be addressed through mitigation and adaptation. Apart from India, only 5 Asian Countries set GHG targets to reduce transport emissions within NDCs.

Outcome

✛ The Transport being a key driver towards low carbon pathway, surveillance of public transport and related infrastructure is a critical component and it needs to be ensured for sustainable long term development.

✛ There is a need for low carbon and climate resilient infrastructure for transport sector towards net zero.

✛ Adaptive and climate resilient transport infrastructure is required by incorporating early warning system, emergency planning measures, etc.

✛ Considering the lifetime of urban transport infrastructure it is imperative to consider vulnerability, variability, and climate analytics in assessing risks and channel finance to facilitate resilience. It needs four pillared approach such as assessing vulnerability, designing resilient infrastructure solutions, building capacity and increasing post disaster resilience.

✛ Transport sector attracts climate finance in terms of scalable decarbonization including domestic and international carbon markets but resilience must be embedded.

✛ Smart mobility zone having effective integration of public transport and electric vehicles would be gainful in adopting EV in public transport.

✛ In order to avoid vehicle kilometer, 15 minute cities need to be developed and small and medium cities must aim at compact development and enhance the share of non- motorised trips in Indian cities.

- Efforts to mitigate and adaptation to climate change would increase accessibility to various opportunities and also to minimize transport poverty.

- Transport decarbonization will also address air pollution and resilience. For instance 10% of emission reduction could be achieved from 'AVOID' the trips, 30% from SHIFT to public transport and NMT and 60% reduction from IMPROVE i.e. intervention from ICEs to EVs , Hydrogen.

- 70-80 percent of infrastructure required by 2050 is yet to be built, it provides opportunity to build resilient infrastructure. Which means business in continuity.

- Cities to implement more stringent pro low carbon policies reducing road space to low efficiency mode.

- Engineered and non-engineered codes are required for resilience.

- Policy perspective for mitigation strategy under climate change need to stress on planning and regulatory instruments by increasing public transit coverage, creating cycling and walking infrastructure and imposing additional tax on purchasing vehicles. Encourage car-pooling and high occupancy vehicle lanes.

- Policy perspective for adaptation may confine to land use and infrastructure development by replacing impermeable road surface with permeable material in vulnerable areas. Attempts be made for slum relocation and rehabilitation, providing proper drainage facilities at vulnerable areas. Restricting development in low lying or vulnerable areas, etc.

- There is a need for pan India level strategies to shift the mobility sector to carbon neutral modes.

- Mitigation action in urban transport should stress on transport system improvement, mode shift and demand management, low carbon fuel, electrification and innovation and upscaling.

- Need for avoid, shift and improve resilience approach.

- For urban freight mitigation measures need to focus on implementation of urban freight management plans, development of logistic park, parcel delivery terminals, developing optimized routes, alternative fuels in urban freight.

- Estimation of GHG emissions for all urban transport projects be made mandatory. Launch an urban transport Mission on climate change to initiate measures in mission mode.

- Low Carbon Mobility Plan (LCMP) and City Climate Action Plan be prepared and complemented with each other and Master Plan.

Active participation in the session

Technical Session 2:- Planning for Bus Based Public Transport.

Low carbon mobility is one of the thrust areas of National Urban Transport Policy 2006. India has committed to net zero emission by 2070 in the UN climate change conference in Glasgow (COP26). Key areas of thrust to achieve these targets are augmentation of public transportation and electrification. The National eBus Program as well as the MoHUA Bus Scheme are expected to induct more than 60,000 buses by 2030.

Public transport planning encompasses a whole range of issues of accessibility, affordability and financing of public transport. City bus agencies are cash- strapped bodies trying to stretch thin resources to cover a large demand. Schemes like JNNURM, Smart Cities Mission and AMRUT have been instrumental in augmenting public transport in cities. The FAME scheme has supported the procurement of around 7000 e- buses in India of which around 2800 have hit the roads.

This session examined the capacity gaps in cities to strategies, plan manage future- proof public transport systems while leveraging innovative financing mechanisms.

Chairperson   Dr. Surendra Kumar Bagde, Additional Secretary MoHUA. Govt. of India.

Context setting and presentation:
   i.   Mr. Pawan Mulukutla, Director, Integrated Transport, Electric Mobility and Hydrogen WRI, India.
   ii.   Mr. Vivek Ogra Rartuer Ernest and Young.

Panelists -
   i.   Mr. K.V.S. Chaudhary, Municipal Commissioner, Bhopal
   ii.   Mr. Rohit Srivastava, Vice President & Head , Tata Motors Limited
   iii.   Mr. Sachin Nijhawan, Chief Revenue Officer, Switch Mobility Ltd.

Rapporteur -   Mr. Anantha Krishnan, Irtana Sagar, Mr. P. Ramesh, Ms. Almas Siddiqui, Mr. Abhinav Rawat, IISc Bangalore.

Highlights of Discussion

- Sustainable planning for bus based public transport has the potential to contribute and assist in achieving the national targets of 50% energy demand from renewable energy by 2030, carbon emission reduction by one billion tonnes by 2030 and target of net zero emission by 2070.

- In less than a decade, India will be home to the world's largest metropolitans regions

- Top 10 urban agglomerations in India

Chairman sharing his views in the Session

contribute more than 50% of the country's urban GDP.

- The transport sector witness the fastest growth of 50% CAGR in CO_2 emission by 2050 as compared to other major energy consuming sectors like power and industry.

- India policy initiative is to adopt zero- emission electric vehicles. It is planning to have 60000 clean fuel buses by 2030.

- Currently in public sector about 0.44 lakh buses are being operated in urban areas and about one lakh buses are playing at inter- city level. In private sector, 1.45 lakh buses are being operated under stage carriage permits and 0.71 lakh are contract carriage buses including mini bus.

- About 12.8 crore passengers travel in 2.91 lakh stage carriage permit buses daily considering ridership of 442 passengers per bus per day.

- 1.32 lakh urban buses are required currently but there is deficit of 65% numbering 91600 buses. Majority of the deficit is in tier-II and III cities. In 9 cities of 40 lakh and above population 28.1 buses is available for one lakh population while in 88 cities between 5 to 40 lakh population 8.2 buses are available.

- As against immediate requirement of at least one lakh buses the current outlay is for 60000 buses only.

- Challenges for urban buses in India are manifold. For instance regulation of buses is under Road Transport Corporation Act, 1950 where the intent was for nationalization in which state has monopoly and taken full responsibility to plan, operate and maintain.

- Quality of bus fleet is poor and there is a limited use of technology in operation and management of buses. There is a gap between cost and revenue and it became severe in the context of COVID. It also lacks trained professionals. 21% of state transport undertaking fleet is overaged. On an overage I in 5 buses is due for scrapping. Over aged buses not only pollute more, they are also costlier to maintain.

- There is a financial gap between earning per kilometer (EPKM) and cost per kilometer (CPKM) and it is also widening which calls for sustainable financing of bus operation.

- Urban STUS recover only 50-60% of their total cost of operation. Fuel cost has gradually increased and is about 15% of total cost of the operation. On the top of it COVID has affected both the cost of operation and ridership adversely.

- Electric buses have achieved parity with ICE buses especially with demand aggregation. As on June 2022 about 2800 electric buses were operational across 40 Indian cities mainly in Maharashtra, Gujarat, and Utter Pradesh.

- It is proposed to procure 50000 e- buses under National Electric Bus Program. Delhi is planning to procure 8000 e- buses by 2025 while Mumbai is targeting 100% electrification by 2028.

- Financial support mechanism helped in starting public transport across 17 cities in Gujarat. Another 5 cities are in the process of introducing bus service. About 2000 buses are operationalized under VGF scheme.

- Under CM- Urban Bus Service scheme in Gujarat V.G.F. (viability gap funding) of 50% or Rs. 12.50 per km is given for CNG buses with an equivalent share by the

concerned city. In July 2018 the scheme was applicable in 30 cities with one lakh and above population.

- Under this scheme there is extended VGF 50% or Rs. 25 per km for electric buses on equivalent share bases by city. In Sept 2019, 4 cities namely Ahmedabad, Surat, Rajkot and Vadodara were

Delegate posing a question to the Panelists

covered.

- Before VGF modal, 8 cities operated organized public transport whereas in post VGF modal 17 cities operated organized public transport.

- In Delhi route rationalization was intended to create an accessible, reliable and affordable bus system in Delhi. Accordingly, hierarchy based route network developed to optimally utilize bus fleet, develop high frequency reliable network and improve accessibility.

- Hierarchy of route include the following :-
  - o   CBD circulator- 5-10 minutes
  - o   Trunk route (directional 5-10) minutes frequency
  - o   Primary routes (connecting zonal hubs) 10-20 minutes frequency.
  - o   Village connectivity routes.
  - o   Airport routes
  - o   NCR routes

- In 2019 a first pilot project in Najafgarh area was taken for 17 routes (including one trunk routes). The findings of the same revealed 17% increase in overage daily

ridership i.e. these routes are catering over 11000 more trips per day as on today as against in January 2019".

- It also registered an increase of 19% in EPKM in the selected 17 routes and over 25% increase in EPKM on trunk route No. 817 during the same period.

- Based on the success of pilot project Govt. of Delhi had additionally rationalized around 30 routes in 2021-22.

- For application of ITS led approach specific goals need to be identified for transport improvement in terms of process improvement willing to change organizational and operational process, setting the priority for change process, funding life cycle, users need, capacity and capability of the organization to implement and sustain ITS, assessment of data needs and planning and implementation of the process.

- ITS planning needs structured thinking and process encompassing 1) planning approach with right kind of ITS applications, 2) design covering technology and platform need data requirements, cost etc, 3) system for ITS implementation and 4) evaluation both pre- installation and post implementation.

- Transport ITS application among other need to corridor operations management, traveller information, driver aids, security, fare collection, central control and analytics, etc. All these parameters need to be taken wisely.

- While implementing ITS process the aspects like service offered and utilisation level, convenience of passenger, economics of operation, vehicular capacity, availability of service, speed and delay in operation, etc. to be considered.

Outcome

- Strategies for an adaptive eco system for buses should follow avoid, shift and improve approach. Under Avoid, Long distance motorised trips should be planned by integrating land use and transport. Shift should focus on investment for walking cycling and public transport, Improve should include quality and fuels, vehicles and data using technological development.

- Potential strategic drivers for ITS planning are customer centricity, operation efficiency, resource efficiency and revenue efficiency.

ITS application is not just a technology project it helps in achieving organisational goals, deployment of ITS may have significant impacts, hence need to be planned carefully. ITS application should be responsive to the needs of the authority, commuters, supplier and other. It should have full involvement of key stakeholders.

Audience in the Session

Technical Session 3:- Gati Shakti Master Plan Role of Cities

The Government of India has launched PM Gati Shakti- National Master plan for multi – modal connectivity. It is essentially a digital platform to bring 16 Ministries including Railways and Roadways together for integrated planning and coordinated implementation of infrastructure connectivity projects. The multi-modality thus achieved, will provide integrated and seamless connectivity for movement of people, goods and services from one mode of transport to another. It will facilitate last mile connectivity of infrastructure and also reduce travel time significantly. The cities would play a key role in housing these multi- modal hubs and will also stand to benefit from these facilities.

In view of the above the session focused on the following : The Gati Shakti National Master Plan and how it is supposed to streamline the work of Cities, National Master Plan (NMP), its various layers and features which will be useful for cities & the work undertaken by one city / state. The advantages and challenges that they have faced, the support which can be leveraged from academia/ cso's on supporting the cities for successful implementation and use of NMP portal for betterment of city planning & infrastructure.

Chairperson	Mr. Anurag Jain IAS Secretary, Ministry of Commerce and Industry Dept. for Promotion of Industry and Internal Trade, Govt, of India.
Moderator	Mr. Deepak Bainder Program Manager, GIZ

Panelists -

i. Dr. Jivisha Joshi Gangopadhyay, Deputy Secretary, Logistics Division, DPIIT, MoCI

ii. Mr. Kaizar Dev Berman, Additional Director (Logistics), Deptt. of Industries & commerce, Govt. of Tripura

iii. Prof. Shivanand Swamy, Director Emeritus, CoE-UT, CRDF-CEPT

iv. Dr. Pawan Kumar, Associate Town & Country Planner, Town &Country Planning Organisation, Ministry Housing and Urban Affairs , GoI

v. Mr. Iftikhar Ahmad Hakim, Chief Town Planner, Kashmir and Additional charge of Director Planning and Coordination, J & K ERA.

Rapporteur - Mr. Rahul R. S., Mr. Sumit, Mr. Aitichya Chandra

Highlights of Discussion

- P.M. Gati Shakti Plan is a transformative approach for reducing logistic cost and improving logistic efficiency.

- In this context, it is addressing the common problems such as complex coordination issues, lack of visibility and information delay in land acquisition and other clearance constrained planning and decision making, institutional arrangement at central and state level, pan India level GIS based digital platform – national master plan, project monitoring group portal, customised decision making and planning support tools etc.

- It is to prepare National Master Plan for integrated infrastructure network planning and to formulate National logistic Policy for efficiency in services and human resources.

- National Master Plan will have 2D/ 3D/ 4D visualisation in GIS based platform in different layers namely forest layers.

- Before NMP, the approach was different. It took 3-4 months in pre- alignment work with limited visibility, non-integration of NOC approvals, discrepancies between land acquisition plan and ground realities and

Chairman giving his opening remarks in the Session

disjointed social sector planning.

- After introduction of PM Gati Sahkti National Master Plan for multimodal connectivity pre- alignment time is reduced to one month, GIS based layers are visible on NMP, NOC approvals are digitised and integrated, accurate land details are available in alignment planning and it has integrated and holistic planning of social and economic infrastructure.

- Gati Shakti NMP approach is followed in Pune – Bangalore expressway in pre-alignment exercise by linking the land records and identifying NOC and approval required for the project falling in Maharashtra & Karnataka states.

- Similarly, PM Gati Shakti approach is also being used for project planning by States. In Goa, project is planned using state Master plan for merger of government schools as well as District Management Plan and infrastructure planning.

- In many other cases PM Gati Shakti NMP used for Ladakh power development mobile application, social sector planning in Uttar Pradesh.

- In an another example it has also been used for examining the project namely doubling of Katihar – Mukuria, Katihar- Kumepur of Rajdhani route in UP, Bihar to North East, Doubling of Agthori- Kamahya including 2nd rail bridge at Saraighat.

- Under PM Gati Shakti – NMP scheme following actions have been taken :-
  - Institutional framework (EGoS, NPG) operational at center and state level .
  - Over 1600 data layers of Central Ministries & States / UTs mapped on NMP individual portals for central ministries (22) and state / UT (36) developed.
  - Tools for planning NOC / approvals / clearances, DPR preparation, land parcel valuation.
  - Integrated project planning -42 Greenfield projects examined by NPG.
  - 197 critical infrastructure gap projects identified.
  - Over 1500 inter-ministerial issues resolved for time bound implementation.

- Under the scheme existing system for monitoring infra projects integrated. Monitoring mechanism for the project will have category of the project, objectives, stakeholder. stages covered, criteria for

Panelist presenting his paper in the Session

monitoring and project data base.

- For various Ministries, targets/ achievement in various sectors are set by 2024-25.

- National logistic policy approved by Union Cabinet on 21.9.2022 will complement the PM Gati Shakti NMP.

- Targets of national logistic policy are:-
  - to reduce cost of logistic in India to be comparable to global benchmark by 2030.
  - Improve the logistic performance index ranking to be among top25 countries by 2030.
  - Create data driven decision support mechanism for an efficient logistic ecosystem.

- It has set a clear agenda for immediate implementation on the ground.

- The state of Tripura has adopted the vision of "PM Gati Shakti" bringing different departments under an institutional framework and made them operate collectively in prioritizing the projects for sustainable development of multi- model connectivity of infrastructure for logistic support for goods and services- " First Mile to Last Mile" to achieve sustainable growth with visual understanding.

- Achievements made so far by Tripura state under Gati Shakti NMP are as under:
  - Created institutional framework – regular interaction, meetings.
  - Uploaded 50 data layers including mandatory data layers.
  - Capacity building for identified technical personal for efficient working on the PM Gati Shakti NMP.
  - Planned & prioritized projects under state action plan for 2022-23.
  - State logistic policy framed to be adopted.

- Union territory of Jammu and Kashmir has formulated PM Gati Shakti Master Plan for J & K and proposed constitution of committees i.e. Empowered Group of Secretaries, (EGoS) , Network Planning Group (NGP) and Technical Support Unit (TSU) in the industries department of UT.

- Manufacturing and services are concentrated in cities in J & K where they are benefitted from agglomeration economies and ample market for inputs, outputs and labour and where idea and knowledge are rapidly diffused.

- City regions play extremely significant role in formulation and implementation of state level Gati Shakti Master Plan. In this regard Jammu and Kashmir Metropolitan Region Development Authority constituted by J & K under J& K Metropolitan Region Development Authority Act 2018 which would provide an integrated framework for this purpose.

- The objectives of these authorities are to prepare Infrastructure Development Plan, Mobility Management Plan, and Sustainable Management of Urban Environment Plan.

- Gati Shakti also known as holistic infrastructure development program aims to improve the productivity of industries and employment opportunities.

- It is a transformative approach for economic growth and sustainable development driven by 7 engines i.e. Railways, Roads, Ports, Waterways, Airports, Mass Transport, Logistic infrastructure.

- Approach is powered by 'Sabka Prayas' i.e. collective efforts of the Central Govt. + State Govt. + private for job and entrepreneurial opportunities for all.

- Gati Shakti Master Plan has been development by BISAG- N on GIS platform wherein data specific action plan of all the Ministries / Departments is being incorporated

within a comprehensive data base, it uses geo- mapping and real- time data in one centralised portal.

- It uses satellite imagery available from ISRO and base maps from SOI comprehensive data base of ongoing and future projects of various Ministries has been integrated with 200+ layers. Individual ministry is given separate login ID to update their data on periodic basis.

- A study conducted by the Reserve Bank of India and the National Institute of public Finance and Policy have estimated that every rupee spent by Govt. in creating infrastructure result in GDP gains worth Rs. 2.5- 3.5.

- As part of multimodal transport system and logistic, multitrillion flagship projects such as Sagarmala, Bharatmala and dedicated freight corridor are already working in this direction.

- The PM Gati Shakti National Master Plan is important for achieving the Prime Minister's dream of making India a USD 5 Trillion economy by 2024-25.

- In order to implement the Gati Shakti initiative, Indian Railways has created a separate directorate at the railway board with its branches at Khurda, Bilaspur, Delhi and Bangalore division. It has identified 74 Gati Shakti multi- modal cargo terminal across the country.

- The Ministry of Ports, Shipping and Waterways (MoPSW) has identified 9 high impact infra projects worth Rs. 1913 crore as part of the Pradhan Mantri Gati Shakti National Master Plan.

- In another facet of PM Gati

Panelists sharing their views in the Session

Shakti, Department of Personal and Training (IGoT) has started training courses on IGoT platform. It has initiated mandatory training for the Govt. officials both at state and center level and E- learning for civil servants across the country.

- IGoT platform has four modules of training program comprising 1) Introductory module of PM Gati Shakti covering concept, objectives, expected outcome supported by case studies. Second module deals with planning and decision making tools under NMP portal and the third module is related to state engagement while the fourth module is on project monitoring framework.

- About 18 indicative courses have been designed by NITIE under PM Gati Shakti covering host of subjects including multi- modal transport management, transport and shipping logistic management, transport system and network design.

- Connectivity in regional perspective intend to use both Gati and Shakti in infrastructure development. Links with other modes of transport network also need to be addressed. For instance development of Metro in Regional Master plans perspective. All the three RRTS lines are proposed to be linked with Delhi Metro and Indian Railway System.

- Performance audits for infrastructure are also critical under Gati Shakti Master Plan for creation of infrastructure, their connectivity, maintenance, repairs, operational costs, etc. Ministry of Road Transport and Highway improved multimodal connectivity and last mile connectivity across the country.

- State wise Gati Shakti portal for multimodal connectivity are to be developed in the following areas:-
  - o   Pragati path- High speed corridor (highways)
  - o   Vikas path – state roads passing through municipalities, urban areas, towns, cities.
  - o   Kisan path – connecting to market place for farm products and milk.
  - o   Pravasi path- connecting to tourist destination.
  - o   Railways connectivity- railway network in the state.
  - o   Pipeline Gas Grid Network- in 25 districts.
  - o   Water Grid Network- for drinking and irrigation.
  - o   Port policy- Private sector participation in port development.

- NITI Aayog to map different projects such as industrial corridor, freight corridor, national industrial manufacturing zones, industrial parks, logistic parks and pharma parks for incorporation under the Gati Shakti Initiatives.

- The Parliament passed a bill to convert the National Rail and Transportation University a deemed to be university into Gati Shakti Vishwavidyalaya, an autonomous central institution. It also seeks to expand the scope of the university beyond the railway to cover the entire transport sector.

- In logistic planning and management urban mobility is facilitator of the movement of goods and service, economic growth,

Delegate posing a question to the Panelists

- employment generation and improvement in quality of life.

- Freight transport is diversifying with large multi axle trucks to e- rickshaw, e-commerce, DFC, multi- modality.

- Challenge of urban freight are multifarious. About 10% of India's freight related CO2 emission are due to urban freight. 23 kilo tones of PM emission and 305 kilo tones of NOx emission annually impact air quality. Freight vehicles contributed to 9% and 6% of road fatalities in million plus cities in 2019 and 2020. Last mile deliveries in cities contribute to nearly 50% of total logistics cost in India's e- commerce supply chains.

- In Ahmedabad city freight transportation in traffic composition across 5 location exceeds by 40%. In Surat city external traffic composition of freight demand in total external demand is 52%.

- In city like Ahmedabad freight activity distribution in respect of trade is spread all over the city with major concentration in city core where as demand for transporters and warehouses and factories and industries is specific location based.

- Freight vehicle movement is mainly internal to internal within city area and internal to external, external to internal is mainly in outlying areas of the city. Operating empty vehicles significantly within the city is the huge losses in terms of its efficiencies and also leads to externalities.

- Generally the focus of city planning does not fully include transport both passenger and goods. Even urban transport planning does not adequately address the needs of freight transport.

- State/ city governments are the primary stakeholders concerned with urban freight. These agencies formulate land use plan showing activity zones, network, infrastructure involved in operation and management of networks, frame regulations and optimize traffic management.

- Private sector operates within the provisions of the system focusing on profit and other gains.

- Linking freight with the growth of region, rail line passing through industrial areas of Ahmedabad city region has a potential for shifting of 55% goods traffic to rail.

- Taking GIDC (Gujrat Industrial Development Corporation) estates of Naroda, Vatva, Odhav in Ahmedabad city region as specific example there is a need for freight management plan focusing on redefining freight zones and time zones.

Outcome

- City region layer should be created in the Gati Shakti Master plan for better planning of city/ city region from infrastructure development perspective and balanced economic development.

- Since uploading of relevant information on "Gati Shakti Digital Platform" needs digitization of data / maps and project formulation on GIS platform, capacity building of those agencies, which may not have significant digital footprints, are required.

- Architecture of the Gati Shakti Platform would have to ensure compatibility with the technologies being used by the ministries.

- For freight management in urban areas logistic hubs and transport nagar in the cities need to be integrated with the city logistic area for smooth movement of goods. Establish logistic hubs consolidation / distribution centers near commercial centers and city area.

- Missing link of freight movement for goods and service in the land use plan or city mobility plan needs to be addressed by local government, urban development authorities. It needs to be ensured that transport system provide accessibility to all categories of transport.

- Sustainable urban freight transport system should improve the resource and energy efficiency and cost–efficiency of the transportation of goods taking into accounts the external costs.

- Amendments in Town Planning Acts need to be made to integrate freight in transport and urban planning and for preparation of comprehensive mobility plan and the common building bye laws.

- Technology be used for transport data management. Traffic data for regional and city level be managed by commodities using GST, E-way bills and satellite traffic monitoring system through road side camera videos.

Participants in the Session

Technical Session 4:- Sustainable PPP in Bus Transport

Global experience shows that cities are moving towards public private partnership (PPP) model for operation of city bus services. The government of India (GoI) has been instrumental in adopting PPP reforms since the last two decades. Contract management and performance monitoring of service providers is crucial for transparent functioning of PPP based bus operations. This session explored and addressed the risks associated with PPP contracting practices for bus agencies and operators and share knowledge, experience and innovative approaches to scale up bus adoption in Indian cities.

Chairperson & Moderator -	Dr. Surendra Kumar Bagde, Additional Secretary, Ministry of Housing and Urban Affairs Govt. of India.
Context Setting and Presentation :	Mr. Madhav Pai, Executive Director WRI, India and Mr. C.R. Goyal Sr. Vice President DIMTS

Presenters -

i. Mr. Biju Prabhakar , IAS, Transport Secretary, Kerala Government

ii. Mr. Prasanna Patwardhan, Chairperson & Managing Director, Prasanna Group of Companies.

iii. Mr. Rohit Srivastava, Vice President & Head, Tata Motors Limited

iv. Mr. Gerald Ollivier, The world Bank

v. Shri. Arun Bothra, Transport Commissioner, Govt. of Odisha

Rapporteur -	Mr. Abhinav Rawat, Mr. Anantha Krishnan and P. Ramesh

Highlights of the Discussion

- PPP model is a partnership between public and private sector for providing a service traditionally provided by the public sector. It results in reduction in management expenditure, cost effective, leveraging private sectors expertise and hassle free service.
- There are four city bus operation PPP models namely gross cost contract (GCC) GCC hybrid, Net cost contact (NCC) and NCC hybrid.
- The structure of these models vary in operational efficiency, investment requirement, access to finance, incentives for private players, project viability and sustainability,

- CRUT (Capital Region Urban Transport) Mo-Bus Odisha is on GCC Hybrid model having partnership among government, operator and traveller.

- The growth story of service is encouraging. Average monthly ridership increased from 33000 in May 2018 to 1.01 lacs in January 2020. Similarly, average monthly revenue increased from 5 lacs in May 2018 to 12 lacs in January 2020.

- CRUT experience shows that the best of the models will fail if it is not customers centric and if all stakeholders of the bus operations are not working together towards a single objective of customer delight and creating moment of truth consistently.

- Mo bus service is a successful story and has won Best City Bus Service Project Initiative of India in Urban Mobility India Expo 2019, marketing campaign of the year in Odisha 2019 and best consumer connect brand of Odisha 2019.

- Government perspective in this case is reflected in its political and administrative will, long term budgetary provisions, welfare scheme and not a profit venture fair play as well as control and compliance.

- Operator perspective in this regard ensure fairness, timely payment, non- interfering management, infrastructure provision and other support.

- It has prepared pocket route maps, issued 15th August Freedom Monthly Pass which helps in increasing the ridership. It also launched customer friendly initiatives like service beyond duty and news on wheels and consumer engagement

Opening remarks by the Chairman in the Session

during COVID- 19 by introducing games on MO BUS. Games not only brought huge brand recall but also successfully communicated social distancing awareness.

- CRUT teams visit depots, bus Shelter and also travel in buses as mystery passengers at least twice a week. Team builds a positive perception of the brand MO BUS. It transformed from slow to an agile youthful brand.

- Social Media outreach strategy includes messaging through Meme, Infographics, GIFs (Graphic Interchange Formats) Moment Marketing, and testimonials Crowd Sourcing, connected with the youth.

- Some of the examples of the Social Media both in English and Odiya are very eye catching such as :

- o Buy ticket or else pay 10 x fare / Rs. 500 which ever in lower.
  - o Mujhe Mo Bus stop PE Land Karwa Do (for visually impired)
  - o Easy pay, digital pay

- MO BUS has tie-up with Odisha supports for free Hockey Match Tickets, Indian Hockey, ISL Football matches ticket for Odisha FC team.

- It created a mascot which is witty, humorous and build a community for MOBUS. MOBBY is trying to promote the brand promises on a daily basis which resonates among commuters. MO BUS built its own Troll Army. Currently CRUT has achieved highest daily ridership of 2 lacs.

- During lockdown period CRUT served the society in different ways. Bus shelters were used for vegetable vending and grocery were sold / distributed on MO BUS, transferring the COVID call centre executives and emergency health workers, police during the pandemic through multiple trips 24 / 7 by making more than 200 trips in a month.

- Adopted to the new normal during pandemic by starting bus pathshala, MO BUS card tap and pay, contactless payment method introduced, no standing in bus and only commuters wearing mask were allowed to board MO BUS.

- In Delhi, bus will continue to be the principle mode of public transport system due to flexibility, low cost etc.

- Journey of public transport in Delhi has been reform oriented. As a follow up of Supreme Court order entire city fleet steadily converted to CNG after March 2001. In 2007- 2008, 50% private bus fleet was revamped under PPP model. Current plan is introduction of electric bus in Delhi. Implementation of PTX2 strategy for doubling the market share of public transport with target fleet of 11000 buses.

- Performance improvement of city transport leads to modernization of transport system by making scientific decision making using technology and data analysis, improvement of economic and financial efficiency, improved user satisfaction and improved monitoring system and capacity building.

- The need is for GCC (opex model) in buses with focus on functional specification which will provide more flexibility for the manufacturers and transferring operating risk on the operator.

- For sustainable PPP opex model may be considered with following options :-

  o Bundling aggregation of demand both for augmentation and in lieu of retiring fleet in next three years to get economy of scale.

  o Depot infra with upstream power infra having sanctioned power load provided by authority in depot.

  o Concession period 12 years.

  o Assured kilo meterage (urban bus) @ 70,000 per bus per annum.

  o Commitment of amount of upfront capital subsidy (demand incentive) at parity with FAME-2 scheme of DHI by state Govt.

  o Payment security mechanism with provision of Escrow Account.

  o Annual revision of fees based on index value for manpower cost and other consumables. Electricity at actual tariff of state with cap based on efficiency criteria.

- In e-bus, integrated technical solution be followed by having a shift changeover window of 60 minutes in depot / terminals versus 20/30 minutes.

- A minimum 200 km/ day

Panelists interacting with the Audience

should be available as single charge to have operational flexibility and lower operating cost.

- In cluster buses in Delhi, technology is being used in several ways i.e. GPS device for monitoring of bus service and its operational status, CCTV monitors offline and online status, AFCS provides passenger data route and bus wise detail etc. and contactless ticketing through charter App.

- Upgradation based NCMC compliant digital tickets solutions is also in pipeline.

- Authority managing cluster buses under GCC model is responsible for planning and scheduling, monitoring, ensuring compliance with technical standards and specifications, compiling real time data, service trip validation, and performance. Adjustment and payment to concessionaire with audit trail.

- Monitoring mechanism uses following key performance parameters.
    - Bus quality & presentability: Daily checking of 100% buses at depot gate.
    - Operational aspects : Over speeding, Bunching, Route deviation, service gaps during peak hour and peak direction on trunk and primary routes.
    - Service Trip Validation : using trip wise mapped GPS data and trip – wise revenue data on web based application software (BMS Application) with evidence mapping / audit trail.
    - Additional checks : Trip departures as per unified time table (zero tolerance for early departure), stoppage at designated bus stops, route adherence, actual service kms as per GPS.
    - Payment processing using ERP software without any human intervention.

- Real time information for the commuter is available in user friendly systems regarding ETA at bus stops, seat availability, trip planner, route details, feedback etc.

Outcome

- An independent communication cell is a must for a public transport organization to run the bus service successfully, it has to work in collaboration with operation team.

- For running bus service effectively development of robust institutional mechanism is required backed by sector specific policies.

- Integrated approach to technical and financial planning is required and a unified agency be established.

- Incorporate the spirit of partnership in PPP contract and comprehensive model contract document along with guideline for all types of projects be developed.

- Timely hand over of assets/ land be provided to operator and efforts be made to involve small operators by safeguarding revenue generation.

- In the proposed source of revenue for National Urban Transport Fund (NUTF) green surcharge of Rs. 2 on petrol sold in the country green cess on existing personalized vehicles and urban transport tax on purchase of new cars and two wheelers may be imposed. As per the revenue collection earmark   the fund to cities / state.

- Approach for planning and procurement of EVs by PTAs / STUs need to follow the steps as under:-

  o Assessment of requirement of EVs (e- Buses) in next 3 years with e- Bus type / size.

  o Earmarking depot(s) / depot (s) space for e- Bus depots with capacity.

  o Feasibility assessment of power load with cost and timeline with Discoms.

  o Selection of routes.

  o Mapping of routes with depot based on least dead mileage.

  o Decision on operating mode (capex, opex- wet lease/ dry lease).

  o Provision of capital funds for construction of depot with power load infra & capital subsidy.

Attentive Audience in the Session

Technical Session 5:- Gender Inclusive Mobility

Women are generally found to be underrepresented in the transport sector because of stringent qualification criteria, stated arduous nature of the job, odd timings, safety concerns and societal norms. Their limited presence adversely impacts the infrastructure and service design of the system. Issues of overcrowding, deserted ill- lit streets and bus stop, poor crew conduct, low women presence, absence of crime preventing elements make women feel vulnerable while travelling. These issues often result in restricted mobility and missed educational and employment opportunities.

This session sought to facilitate discussion on gender inclusive transport pertaining to issues faced by women in transportation systems and the interventions various cities have taken up to make the system more inclusive alongside their impact.

Chairperson -	Ms. V. Manjula, commissioner Directorate of Urban Land Transport (DULT), Bangalore
Context setting & Moderator -	Ms. Krishna Desai, Technical Advisor GIZ
Speakers -	i. Ms. Dipti Mahapatro, General Manager, Capital Region Urban Transport (CRUT) Officer on Special Duty, Odisha State Road Transport Corporation (OSRTC); Secretary, Berhampur Development Authority; and Deputy CEO, Ganjam Urban Transport Service Ltd. ii. Dr. Kalpana Vishwanath, Co-Founder and CEO, Safetipin. iii. Ms. Meera Sundararajan, Gender and M & E Expert and Team Lead at the Gender and Policy Lab, Greater Chennai Corporation. iv. Ms. Priya Singh, Cofounder and Director, Chalo Mobility
Rapporteur -	Mr. Sayanton Mohanta, Mr. Itana Sagar, Mr. Roshan Koshythomas

Highlights of the Discussion

- Freedom of mobility and ease of access to public spaces are important enablers to women's empowerment.

- Easy access to economic opportunities, education especially higher education, health care, leisure etc. for the women will really make it inclusive gender mobility.

- In a specific example of Chennai metropolitan area 37% of all female trips are through walking as compared to 26% of all male trips.

- Fewer women own vehicles (only about 5% of the sample surveyed) as compared to 44% owned by men.

- Besides walking women in the working age also use public transport and auto rickshaw more than men. Moreover women generally travel in off peak hours.

- For men 2 wheelers are by far the most dominant mode with 54% of all male trips whereas women transport modes are more diverse.

- While men and women experience the city differently. Historically, the city's public infrastructure including urban mobility system designs disproportionally benefit the male users.

- Infra and service barriers in accessing public transport, lack of safety and social norms severely limit women's work, education and life choices. Further harassment on public transport and in public spaces is widely underreported.

- Accessibility in terms of connectivity and walkability, acceptability from safety, comfort, frequency and reliability point of view, affordability in cost of travel and availability of multi- modal transport options, gender informed schedules and routes are the hall mark of gender sensitive public transport.

- As part of Chennai city partnership, a World Bank funded study team of expert comprising legal, mobility, planning, safety audit and training carried out a rapid gap assessment exercise.

- After identifying the gaps, recommendations made and institutional mechanism for coordinating the gender programme suggested.

- Institutional mechanism and funding are established (Gender and Policy Lab) by the government of Tamil Nadu under the Nirbhaya Fund which is overseen by Deputy Commissioner (Education) at the Greater Chennai Corporation.

- Action plan is formed by the gender lab based in the gap assessment report and in consultation with government and other stakeholders. Its implementation started in May 2022.

- Institutional mechanism for government of Tamil Nadu Nirbhaya fund project has been set up. It has apex steering committee as well as implementation committee.

- In addition, it has working group consisting of officers from other departments dealing with women's safety. There is a voluntary advisory committee consisting of civil society representation and external organisation for carrying out survey.

- Key implementing agencies for the project are Greater Chennai Corp., Greater Chennai Police, Metropolitan Transport Authority and Social Welfare and Women's Empowerment Department.

- Gender and policy lab in Chennai aims to create a system with seamless inter-departmental coordination within the government and outside the system to facilitate greater mainstreaming in urban development including transport.

- Census 2011 shows that in India 84% women trips are either by using public transport intermediate public transport or non- motorised transport (including walking).

- A study conducted by Safetipin on the yellow line of Delhi Metro reveals the short fall in the public transportation of Delhi and suggests recommendation to better integrate the metro with other mode of travels.

Chairperson opening the Session

- Users perception study in Kolkata shows that walking is the prime mode of NMT. 80% of the people would walk to complete their trips.

- Bicycle and rickshaws are the preferred mode of NMT because it is cheap & quick. 26% have NMT vehicles as their livelihood.

- Man and women choose different modes of transport even when commuting for the same purpose depending on the distance to be travelled for the commute and hour of the day travelled.

- As per Ministry of Road Transport and Highway (2018) in transport sector only 1% women possessed the commercial driving license.

- In Bhubaneshwar CRUT MO BUS provides socially inclusive and gender sensitive mobility service. First and last mile connectivity is provided by feeder service of MO- E- Ride to MO- BUS.

- It has 50% reservation for women guide (conductor of MO BUS) 100% reservation for women, Transgender and HIV+ people as sarthies including policy on recruiting women captains (drivers of MO BUS).

- There is a provision for separate washrooms for different gender groups in the Depot. Concession is given for differently abled people and their companion on MO BUS- and 50% concession is for senior citizen in bus fare.

- Bus queue shelter are well lit. There is provision for priority seats for women along with CCTV surveillance and emergency panic button in MO BUS.

- Mo Bus also contribute to sustainable development goals. As per SDG's target 5.1 MO BUS has gender inclusive recruitment policy. Under target 8.5 it ensures equal pay for equal work for all. Target 10.2 is achieved through mainstreaming people belonging to marginalised section of the society. Target 11.2 is assimilated in providing safe, affordable, accessible and sustainable transport system for all. And the target 13.2 for zero emission is well achieved by MO- Ride and E- Bus which promote green and resilient mobility service.

- In a survey conducted in 2019 in Mumbai it is noted that 31% of surveyed women reported commuting as a barrier to working.

- When a women travels in public transport she has to think about safety, integration, cost of travel, frequency and waiting time, crew behaviour visibility of last mile travel , etc.

- It is challenging to travel as a women when it is overcrowded, bus stops are secluded / dark, low frequency of buses at night, absence of crime prevention mechanism in buses and infrastructure is not designed for them.

- CHALO is trying for inclusive mobility making it safer and cost effective by live tracking, bus crowd indicator, SOS- share trip with family, live monitoring through CCTV inside buses, deploying trained crew, trip based plans to address multiple hops.

- It also hire women in work force in buses as digital assistants / conductors, mandatory 20% women in field force and as leader. This will enable women's economic independence and empowerment.

Outcome

- For gender sensitive transport system, gaps need to be identified before changes in the system are introduced. Issues need to be addressed at multiple levels. Such system will be effective when designed well and executed.

- In gender inclusive mobility four pillar approach consisting of assessing the ground situation, building capacity and raising awareness, strengthening planning and policy

and lastly improvement in infrastructure and service should be the framework for the gender programme in urban mobility as followed by Chennai.

- Strategies for gender inclusion should focus on provision of lighting and good infrastructure at transit point, improvement of first and last mile connectivity, increased presence of diverse women in the transport sector, robust data collection to understand the different aspects of gender exclusion in transport planning. Provision of light on the street will improve the lighting in the area and in turn greatly encourage the walkability.

- Making cycling gender friendly as has been done in Bogota city. Here the focus has been on improving women's access and use of cycle tracks especially at night in collaboration with women organisation.

- Gender inclusive mobility should not only include women travelling in public transport but also women in mobility work force.

- Local area Mobility Plan be prepared for improving gender inclusive mobility.

- Four pillar approach comprising bus, bus stop, journey in the bus and waiting time be followed to address the problems in public transport for making the travelling comfortable and attractive for women. Infect gender inclusive mobility be considered as a societal issue and not a women issue.

Participant posing a question to the Speaker

Technical Session 6:- Smart Mobility Solutions & Mobility as a Service (MaaS)

Urban Mobility is an area that continuously evolves. The rapid growth of digital advancement, the ubiquitous use of mobile phones and increasing use of wearable technologies, coupled with the ability of organizations to generate, store, an analyses massive quantities of user data (termed as BIG DATA), means that companies now have the ability to assemble and predict the travel behavior and other mobility related habits of consumer more easily. This abundant availability of mobility data has enabled service operators to come up with innovations like Mobility as a Service (MaaS). MaaS has the potential to revolutionize the urban mobility system.

This session focused on the concept of MaaS and its need, challenges and opportunities for cities including key enablers for developing a thriving MaaS ecosystem.

Chairperson -	Mr. Abhijit Sen Gupta, Director India (Asia Pacific Smart Card Association)
Moderator -	Mr. Narendra Verma, Advisor, GIZ
Presenters -	i. Mr. Sujith Nayar, CEO & CoFounder, Beckn Foundation,
	ii. Mr. Shailendra Kaushik, Co-founder, Cities Forum, Dubai
	iii. Mr. GP Hari, Special Officer, Kochi Metropolitan Transport Authority, Kerala
	iv. Ms. Hadar Weinberger, Head of Product at Ev-Edge, Tel Aviv, Israel
	v. Mr. Kishore Nathani, Principal Advisor, UMTC
	vi. Ms. Reji Nair, Senior Director, STQC, Ministry of Electronics & Information Technology
Rapporteur -	Mr. Rahul R.S., Mr. Sumit, Aitichya Chandra, Mr. Sayanton Mohanta

Highlights of the Discussion

- Mobility and commerce are two different platform. There is a rise of closed and central platform for buyers and sellers. In this case aggregation is the de facto approach.

- Now we are imagining open network having buyers and sellers platform. Open network system is a decentralized open network.

- It empowers local and small business with equitable access to market opportunities and participation in digital economy.

- Open transaction protocol for digital economy not a platform, not "an app" it is beck in" to signal by a gesture with the hand.

- MaaS is Decentralized open networks. It is an integrated mobility as an open network. In one case consumer reaches provider of service through Mobility App while in other case consumer directly approach provider of service.

- Similarly consumers tap mobility App to driver App and goes to cab provider. Similar process is to reach Metro/ Buses.

- Kochi open mobility Network is operating on the same principal which is to be expanded to whole of Kerala with ONDC open network for digital commerce Kerala to implement open mobility project where through one App all forms of transport could be accessed. Over 1000 drivers have enrolled with Yatri App in Kochi.

- Namma Yatri (Beta) is by the driver, for the driver and of the driver. It has verified 8900 drivers with valid driving license, R.C., permit and insurance.

Panelists on the dias sharig their views

- MaaS as open mobility network is expanding across the country like Kochi, Mysore, and Bangalore.

- JUSPAY's atlas contribution to open mobility has both consumer side mobility Apps and Provider side Mobility Apps which are compatible to any multimodal network that supports Beck n protocol.

- It has mobile Apps for driver and rider, on boarding and MVD compliance, driver pool computation, fare policy management, multimodal mobility service management and support and grievances.

- Open network ecosystem with Beck n protocol is for mobility and beyond. It serves the sector like mobility, retail and logistics, health and wellness learning and skilling.

- Urban MaaS is stitching of products of formal and informal transit, operations into a widely accepted multimodal service.

- Maas operators (integrators) interface-promise, commit and insure.
- Impactful idea starts with development of MaaS leading to diffusion of MaaS and use of MaaS resulting in its impact.
- Moovit has all local mobility options in one App choose preferred option like Yatri, metro and taxi.
- Urban MaaS (UMAAS) give practical offering as given below:
  - Plan, book and pay for multiple types of mobility service.
  - Pay-as-you-go one off
  - If not one off then, bundled transport service, monthly subscription.
  - MaaS operators purchase transport service and provide guarantees.
  - Trip chains, technical and business relationships.
  - Total cost of business mobility.
- In MaaS need is for open data protocol including shared assets, personalized services, facilitator through customers to connected living, on demand transport and enablers.
- MaaS approach is for marketplace for users, transport operators, integrators, mobility service providers. It has open but secured architecture, APIs (Application Programming Interface).
- It provides real-time secure access to in-vehicle data with clearly defined and secured ownership of data and revenues and possibilities to create scaling services.
- New Eco System is emerging players, intermediaries, business model need acceptance do not conveniently fit into the current regulatory framework. Data is still not fully shred, less still open architecture, APIs
- Examples of NCR Metro, NCMC KOMN. Closed loop need to reconcile IT systems and data formats.
- Multimodal multi-provides integration in all form are essential infra, data operations Kochi can be the light house.
- MaaS has to be adopted at mass scale to nudge out personal (car) mode. It needs to subsidize mobility subscription bundles for commuters.
- Helsinki (Finland) was the first city in the world to introduce the first fully commercial "Mobility as a Service (MaaS). A single smartphone App (whim) that people can use for planning their travel and booking tickets.
- Cities are focusing on MaaS to make them more livable and less vehicle centric. Commuters also have increasingly accepted new mobility options in the last decade.
- Data is the major barrier in MaaS. Lack of availability of data as a most of the requisite data sets lies in silos and also discrepancy in available data sets. Data sets received

from various entities are in different modes. Moreover reluctance of the private operators in sharing data (or APIs).

- MaaS market is expected to grow from USD 3.3 billion in 2021 to USD 40.1 billion by 2030. The key market will be developing countries in Asia-oceanic region with major population growth in China, India, Australia and Singapore.

- Currently the market is dominated by not more than ten companies originated mainly from Europe. New MaaS projects are being launched in Spanish cities, U.K., Australia, Scandinavian cities, etc.

- Changing business models are being launched in MaaS along with startups and seeking new investors by

Panelist addressing the participants in the session

inviting major mobility companies to stay afloat. Typical MaaS solution coverage opt for seamless travel across various modes and integrated discovery, booking, ticketing and reporting platform from mobility service plus mobility service.

- In India about 70% private transport service providers consider that currently Indian cities have low level of MaaS. About 50% of public transport service providers are uncertain about cities preparedness for MaaS.

- On the other hand 57% of Mobility experts believe that Indian cities need to take certain steps to move to MaaS.

- The major barriers for MaaS in Indian Context are:
    o Lack of knowledge and understanding.
    o Regulatory framework and operational interoperability.
    o Payment mode integration and sales channel restriction.
    o Undefined principles of data sharing and access.
    o Lack of Public-Private trust and collaboration Scalability.

- GIZ has launched a MaaS toolkit for Indian cities and one of the products is proposed structure of an open mobility data policy identifying 40 policy measures across 9 policy areas.

- Aggregated data hub are generating insights for different stakeholders comprising Govt. and cities, public transportation, mobility service providers, startups, aggregators, end users, etc.

- The need is to plan infrastructures according to insight from aggregators by collaborating with mobility service providers.
- Crowd sourcing for actively collecting data and gathering feedback from users and transport planning.
- Uber movement provides data and tools for cities to move deeply understand and address urban transportation challenges.
- Intel acquires Moovit and is investing and expanding to serve new data rich market opprtunities, including the fast growing market for ADAS, data and MaaS technologies.
- The areas of concern for security status of sensitive installations and strategic assets includes I) IT infrastructure II) Network III) software application including mobile Apps IV) sensors / end points devices IOT devices wearables and the various services.
- Security issues arising out of critical telecom and IT products sourced from outside of India.
- Vulnerability assessment penetration testing need to be confined to cyber security status of servers and network devices, software applications, mobile application, overall network architecture, internet facing IPS/ URLs through penetration testing.

Outcome

- Rethinking in model for MaaS is required. The need is to adopt interoperability, not aggregation. It should be open specifications based, multimodal, and multi-platform.
- As infrastructure, it should be a central platform but be open protocol and network as digital public infrastructure. One should think ecosystem not system, recognize diversity across mobility stakeholders, unify not standardize. Interoperable networks work in other domains too.
- In MaaS strategy for wider application learn global, do local and go global as it has transformational impact and catalyst for innovative planning.
- Framework for MaaS need to be created in Indian cities having MaaS toolkit, Mobility data policy, MaaS readiness tool for cities, data sharing standards, regulatory framework.
- In India MaaS will be a good starting point to implement MaaS by involving all concerned stakeholders and integrating fare structure and trip planning. Next step should be to have open mobility data policy indicating I) data coverage in terms of typology, standard, access II) regulation and accountability covering data privacy,

protection and sharing and III) institution and governance like nodal agency, funding and resources and citizen engagement.

- For achieving cyber security in mobility ecosystem approach should be vulnerability assessment / penetration testing, end point security, sourcing of critical telecom and IT products from trusted sources and process audit.

- Information Security management System (ITMS) to be established in line with ISO 27001 standard covering cyber security policy, procedures and guidelines.

- Cyber security Model Framework for smart cities, issued by MoHUA be referred in future RPFs.

- MaaS will bring 360 degree change in travel. Data is necessary for efficient planning of MaaS. One single language is required for all for integrating them together.

Audience in the session

Technical Session 7:- Common Issues for Indian Metro System

The session was restricted for Managing Directors of Metro, India. It dwelt on solving many of the problems and concerns that Managing Directors of Metro system from all over the country put forth in the session. Main discussion revolved around policy issues, safety of the commuters, maintenance of the metro system whether it is done by the department, by a third partly or by the metro company itself. It was highlighted that every city does not need a metro. It is to be planned judiciously according to what all the manufacturing concern and service industry bringing forth in future. Metros are meant for developing cities with future vision. In every city there are different growth pattern but the need is to plan holistically, work together to improve transportation and the economy. Following experts participated in the session.

Chairperson & Moderator -	Mr. Jaideep, OSD & E.O. JS, Ministry of Housing & Urban Affairs, Government of India
Presenters -	i. Mr. A Siddique, Chennai, Metro Rail Corporation
	ii. Mr. Anjum Parwez, Bangalore Metro Rail Corporation
	iii. Mr. N V S Reddy, Hyderabad Metro Rail Corporation
	iv. Mr. KVB Reddy, L & T Metro Rail Limited
	v. Mr. Vikas Kumar, Delhi Metro Rail Corporation
	vi. Mr. Brijesh Dixit, Nagpur Metro Rail Corporation
	vii. Mr. Jitendra Tyagi, Uttrakhand Metro Rail Corporation
	viii. Mr. Suheel Kumar, Lucknow Metro Rail Corporation
	ix. Mr. U.J.M. Rao, Andhra Pradesh Metro Rail Corporation
	x. Ms. Ashwin Bhide, Mumbai Metro Rail Corporation Ltd.
	xi. Mr. Alok Kapoor, Pune Metro / Tata Realty
	xii. Mr. Vinay Kumar Singh, National Capital Regional Transport Corporation

xiii.   Mr. P. Ramesh, IAS, Jaipur Metro Rail Corporation

xiv.   Mr. Loknath Behera, Kochi Metro Rail Corporation

xv.   Mr. Sahadeva Singh, Director (Projects& Planning), Gujarat Metro Rail Corporation

xvi.   Mr. Ajay Sharma, Director (Projects), Madhya Pradesh Metro Rail Corporation

xvii.   Mr. Karamali, Director, Kolkata Metro Rail Corporation

xviii.   Mr. D.K Ujjainia, SE (UT)

xix.   Mr. Ravi Prakash, Director (UT)

xx.   Mr. Yogesh Antil, Deputy Secretary (MRTS I)

xxi.   Ms. Rachna Kumar, Deputy Secretary (UT-II)

Technical Session 8:- Realizing the Potential of Transit-Oriented Development in India

India is urbanizing at a rapid pace. Indian cities are growing at a rate faster than other cities in the world. Considering the rapid urbanization and the imminent need for enhancing mobility in cities, it is imperative to strengthen mass transit systems and explore alternative and innovative sources of funds to supplement budgetary resources.

The Government of India through the Metro Rail Policy 2017 has linked the metro rail system to the adoption of the national Transit-Oriented Development (TOD) Policy and land Value Capture (LVC) financing framework. The policy defines TOD as a measure to integrate land use and transport planning through the development of well-planned and sustainable urban growth centers linked with high quality transit systems.

Asian Development Bank (ADB) has been providing financial assistance in the development of various mass transit systems in major Indian cities. In line with the Metro Rail Policy 2017, ADB seeks to strengthen the planning and implementation of TOD and LVC associated with these mass transit systems as value addition to enhance ridership and non-fare box revenue.

The session explored the opportunities for realizing the potential of transit oriented development in India.

Chairperson -	Mr. Sharad Saxena, Principal Transport Specialist, Asian Development Bank (ADB)
Speakers -	i. Ms. V. Manjula - Commissioner, Directorate of Urban Land Transport (DULT), Bangalore
	ii. Mr. Abhay Kantak, CRISIL
	iii. Mr. Mukut Sharma, National, Capital Region Transport Corporation Limited, (NCRTC)
	iv. Mr. Anil Kumar Kokate, Director, Maha Metro
	v. Mr. Amit Sharma, Staff Consultant, ADB
	vi. Mr. Norio Saito, Director, ADB
Rapporteur -	Mr. Saugata Dasgupta, ADB Official
	Mr. Ashok Srivastava, ADB Official
	Mr. Ashish Ranjan, ADB Official

Facilitators -   Ms. Marie Kristine Estrella, ADB

Ms. Cheska Angelie Llamas, ADB

Highlights of the Discussion

- Nagpur Metro Rail Project included the concept of TOD for generating non-fare box revenue and to make Nagpur metro financially sustainable in the long run.

- Maha Metro envisages above 60% of the total revenue as non-fare box revenue through:-
  - o Transit Oriented Development along Metro corridor (500 meters on either side)
  - o Collection of 1% additional Cess on stamp duty levied during property transaction.
  - o Property development along metro corridor.
  - o Co-branding of metro station.
  - o Advertisement on outside/ inside metro stations and viaduct.

- Govt. of Maharashtra vide notification dated 30th June 2016 declared Nagpur Metro Rail Project as a vital urban transport project.

- Govt. of Maharashtra vide notification dated 24th July 2017 have fixed following premium for availing additional FSI as per TOD:-
  - o 30% of Annual Schedule of Rates (ASR) value for minimum tenement density of 200 tenements per hectare.
  - o 40% of ASR value for tenement density less than 200 tenements per hectare.

- The Govt. of Maharashtra vide notification dated 2nd November 2018 approved TOD policy with additional benefits to the developer in terms of free of FSI such as parking and double height terrace upto 20%, balconies 15% and service floor and entrance lobbies.

- The premium so collected shall be distributed equally among Maha Metro and other Planning Authorities/ ULB (NCT/ NMC/ MADC) within Nagpur city.

- Maha Metro started getting this 50% share of premium. An amount of Rs. 85.61 crore is received till Sept 2022 on account of additional FSI premium under TOD policy before metro is fully operational.

- Transit Oriented Development is to densify the metro corridor to increase the metro ridership by reducing the use of private vehicles and thus promote sustainable urban growth and quality of life.

- Metro corridor includes the area falling within the 500 mts. distance on either side of Metro rail measured from its center line and also includes the area falling within 500 mts. distance from longitudinal end of the east metro rail station.

Allowable FSI (Depending on road width and area of plot.				
Sr. No.	Minimum Road Width	Plot Area	Maximum Permissible FSI
1.	9.00 m	Below 1000 sq.m.	2
2.	9.00 m	1000 sq.m. or above	3
3.	12.00 m	2000 sq.m. or above	3.5
4.	15.00 m	2000 sq.m. or above	4

+ In addition to above, as per TOD notification, 15% additional FSI shall be allowed on payment of premium as applicable over and above the FSI indicated in the above table.

+ Benefits of TOD are as under:
    o Increase in ridership in TOD zone
    o Encourage smart growth development through higher densities in a compact manner.
    o Decrease in the cost of municipal services.
    o Improve the municipal tax base.
    o Improve the environment and social quality of life.

+ Govt. of Maharashtra vide notification dated 21st August, 2015 amended Maharashtra Municipal Corporation Act, 2015 to levy 1% additional surcharge on stamp duty to be levied in cities where vital urban transportation projects are implemented.

+ Nagpur Metro Rail Project and Pune Metro Rail project are declared as vital urban transport projects by the Govt. of Maharashtra. As such 1% additional surcharge on stamp duty is taken. Accordingly Rs. 249.21 Crore and Rs. 513 crore collected till Sept. 2022 by Nagpur and Pune Metro respectively.

+ Nagpur Metro Rail Corp. has been designated as "Special Planning Authority" under section 40 of Maharashtra Regional and Town Planning (MRTP) Act 1966 since 11th June, 2018 for the metro owned land within Nagpur city. It facilitates Nagpur Metro to give single window clearance to the prospective developer resulting in early completion of projects and increase in Non-fare box revenue as well as getting 100% TOD FSI premium.

+ Some examples of TOD at Nagpur where through additional FSI extra built up area added in the respective projects are as under:-
    o Maha Metro's Zero Mile Property Development Building on PPP mode. In this Maha Metro will be availing additional FSI 4.25 Lakh Sq.mts under TOD.

- o Maha Metro's Kasturchand Park property development on PPP mode. Maha Metro will be availing additional FSI 2.75 lakh sq.mts under TOD.
- o Maha Metro commercial project on PPP mode. Maha Metro will be availing additional FSI 0.50 lakh sq.mts under TOD.
- o Infinity tower by M/s Kukreja infrastructure (Private developers). It will be a tallest building in Nagpur and will have additional FSI of 7930 sq.m. under TOD.
- o Residential project by Smt. Vidya Vijay Hardas will avail additional FSI of 1337 sq.m. under TOD.
- o 24 Carat Towers by Rachna Cont. Pvt. Ltd. will avail an additional FSI 567 sq.m.
- o Ved Towers by Praful Ved Infra Pvt. Ltd. has availed an additional FSI of 2878 sq.m. under TOD.

- A study on TOD and urban rail in India in 5 Asian cities undertaken by ADB highlights some of the best practices of good TOD design and its implementation.

- The important finding is to have outcome based approach. It observed that international cities like Singapore has well defined and measurable outcomes for I) share of Public transport journey in peak time traffic, II) compact development in transit influence areas III) travel time between important nodes IV) dis-incentivizing use of private vehicles.

Speaker sharing her experience in the Session

- Indian cities do not have outcome based approach. For example I) National TOD policy provides guidance on outcome but the city level plans do not take a targeted approach for achieving TOD II) transportation plans are inputs oriented infrastructure project rather than taking an integrated view of improving mobility III) travel modes compete with each other rather than complementing each other.

- Internationally some good examples on outcome based approaches in TOD are as under:-

- Singapore concept Plan:
  - o 80% home are less than 10 minute walk from MRT station.
  - o 85% public transit trips under 20 km within 45 minutes.

- o 75% of all peak period journeys on public transport.
- Seoul Metro vision.
    - o Access to urban railway within 10 minutes by foot.
    - o 10% increase in transportation share.
    - o 10% decrease in congestion cost.
- H.K. Railway Development Strategy.
    - o Densification of brownfield area.
    - o Economic returns in terms of travel time saving.
    - o Increased share of railways.
    - o Creating job opportunities near transit station.
- Shenzhen TOD
    - o 50% of population or commuter traffic demand in influence area.
    - o Commercial nodes served by at least two transit corridors.
    - o Road density of 6 to 8 km per sq.km.
- Another lesson of the study is that planning framework should be amenable for TOD. In this context international cities have unified or and coordinated land use and transportation planning framework. It has planning for every node according to development potential with a provision for change in land use plan while planning for MRT projects.
- They have strategies to encourage development in the proximity of public transit such as commercial development, public amenities and affordable housing planned in the vicinity of public transit and proposal to improve access to public transit from existing commercial center.
- In contrast, Indian cities do have statutory land use development plans/ Master plans and Mobility Plans but are prepared in isolation.
- There is no framework for station area plans or for node level assessment. TOD approach is also missing and even if present it does not have an implementation mechanism.
- For instance, Singapore concept plan is a centralized guidance document for land use, master plan and transportation master plan and also for identifying land development projects.
- Similarly MTR Ltd. Hong Kong and Department of Rapid Transit system Taipei are empowered to undertake provision of MRT service plus property development.
- MRTC Hong Kong also prepared land development plan for every station area and carried out feasibility study for development potential and accordingly land use Master Plan for city changed.

- In Taipei restriction imposed on development outside TOD zone and relaxed floor space regulations around transit stations.

	First level station	Second Level Station
Core Area	30%	20%
General Area	15%	10%

- In Shenzhan also FAR outside TOD zone is less than 60% of minimum FAR in TOD zone.
- Another lesson from the study is regarding enabling institutional framework.
- In international cities roles are assigned to those institutions which are in best position to perform that task. Property development around stations is best left to the agency implementing the metro projects like DORT in Taipai and MTRC in Hong Kong.
- They have well established mechanism to ensure coordination among various institutions like concept plan in Singapore is prepared by five key institutions together. Land and Transport Authority Singapore prepares guidelines for integration of properties with transit stations, CEO of LTA is on URA's Board.
- In Indian cities, institutional framework designed to implement infrastructure projects but not to ensure integrated development of an area. For instance, MRT agencies are involved only in project implementation and not in integrated development of the area. Also institutional framework is disjointed for land use planning, transport planning, infrastructure planning, etc.
- Planning framework and policy framework is inadequate or disjointed to guide institutional roles.
- A common policy and planning framework can facilitate coordinated and integrated role.
- Next lesson from the study indicates that urban regeneration requires a proactive approach and cannot be left to the market. Internationally cities have a city-wide perspective on re-development/ regeneration of old settlements. Seoul downtown has redevelopment master plan 1978 and subsequently it has urban renewal plans.
- In the same manner Hong Kong Development strategy 2014 identified densification of brownfield areas as part of its broader objectives.
- In India regeneration is dealt with in a piece-meal manner by various project implementation agencies. City wide planning required to identify areas need regeneration, creating scheme for regeneration activities.
- Another good lesson from the study is successful land value capture an outcome of good TOD implantation and not cause for it. In this context, high real estate prices and

- inelastic real estate demand is a common characteristic in international cities. Land valuation capturing market prices allowed government agencies to capture market valuation due to development.

- In India, high real estate prices and inelastic real estate demand are not traits of most Indian cities, but land value capture not to be recognized as a target of TOD implementation but an outcome. Framework to capture market price trends in official prices are lacking in many cities. In this situation, land based value capture tools will not be effective way of financing.

- Metro system in some of the Indian cities like Delhi have evolved from being intracity to intercity.

- The functional plan on transport for NCR 2032 identified eight RRTS corridor for the National Capital Region of which 3 corridors namely I) Delhi-Ghaziabad-Meerut corridor is under construction with a total length of 82 km. It will have 24 stations at a distance of approximately 5-10 km. from each other.

- Delhi TOD policy provides guiding framework and principles for TOD in Delhi. A new Chapter on TOD with details is included in Master Plan for Delhi-2021. Draft Master Plan 2041 has identified nodes for pilot TOD implementation. NCRTC has been working with DDA in formulation, updating and operationalization of the TOD policy.

- NCRTC has prepared indicative influence zones of Jangpura RRTS station TOD Node under Delhi TOD policy interventions. It has delineated TOD planning covering 800 m from station centroid for preparation of influence zone plan. Also delineated intense development area (500 m from station centroid) where TOD benefits like mixed use and additional FAR shall be available.

- Subsequent to the approval of Influence Zone Plan, TOD schemes will be prepared for individual sites as per guidelines laid down in the TOD policy.

- Apart from Jangpura, NCRTC is preparing the IZP for the Anand Vihar-Karkardooma and the Sarai Kale Khan TOD nodes as well.

- In Uttar Pradesh action is being taken for approval of VCF instruments comprising additional purchasable FAR, special amenity fees and urban use charges as well as on notification of the Uttar Pradesh TOD policy, delineation and incorporation of TOD zones in draft master plans.

- Key aspects of proposed TOD policy in Uttar Pradesh are as under:-
    - Distinct development framework for greenfield and brownfield TOD areas.
    - Integrated planning around TOD nodes.
    - Mixed use and graded additional FAR based on road width and development.

- Financial sustainability of TOD and transit through land value capture.
- Role of stakeholders in TOD.

- In line with the provision of UP TOD policy, NCRTC is coordinating with development authorities in delineation of the TOD zones of RRTS and incorporation into Master Plan of Ghaziabad and Meerut. The influence zones of 1.5 km from the center of RRTS station are taken.

- For special development areas having high development potentials and contiguous to green field zones in the proximity of the proposed RRTS stations will have high density development following TOD principles and will be the extensions of the station influence zones with feeder connectivity.

- UP TOD policy provides for the preparation of TOD based Zonal Development Plans for the TOD zones and preparation of the Zonal Development Plans by concerned transit agencies for integrated development.

- In line with National land value capture policy framework 2017 following instruments are under implementation or proposal stage:-
    - Additional purchasable FAR under implementation with fifty-fifty share between RRTS and Development Authority.
    - Special amenity fee and urban use charges are also under implementation with same sharing formula.
    - Additional 1% stamp duty is proposed with 100% share to RRTS.

- ADB is a major player in the urban transport sector and supporting Bangalore, Mumbai, Jaipur and Chennai to expand metro network and also financing Regional Rapid Transport system projects.

- ADB has supported TOD-VCF components plans/ schemes in Delhi Meerut Regional Rapid Transport system project. It has provided operational support for non-fare revenue for Mumbai Metro operation organization. Prepared urban development plans and implementation framework based on TOD principle and Multimodal integration plan and implementation framework for Bangalore Metro Project Phase 2A & 2B.

- For Chennai Metro Rail Investment Project (Planned) ADB is involved in improvement of multimodal and land integration and strengthening of non-fare box revenue mechanism. In Nasik Metro Neo project ADB to prepare Action Plans for value capture financing and TOD.

- ADB is assisting DULT to put together a framework for operationalizing TOD through a three-tiered planning and approval framework comprising of :-
    - Town Planning schemes as per provisions of the KTCP Act at the TOD zonal level.

- - - o TOD scheme at the project level.
      o TOD building (aligning conflicts in existing development control norms and Building bye-laws).
- Wide variations noted in the structure of TOD Policies, Regulations and Building Bye-laws, VCF from state to state.
- The revenue sharing VCF instruments likely to enhance financial sustainability fo mass transit and TOD projects.
- ADB issued a knowledge product (2019) on urban TOD focusing on examples from Tokyo, Toyamma (Japan) Denver(USA) and Kaula Lumpur (Malaysia) for reference and guide. It also issued knowledge product (2019) sustaining transit investment in Asia's cities: A Beneficiary funding and land value capture perspective.
- Five land value capture mechanism can be used in combination to have good results as stated below:
      o Value capture through the mainstream taxation system (regulatory).
      o Special fees and levies (Non-regulatory).
      o Auction of development right (TDR)
      o Comprehensive TOD and urban renewal agency with value capture capabilities (can be explored by expanding mandate of UMTA)
      o Direct property rail agency as developer on the East Asian style.. explore possibility through piloting by expanding the mandate of Transit Agency.
- In metro rail system there is causal relationship between land use and hourly ridership.
- Growth story of Bangalore is very interesting. It grew from pensioner's paradise to fourth largest technology hub in the world. From 2.91 million population in 1981 it has grown to the size of 12.76 million population in 2021.
- Impact of this unbridled growth reflected its impact in the form of urban sprawl increased trip length, increasing reliance on private vehicles numbering more than 10 million, depletion of green space and water bodies.
- CMP target is 70% mode share by public transport by 2030. Currently, there is undesired transformation around station area. For instance 16% residential plot area changed to commercial and call for mixed land use.
- There is no substantial increase in densification. Average FAR utilized was 1.4 and 1.7 in 2014 & 2017 respectively against permissible FSI upto 3.25.
- Due to increase in rental value displacement observed. Increased parking in street around station area made access to station by walk difficult.
- TOD policy for Bangalore is to enable more people to live, work or play 6-6-6 access to station/ bus terminal. 6 minutes walking distance of 500m, another 6 minutes refers

to bicycle distance upto 1000 minutes and the last 6 minutes indicate distance by bus upto 2 km. It reveals that improved accessibility equates to increased public transport patronage.

- Six TOD objectives include:
    - o High mode share of public transport.
    - o Provide built environment and associated infrastructure conducive for NMT.
    - o Implement mixed land use leading to shorter commuter and reduced travel demand.
    - o Inclusivity for all economic classes, gender, age and abilities in the design of TOD.
    - o High quality of life through place making and sustainable practices.
    - o Build enabling framework to deliver TOD projects of high quality.

Outcome

- From the presentations made and international case studies showed clearly that implementation of TOD in right earnest with appropriate planning implementation approach will result in enhancing the metro ridership. Therefore a compilation of success models in India and abroad will be a good guidance for others to follow.

Active participation in the Session

Technical Session 9:- Future Fuels

Cities are the engines of economic growth and transport is the engine's wheels. Energy is required to keep the wheels moving. Petrol and diesel are the most commonly used fuels for transport in urban areas. Overdependence on these sources is adversely impacting global climate, local air quality and health, and the country's balance of payments and transportation cost. Data shows that 82.8% of imports are dependent on crude oil. The transport sector consumes 70% of diesel and 99.6% of petrol. The road transport sector is strongly linked to India's energy security.

With these concerns in mind, the Government of India has committed to reducing the GHG emissions intensity of GDP by 33-35% by 2030 (Nationally Determined Contributions (NDC) following the Paris Agreement) and net zero by 2070 (COP26). Reducing GHG emission intensity and achievement net zero greenhouse gas emissions by 2070 will require the rapid development and deployment of clean energy technologies. The effort here is to switch to alternative fuels such as electric, biofuels, hydrogen etc., which are climate-friendly.

The objective of this session has taken stock of the situation concerning alternative fuels in the urban context (technology, economics, polices, application, adoption, stakeholder responses)

Chairperson -	Mr. Ravi Prakash, Director, (Urban Transport) Ministry of Housing & Urban Affairs, Government of India
Moderator -	Mr. Abhijit Sarkar, Ex. Secretary (State Transport Authority), Delhi
Speakers -	i. Mr. Amit Bhatt, Managing Director, ICCT
	ii. Dr. Himani Jain, Senior Programme Lead, and Krishna Khanna, CEEW
	iii. Dr. Sewa Ram, Head of Department School of Planning and Architecture (SPA), New Delhi
	iv. Ms. Anumita Roy Chowdhary, Executive Director Research and Advocacy, Centre for

Science and Environment (CSE)

    v.   Prof. Aravind Purushothaman Vellayani, Prof and Chair of Energy Conversion, University of Groningen

    vi.   Mr. Artemii Iarchevskii, Private consultant, Ex-head of Metro, Tramway, Buses and Hubs Development Division at Moscow Government Department of Transport, Russia

Rapporteur -   Aitichya Chandra, Mr. Rahul S., Mr. Sumit

Highlights of the Discussion

- In global emission, transport and road transport contribute significantly to the total emission of 38Gt Co2. Transport accounts for 8.8 GTCo2 and Road transport share is 6.5 GtCo2 accounting for 23% and 16% respectively.

- Road transport as India's largest source of oil consumption sector.

- There is no realistic pathway to fully decarbonize the internal combustion engine. Current biofuels have relatively high GHG emission and minor growth potential to limited feed stock.

- Hybrid and plug-in-hybrid achieve short term gains but do not offer long term zero emission potentials.

- E-fuels offer near zero carbon emission but cost parity to fossil fuels only by 2050 in best case.

- Even today, EVs have by far the lowest lifeline GHG emissions compared to all other technologies.

Panelists on the dias sharing their views

- An electric power becomes lower carbon, GHG emissions from electric vehicles will decline further.

- A comparative picture indicating GHG emission is as under:
  - In gasoline cars-biofuels offer only modest GHG reduction.
  - In diesel and CNG Cars-No GHG emissions benefit.

- In Battery EVs – lowest GHG emission.

- In Fuel Cells EVs – No GHG emission benefit with natural gas hydrogen, 68% lower with renewals.

- Electric two-wheelers – lowest GHG emissions.
- India is yet to have commitment towards 100% new ZEV sales.
- Although Govt. of India offers wide range of mechanism of getting fiscal incentives like purchase incentives, road tax exemption, income tax benefits, etc. weak fuel economy targets do not enable rapid electrification.
- In transport sector based on road and rail fuel comprising refined liquids, electric, gas, hydrogen are used. So is the case of freight modes where the same fuels are used.
- Electric cars reach cost parity with petrol cars by 2030. E.V. penetration is likely faster in the smaller vehicle segments, pushed in by M&HDVs. The need is to skew the modal share towards four wheelers particularly bus.
- Owing to EV penetration, GHG emission will peak till 2030 and then decline.
- The share of emissions will be highest from domestic air travel. Emission from the trucking sector keeps increasing.

Outcome

- Need to have a full MSc. Programme on Hydrogen and fuel cells for wider application and awareness.
- Concerns regarding disposal of batteries and its rising prices also need to be addressed by center/ state authorities.

Chairman giving his concluding remarks

Attentive audience in the Session

Technical Session 10:- Multimodal Integration

Mass transport systems like metro rail, light rail and bus rapid transit are infinitely more user – friendly when they connect to one another. Full scale multimodal integration is characterized by two key features: integration of mass transport modes with each other, and integration of mass transport modes with other 'feeder' modes such as taxis, shared-mobility services like car-sharing and bike-sharing, walking, and cycling-all of which help provide first and last-mile connectivity.

This session sought to achieve integrated multimodal mobility in cities to promote people oriented sustainable transport systems that help urban residents move safely and efficiently through their cities.

Chairperson -	Dr. Sanjeev Kumar Lohia, Sr Advisor (Rail & Urban Mobility) The World Bank & Former MD & CEO, IRSDC
Moderator cum Context Setting -	Mr Anjum Parvez, Managing Director, BMRCL
Speakers -	i. Dr. Shalini Sinha, Centre Head & Principal Researcher, CoEUT
	ii. Mr. Rajneesh Porwal, Vice President, Urban Mass Transit Company (UMTC)
	iii. Mr. Madhav Pai, Program Executive Director-Sustainable Cities Transport, WRI
	iv. Mr. Ravi Jain, Pay Craft, ADB Resource Person
	v. Ms. Bianca Bianchi Alves, The World Bank
	vi. Mr. V Ajith Kumar, Managing Director, Kerala Rail Development Corporation Ltd. (K-rail)
	vii. Ms. Aditi Singh, Principal Consultant, Mott Macdonald and Mr. Amit Kumar, Project Director, Mott Macdonald
Rapporteur -	Mr. Abhinav Rawat, Mr. Ali Hussain

Highlights of Discussion

- In public transport travel including Metro rail, passenger consider the entire journey experience while making travel choices right from access to Public transport station to egress including wait time, in vehicle time, P.T. station transfer if any, last mile, destination, etc. In the entire journey seamless movement becomes critical.

- Combining of public transport with other modes like NMT, private vehicles other PT modes is necessary to provide seamless and door to door travel alternatives for commuters.

- Status of multi-modal integration in Indian cities reveal the following:
  - There is a heavy investment in rapid transport mode in Indian cities.
  - Cities adopt various multimodal strategies such as feeder bus services and e-autos, introduction of smart cards, multimodal hubs, travel apps, etc.
  - Rapid transit mode often planned independently to other modes.

- As a result commuter faced with onerous transfers, increased wait times, higher travel costs, poor ridership levels making public transport unattractive and unable to facilitate mode shift.

Chairman initiating the discussion with his opening remarks

- In fact multi-modal integration should improve I) delivery of public transport services, II) passenger comforts and convenience III) access to major facilities and activity centers, bring efficiency and increased revenue for public transport and facilitate shift to sustainable modes.

- Core areas of multi-modal integration comprise network & service, physical, fare, information and institution integration.

- Network and service integration deals with linking of routes & services of different modes, increase of PT service/ catchment areas and improvement of public transport accessibility.

- In physical integration, bus stops/ stands/ stations of various modes are to be brought in close proximity of each other for improving last mile connectivity. It also facilitates easy transfer and improves multi-modal transport system.

- Fare integration enables payment as a single journey and makes travel attractive, affordable and achievement.

- Information integration helps passengers make informed decision based on the information available prior to the start of the journey and enroute regarding stops/ stations, on-board travel, services and way finding.

- Institutional integration ensures coordinated working of agencies to plan and deliver integrated transport systems. It is also key for achieving integration across other core areas.

- Present position towards integrated transport system in cities studied under a project jointly implemented by MoHUA and GIZ under the Indo-German Green Urban Mobility partnership reveal that cities are undertaking several initiative towards integration.

- Ease of accessibility and dispersal to public transit enhances ridership, reduces usage of private vehicles on road which further reduces congestion and pollution. All this benefit the commuters, operators and city.

- Levels of priority in multimodal integration are generally in the following scale.

Mode	Access length (m)
NMT Access	< 50 m.
PT stop	< 100 m.
Drop off	< 150 m.
Personalised Parking	< 250 m.
Walking (main Mode)	Upto 500 m.

- In place making as part of precinct design existing landscape pockets can be used for accommodating Kiosks (food and beverages) and creating spaces for users from surrounding IT parks/ offices.

- Multimodal integration is characterized by two components covering integration of mass transit system with each other and integration of mass transit system with feeder system that connects them to trip origin and destination.

- In a primary survey about 7000 persons non-metro users listed several reasons such as inconvenience transfers/ connectivity to stations, high fare, low frequency, high journey time, lack of information, crowding, etc.

- As per World Bank, Planning for multimodality in India is practically non-existent. About 60% commuters rely on walking and 35% commuters use buses. World over multimodality is an afterthought.

- Planning for multimodality needs to consider total journey time, total journey cost, walking distance and barriers, wait time, transfer penalties, reliability, safety/ security, comforts, etc.

- Mobility-as-a Service is enabler of sustainable mobility. It considers entire journey approach, customer centric and access to service oriented, minimizing private vehicles, using most optimal mode on a trip by trip basis. It relies on data integration, service integration and policy integration and includes all income group.

- MaaS if planned and implemented appropriately could reduce the pressure of motorization which is projected to come with economic growth.

- If left unchecked it can have very negative impacts in terms of growing congestion, worsening road safety and leaving vulnerable population behind.

- In physical integration not only size but also quality of connections matter. Operation integration needs to consider point to point services to trunk feeder system along high volume corridor. In fare integration not only payment but should also have fare policy integration.

Distinguished guests in the Session

- MaaS agency should be multi-stakeholders and flexible in adopting tools. Government can act as a facilitator, partner with MaaS providers and focus regulations.

- Currently, major investment supports cars and two wheeler mobility.

- Silver line semi high speed rail planned in Kerala having a network length of 530 km with 11 stations from Kasaragod to Thiruvananthapuram will be a good example for multimodal integration in Kerala.

- It will integrate Metro, Water Metro and silver line station at Ernakulum and Kochi Airport station. Light metros of Thiruvananthapuram and Kasaragod to be linked with silver line stations. It will have EV charging points at silver line stations to encourage adoption of E-Vehicle.

- Multimodal transport network in Kerala provides seamless movement of passengers, goods and services. Different modes of public transport complement each other. It has people centric model of transport to encourage shift from personal to public modes of conveyance. Mobile Apps to provide real time information and smart cards to assist in intermodal travel.

- In north east India having a special terrain multi-modal integration needs to follow a different approach. This area has major challenges like proximity of international boarders, topographical constrains, poor connectivity with rest of the country, high disaster proneness, high cost of travel in urban areas.

- Integration is required between Non-motorized transport with the public transport through ropeway and funiculars as well as with public stair cases.

- Public transport systems are more users friendly when they provide end to end connectivity. Multi-modal integration is the key to sustainable growth.

- Traditional modes like walking will arrest the rampant increase of private vehicles.

- Innovative use of technology systems to be explored to complement buses as Public Transport System.

- Multimodal transport is a giant step towards digital India mission. One click solution to pay all modes of transport. It will replace complex public transport ticketing schemes.

- Implementing multi-modal solution in India face many challenges.
    - Efforts mainly to cater commuters with in the city and not the visitors/ tourist.
    - City mobile app has only limited transit options.
    - Journey planning features is missing in most of the city app.
    - Integration is difficult to varied ticketing business rules between the public transports in India.
    - Readiness to share real time transport data.
    - Deficiency of real time data for supply demand travel forecast.
    - Difficult to adopt single user identity in local transport.

- Some of the MaaS pilots around the world are as under:
    - Whim App (Helsinki)
    - Oixxit App (Germany)
    - Ubigo (city of Gothenburg)
    - Moovel (Germany also testing in Boston, Portland and Helsinki)
    - Beelline (commuters in Singapore)
    - SMILE App (Vienna)
    - Bridj (Commuters in Bostor, Kansas city and Washington DC)
    - Communato/ Bixi (cities in Quebec, Canada)

Outcome

- TOD entails an integrated approach towards land-use planning, transportation planning, property development, housing and infrastructure creation.
- Plans to be outcome oriented and which can be quantified.
- Institutional fragmentation/ overlapping responsibilities are a reality; a common plan for all to follow can achieve the much needed alignment.
- Proactive urban regeneration and 'not market driven approach' needed.
- Land value capture is an outcome of successful TOD implementation.
- Transportation and land use integration need effective synergy between the two for smooth integration of planning and transit projects.
- There is a need to define comprehensively the implementation mechanism requisite changes in Planning Acts, Rules, and Development norms.
- Implementation modality for TOD / VCF needs to be designed as per site specific requirements / geography, keeping in view the local requirements, strengths and constraints.
- There is a requirements for sensitization, capacity building and training of officials and stakeholders both at state and local bodies levels to develop know – how on implementation of these aspects.
- Extensive consultation with stakeholder is required at state / city level for effectualisation of TOD principles and policy.
- More clarity is necessary in the approval mechanism for TOD projects and infrastructure.
- TOD planning should be supported by comprehensive Mobility Plan, intermodal transport facility (Multi-modal hubs) last-mile connectivity solutions, transfer of development right.
- A cross agency platform to widen the urban corridor growth potential and demand for urban infrastructure, housing needs should be discussed with the relevant State Planning Dept. and Development Authorities.
- Effective implementation of TOD and MMI could be enabled through people consensus and people capacities, institutional responsibilities, capacity building initiative statutory process, data transparency and scaling of TOD to other station areas.
- National campaign should be taken up to spread awareness encouraging E-mobility.
- Phase out targets for fossil fuel vehicle or 100% electrification targets.
- Increase focus on EV charging infrastructure in Mega cities.
- To achieve net zero by 2070 it will be imperative to:-
  - Share of electric cars in car sales must reach 74% by 2070.

- o Share of biofuels blend in oil for cars, trucks and airlines must touch 84% by 2070.
- Coal use in the industrial sector must peak by 2040 and reduce by 97% between 2040 and 2065. Hydrogen share in total industrial energy use must increase to 15% by 2050 and 19% by 2070.
- Coal based electricity generation must peak by 2040 and reduce by 99% between 2040 and 2060.
- Solar based electricity generation capacity must increase to 1689 GW by 2050 and to 5630 GW by 2070.
- Wind based energy generation capacity must increase to 557 GW by 2050 and 1792 GW by 2070.

Active participation in the Session

- Nuclear based electricity generation capacity must increase to 68 GW by 2050 and to 225 GW by 2070.
- Integrated transport system is key for seamless passenger journeys and facilitating mode shift.
- Enabling short and convenient transfers between different modes and static and dynamic signage for information on feeder mode and supporting infrastructure are crucial for multi-modal integration.
- As a way forward for multi-modal integration in India single platform is required for integration of multiple operations.
- Policy changes are required to standardize data formats. Openness of operators towards data sharing is necessary to ripe the benefits of Artificial Intelligence.
- One click solution such as single app connecting multiple operators is must. There is a need for simple business rule for revenue sharing among operators.

E.   Round Table Discussions

A total of 5 Round Table Discussions covering a wide range of transport related issues such as urban transport startups, integrating urban and transport planning as a statutory process, promotion of E.V. city Buses in Indian cities, street for all and sustainable transport development were conducted as part of this year's UMI conference. Discussions in Round Table sessions provided a platform to the speakers and participants to interact on the issues in areas of topical interest and sharing experiences of ongoing and completed studies and research projects across the cities both in India and across the world. In each session a key presentation was made eliciting the comments and views of the expert panelists and participants. The discussion were moderated by the expert in the field.

Round Table 1:- Urban Transport Startups – Ideation and Follow up Action. (Sponsored by GIZ)

In recent years, Indian cities have witnessed the entry of a number of start-ups providing digital solutions and mobility related services under various sectors of urban transport. Their numbers are increasing and they are now being widely recognized as important engines for growth and jobs generation. Intuitive ideas combined with smart phone applications are changing the user experience for urban commuting. Through innovation and scalable technology, start-ups can generate impactful solutions and thereby act as vehicles for socio-economic development and transformation.

Today, India is home to the third-largest startup ecosystem after the US and China going by the number of startups and unicorns. The objective of the session was to bring together innovations, entrepreneurs & ventures driving the future of urban transport digitalization in India. A closer look was taken at how tech based startups in the urban mobility domain are changing the way we commute and how the challenges related to urban mobility are being solved with emerging technologies.

Moderator -   Mr. Narendra Verma, Advisor, GIZ and Mr Vivekanand Kotikalapudi, Technical Expert, GiZ

Speakers -

    i.   Mr. Hiranmay Mallick, CEO & Co-Founder, TUMMOC

    ii.   Mr. Manjunath R S, Director, FAIRTIQ India Pvt Ltd

    iii.   Mr. Amit Gupta, Co-founder, gogoBus

    iv.   Mr. Sujith Nayar, CEO & Co-Founder, Beckn Foundation, Bengaluru, Karnataka

    v.   Ms. Hadar Weinberger, Head of Product at Ev-Edge, Tel Aviv,

Israel

    vi.   Mr. Manraj Singh Bains, Director & Co-founder, Unitrans Mobility Solutions Pvt. Ltd.

Highlights of Discussion

- Israel is known as "Startup Nation" by setting up most tech companies per capita. The Israeli mobility eco system is comprised of government entities, start-ups, investors and OEM & OES (Original Equipment Manufacture and Original Equipment Supplier).

- There are 630 mobility start-ups and companies in Israel. It comprises 40% autonomous and connected, 35% mobility services, 15% electrification and energy, 8% drones and aviation and 2% maritime. Since 2013

Panelists on the dias sharing their views

dollar sign 25 billion invested in Israeli mobility start-ups. 50% of all mobility start-ups received funding from the government.

- Government has made innovation through National Mobility testing field, Emerging technologies have been used by Mobileye an intel company, moovit and Intel. Strategy for start-ups revolves around community, supporting agencies and collaboration with government and other companies.

- UNITRANS a private Ltd. firm incorporated as a company in 2018 have worked in various countries like Middle-east, Africa, Australia, New Zealand, UK as well as with central and state governments in India. The Company innovative solutions are in traffic modelling, transport planning services, etc.

- For congestion problem, widening of roads or building a competing mode may be theoretical solutions but building a rapid transit line, running an express bus or building sidewalks and bike lanes are the real solution. By doing so many people may switch off the road and leaving the roads faster for the rest of us.

- Through simulations, decision makers can test different solutions, fix ideas, solve mobility issues and will be able to fully understand the complexities of traffic system with zero impact.

- The company has various offline products for modelling and simulation namely PTV Visum, PTV Vissim, PTV Viswalk.

- It has developed various technology solution for transport planning. Some of the initiatives are data driven solutions to enhance traditional approaches, using API interfaces to assess various transport supply options, calibrating model for local conditions, Algorithms for integration of bid data to transport demand modelling, planning for integration of new mobility modes and capacity building for government authorities.

- Some of the transport planning projects undertaken by the company showcase their achievements, they are Re-development of New Delhi Railway Station M3M 65th Avenue, Mixed use Development, Gurgaon, office Complex Aerocity Delhi, Redevelopment of Ahmedabad Railway Station, etc. Traffic Management and Operational Plan for SEZ Gurgaon, Station Re-development and Integrated Transit Oriented Mixed-use Development, New Delhi.

- Tummoc is India's only patented all mode intercity journey planning and ticketing App. In Intercity transit 95% of public transport users do not have access to actionable public transport information. For integrated first and last mile connectivity 3-4 different Apps are used by public transport users every day. Intercity Mobile Ticketing is a multi-mode single ticketing.

Participants in the Round Table Discussion

CEEW, through the USAID-funded 'Cleaner Air and Better Health' programme, has aimed to focus on reducing air pollution sources, exposure and its health impact. To reduce the impact of traffic-related sources, mobility should be sustainable not only in terms of clean-tech but also travel demand management. Through this session, the participants discussed the planning framework, key considerations to plan and implement Smart Mobility Zone and Low Emission Zone in Indian cities.

Restrictive measures like Low Emission Zones, Zero Emission Zones, Clean Air Zones, etc. are adopted globally to check the usage of polluting vehicles in the pollution hot-spot areas in the city. Various studies translate the benefits in terms of economic, environmental and health parameter through continuous monitoring and surveillance. These Zones are effective tools for structuring and explaining policy on these concerns and enforcing regulations within a defined zone. However, unlike European cities, Indian cities are facing urbanization, economic growth and exponential growth in travel demand.

Thus, India might need to customize LEZ as a tool for catering to growing mobility demand. The Finance Minister (GoI) had proposed Smart Mobility Zones as a solution in the Union Budget FY 2022-23. We propose a unique framework for designing smart mobility zones as a prerequisite to LEZ in the Indian context.

Additionally, a reformed legal framework may be used to promote the planning of such smart mobility zones and low-emission zones. The creation of a distinct legal system entails controlling the kind of transport vehicles and fuel technology that are forbidden and allowed in each designated zone. It goes without saying that such presumptions and restrictions will rely on local land use and activities and may vary across board. Land use is important in the execution of various transport planning measures however, it receives a little less attention. Transport supply is reliant on land use and its character is influenced by it.

Chairperson	Mr. Soumitri Das, Project Management Specialist (Environment), (USAID)
Moderator -	Ms Himani Jain, Senior Programme Lead, CEEW
Speakers -	i. Mr. Martin Lutz, Senate Department for Environment, Mobility, Consumer and Climate

Protection (new), Head of Air Quality Management, Berlin, Germany

    ii. Ms. Pramoda Gode, Senior Expert, Electric Mobility & Sustainable Transportation

    iii. Ms. Surabhi Kureel, Associate Director, IPE Global

    iv. Dr. O.P. Agarwal, Former OSD (UT), MoUD and DG, IUT;

    v. Mr. K. J. Sohan, Former Mayor, Kochi Municipal Corporation

    vi. Mr. G.P Hari, Executive Officer, KMTA, Kochi

    vii. Dr. Rajender Pensiya, IAS, Director, Directorate of Urban Transport, Uttar Pradesh

    viii. Mr. Ajit Sharma, GM, Finance, DMRC

    ix. Dr. Shalini Sinha, Centre Head & Principal Researcher, CoEUT

    x. Prof. (Dr.) Ashish Verma, IISC & Convener, Sustainable Transportation Lab (IST Lab);

    xi. Mr. Subash Dhar, Senior Researcher at UNEP Copenhagen Climate Centre,

    xii. Mr. Kaushal Kumar Sahu, Sr. Project Officer - Transport, ADB

    xiii. Er. A. K. Gupta, Additional Director, RCUES, Lucknow

Highlights of Discussion

- Objective of cleaner air and better health in India aim at I) improving air pollution mitigation in India with a focus on improving the existing air quality regime, II) reducing exposure to air pollution in India by integrating air quality benefits in health planning.
- Emission norms in India being followed since 1991 are basically restrictive in nature such as old vehicle scrapping policy, B.S stage vehicles, national clean air policy, alternate fuels, vehicle pollution checks green zone, odd even system, etc.

- Globally, highest number of low emission zone (LEZ) exists in Europe where all polluting vehicles are prohibitive from travelling.

- In India Mathern (Maharashtra) is an eco-resistive region and Asia's only automobile free hill station. Similarly, around 500 m radius of Taj Mahal (Agra) ICE vehicles are banned.

- Kevadia (Gujarat) is envisaged as the first electric vehicle only city of India and will have Greenfield tourism development. Lingaraj temple area (Bhubaneshwar) is also proposed as Low Emission Zone. Hilly Towns of Shimla and Dharamshala are also proposed to be developed as Low Emission Zone.

- In Europe urbanisation level of 75% is much higher than 35% in India but urbanization growth is higher in India than European Union.

- With the higher growth of urbanization level, motorized passenger travel demand will also grow almost 2 times by 2030. This will skew the modal share towards four wheelers. As a result, emission in four wheelers is estimated to increase by 2 times by 2030.

- In 2021 out of 20 most polluted cities in world 14 were in India of which 7 were in Uttar Pradesh. Lucknow having an annual growth rate of 2.38% passenger KM demand has increased from 188,725 kms in 2011 to 287,250 km and is expected to be 375923 km by 2030.

- In Lucknow there is a mismatch in vehicle stock and modal shares. Two wheelers and car are more than 95% of total vehicles in the city but cater to only 41% of modal split. On the other hand 1.5% of shared vehicle stock in the city are

Speaker expressing his views in the Session

responsible for more than 30% of modal share.

- Average traffic speed during day hours remain as 23 kmph and pollution hot spots overlap with low speed areas.

- Population density, type of road network, public transport connectivity, land use in the area, congestion and traffic speed are some of the drivers which impact the pollution.

- Requirements for Low Emission Zone include proper traffic management, set up of parking and EV charging infrastructure creation of special purpose vehicle of zone

management, etc. Whereas for Smart Mobility Zone traffic management through ITMS, infrastructural set up comprising NMT, charging, transit stop and public transport in terms of fleet enhancement, route rationalization, PT and IPT technological enhancement are necessary requirements.

- Low Emission Zone planning process adopted in Berlin follow stricter regulations for polluting sources impose access restrictions in urban areas for certain vehicles depending on their pollution emission and accelerate improvement in vehicle fleet.

- There are about 250 low emission zones (LEZ) in Europe and 70 in Germany. An emission criterion is based on Euro emission standard. Areas range from big LEZ in London and Rhine-Ruler area to small town in the PO valley (Italy).

- Britain follows a strategy of "No diesel without filter". It also follow accelerated improvement of the growing diesel vehicle fleet.

- Berlin also follow the same strategy as in Britain. In addition it impose selective traffic ban for polluting vehicles. LEZ scheme is in force in almost 60 German towns and a total of 250 towns in Europe.

- LEZ in Paris (France) is in the entire city. It will have no diesel car after 2024 and no-petrol after 2030 without any retrofit option.

- For LEZ implementation either it is through automatic vehicle recognitions system without cameras like in London or stickers based on vehicle labelling scheme.

- It envisages to set out the emission dependent sticker system defining requisite properties, emission classes, and setting technical requirements for diesel filter retrofit system.

- Modalities for issuing the stickers also need to be set and competent institutions identified for issuing the stickers.

- Lots of tasks and many stakeholders are involved in LEZ implementation. Tasks consist of setting basic planning process, deployment of traffic signs, vehicle identification/ labelling, identifying exemptions, indicating funding, surveillance, communication, legal implication, evaluation and impact assessment.

- Stakeholders include pollution control authority, traffic authority, vehicle registration office, police, press / public relation bureau, economic department, industry organizations, NGOs, etc.

- LEZ impact is being analyzed on traffic flows, vehicle fleet composition, pollution emissions from road traffic and air quality.

- It shows change of vehicle fleet composition on the road indicating a decrease of no-sticker fleet by 70-90% and increase in green vehicle by a factor of 1.5 to 3. Diesel

vehicles in Berlin retrofitted with DPF (Diesel Particle Filter) significantly in 3 years and also reduction in particle exhaust emissions.

- Berlin has had serious problems with particulate matter pollution 15 years ago. It focused on black carbon diesel emission control with emphasis on health benefits as ultrafine soot particles are considered the most toxic PM components.

- Cost efficient diesel particle filter technology has become important element of Berlin strategy to attain the particle pollution standards.

- As of now no diesel without particle filter and DPF is mandatory in new diesel engines. There is also retrofit of in-use vehicle/ machinery stock with DPF.

- Transport planning measures were not enough to deal with the problem and as such need was felt to accelerate improvement of the growing diesel vehicle fleet replacing polluting vehicle by new cleaner vehicles and retrofitting.

- It, however has general exemption for police, fire brigade, military, ambulance, etc. vehicles also exempted are two wheelers, mobile machinery, and vintage cars.

- For tackling the NO_2 problem, national government is to stop diesel subsidies and provide fund for alternate fuels like LNG, CNG, H_2 and charging.

- Extend existing/ develop new national labeling scheme (stickers) for clean vehicles based on real driving emissions, including retrofitted vehicles. Allow car buyers to easily identify clean vehicles. It has also tightened regulations for regular vehicle inspections so as to detect malfunction of exhaust treatment system.

- In LEZ implementation the following lessons learnt on individual exemptions:
    o Define the criteria for the information of the public well in advance.
    o There should be only few general exemption.
    o No exemption for vehicles which can be retrofitted with a filter.
    o Criteria found relatively strict when assessing cases of hardships need to be redefined for an economically precarious situation.
    o Fees to be charged related to the value of exemption taking the cost for filter retrofit.
    o Keep number of exemptions below the benchmark of 10% of the number of banned vehicles.
    o While giving exemptions environmental benefits of the LEZ should not be at risk.

- Objectively LEZ be considered when there is high contribution of urban traffic related air pollutants, air quality limit values exceeded in many urban streets, low proportion of through traffic or no alternative routes and high share of diesel vehicles.

- LEZ advantages aim specifically at the highest emitting vehicles, reward vehicle owners who invested in clean vehicles and reduce the emission of the overall vehicle fleet all over the LEZ. Ultimately it decreased the emission in urban areas and minimizes the exposure to emission in the city.

- In spite of pros it also has some cons in terms of financial burden on the owners of high emitting vehicles and lot of efforts required for granting single exemptions.

- There are a number of variants of LEZ in Europe. Some LEZ are restricted only for heavy goods vehicles while some includes light goods vehicles. In Italy it includes motor vehicles while in Germany it comprises all vehicles.

- Enforcement LEZ is either manually based on sticker system or automatically with vehicle recognition technology. The operating hours vary significantly from permanent to seasonal operations. For instance in Italy the operation is confined during winter half year. In some places the operation is during selected daytimes/ weekdays. In specific case the operation is only when pollution levels exceed certain thresholds.

- Exemption in LEZ is provided for emergency and special vehicles as well as in case of hardship and identified group of residents and/ or businesses in the zone.

- Conclusions from "No Diesel without Filter" policy in Berlin are as under:-
  - Renewal of vehicle/ machinery stock is slow. Electric/ alternative fuel options not yet fully available.
  - Life time of vehicles fairly long > 10 years
  - Emission control technology in use of fleet quite often poor.

- Retrofit is attractive short term and cheap option.

- Particle filter retrofit is sound, efficient and cost effective solution for almost all road and non-road applications. It helped substantially to drop black carbon levels in Berlin by 50%.

- Retrofit with NOX filter retrofit (SCR) technically feasible, efficient and still be cost effective for buses. It has made important contribution to meet NO_2 air quality standards in Berlin. Probably it is too complex and expensive for non-road.

Outcome

- Smart mobility and reduced emission are part of the special mobility zones. It needs to be developed in phases. In first phase delineate the boundary of the smart mobility zone without any restrictions for the entry of vehicles.

- Moving further light low emission zone need to be created with provision of parking meters in the influx magnets. In this case ICE passenger and IPT vehicles may be allowed with higher parking charges/ entry fee. It will be followed by heavy low

emission zone by installation of charging infrastructure at strategic points – ICE vehicles may be allowed by paying 3-4 times parking charges.

- Lastly, it will be zero emission zone where necessary infrastructure be provided and only electric vehicle be allowed in the zone.
- There is a need for a unified vehicle registration system across the country. A single vehicle Act giving powers to develop SMZ/ LEZ and managing them across the city or beyond as per airshed rather than the municipal boundaries.
- Restrictions imposed directly or indirectly would result in backlash, Public should be given priority and public transport should be set up first before starting SMZ/ LEZ. Learnings from Bangalore can be used as a case study where month long trial road pedestrianisation and vehicle ban were discussed.
- Integration of Urban Planning and Transport planning is required and can be added as a statutory process in the policy. Shift to use of Public transport will directly affect the emission, policy at national level is

Participants in the Round Table Discussion

required; Enforcement mechanism is also very important, restrictive policy can face major backlash, Modal shift can be the way to accomplish SMZ/ LEZs.

- Pilot SMZ/ LEZ should have a network level impact; Stakeholder and resident interest should be considered as a first priority. Air quality as well as Quality of life should be the measure to judge the working of a low emission zone. Technology and travel demand management compliments each other. Technology will play a very important role in the Planning of Low emission zones.
- There should be a legal binding agreement and unified set up of planning is required. Amendments should be made in city plans rather than waiting for years until the next plan starts.

Climate change is real and is impacting millions of lives across the globe. It is imminent that we make environment friendly choices to prevent further damage to the environment. A transition to electric vehicles can have far reaching effects in curbing pollution and as a result climate change. With the Hon'ble Prime Minister Shri Narendra Modi making the pledge to be 100% energy independent by 2047 and with India setting a target of achieving net zero carbon emissions by 2070, the need of the hour is for all vehicles, from motorbikes, scooters, cars, trucks and buses to switch to electric.

Buses plying in India today account for almost 10% of the total diesel consumption in the country. This straight away points at deployment of electric buses as the way forward to curb emissions. However, despite personal EV sales rapidly gathering pace in the last few years, the switch over to EV city buses has been rather slow, owing to several challenges.

This session aimed to seek the following answers:

- A viable model to add electric city buses with lesser reliance on government investments and subsidies.
- Partnerships to finance and procure electric city buses.
- New technology and business models to increase revenue.
- Optimizing operations with technology so that electric buses can speedily recover investments and start paying returns.
- Discussing examples of successful viable deployment of electric city buses and the learnings for other cities from the successful examples.

Chairperson	Mr. Anurag Jain (IAS), Secretary, Ministry of Commerce and Industry, Department for Promotion of Industry and Internal Trade, Government of India
Moderator -	Ms. Vaidhehi Ravindran, Partner, Lightrock India
Speakers -	i. Mr. Biju Prabhakar, IAS, CMD, KSRTC
	ii. Ms. Mahua Acharya, MD and CEO, CESL
	iii. Mr. Arun Bothra, IPS, Transport Commissioner, Odisha
	iv. Mr. Radhakrishnan B., IAS, Commissioner, Nagpur Municipal Corporation

v. Mr. Rahul Yadav, IAS, Municipal Commissioner, Jammu

vi. Mr. Manuj Goyal, IAS, Municipal Commissioner, Dehradun

Highlights of Discussion

- As on date 70 million passengers use 150, 000 buses everyday and one lakh more city buses are required to cater to the demand.

- By 2031, demand will be of 2 Lakh city buses. In the absence of adequate buses private vehicles increase. Rising number of private vehicles lead to congestion and pollution.

- In India there are 320 vehicles per 1000 population.

- By 2047 the objective is to make India energy independent and by 2070 India will have net zero emissions. In this context E-buses will facilitate to achieve the above set targets in providing mass transport option and reducing GHG emission.

- E-buses face several challenges consisting of high capex cost, dearth of funds at state and central level, low trust in new technology, low manufacturing capacity at local level, reliance on other countries for batteries, disruption in ecosystem by supply chain, etc.

- Indore in Madhya Pradesh is amongst the first adopter of electric vehicles in central India.

- MP state EV policy first drafted by AICTSL in 2018 has provision for waiving the tax by charging only 1% of M.V. Tax. Registration fee is also waived and the bye laws provide for EV charging spaces in public and private infrastructure. It also provided that 1,500 e-buses can also operate without permit.

Moderator moderating the discission

- AICTSL took innovative action for E-buses. Indore was chosen amongst 5 cities under FAME-I. Capex share comprises 60%, 20% and 20% by Govt. of India, IMC and operators respectively.

- Innovative financial model for sustaining 40 E-buses followed the operation as under. AICTSL made route cluster of 20 Indore-Bhopal luxury Bus and 40 intra-city e-buses. Premium from Indore-Bhopal route waived off by AICTSL.

- Operator used intercity premium to cross-subsidize intra-city buses. AICTSL also provided land for depot and charging infrastructure at bus depot to the operator. Cost of electricity is borne by IMC.

- Outcome of this collaborative strategy is that 40 e-buses are running successfully Average daily ridership is 17,000 plus and EPKM is Rs. 30.

- Taking into account the difference in earning and cost per km and yearly cost to Govt. total saving on 40 electric buses for 10 year project cost is estimated at Rs. 710 million.

- Similarly saving in 50 intra-city buses operating on NCC modal and 30 BRTS buses operating on GCC model for 12 years is estimated at Rs. 1213 million.

- In respect of Bio-CNG buses with investment of Rs. 46,40 crore only and introduction of 400 intercity buses for 7 years earning is Rs. 16.32 crore.

- AICTSL provided most viable locations for chargers having high concessionaire period of 12 years. Advertisement rights/ Kiosks for charging stations recovered the initial losses.

- AICTSL also provided additional support in the following areas:-

- Administrative Support
    - Fully Operational Electric Bus Depots.
    - Upstream Charging Infra.
    - Free Electricity for Bus Charging to Operator under FAME 1.
    - Advertisement rights on Buses.
    - Route Planning and Optimization.

- Financial Support
    - 40% Subsidy of Capex.
    - Subsidized plans and passes.
    - Reduced pricing on Digital programs. Tickets (Tap-in Tap-out buses)

- Policy Support
    - First 1500 electric buses to be charged 1% motor vehicle tax.
    - No Permits for first 1500 Electric Buses
    - 25 KM route extension beyond city limits to Sub-Urban Areas.
    - Annual Fare Revision Policy.

- Marketing Support
    - Deployment of Informative charts.
    - Various subsidized plans (Super Saver Plans)

- o Permissions for off board ticketing
- o Faster sales of Common Mobility Cards through city wide outlets.
- AICTSL collaboration has made following achievement:-
  - o There is minimum public fund infusion for new services.
  - o No of operators/ agencies increased from 2013 to 2022.
  - o Ridership increased due to introduction of new service support of AICTSL ecosystem.
  - o Strongest SLA enforcement on bus operator.
  - o 150 interstate/ intercity buses operate under AICTSL with 10 operators serving 70, 000 passengers daily.
  - o Numbers of Start-ups/ companies are also growing with AICTSL's collaboration. It has given assistance to start-up and as a result incubator for start-ups namely Chalo operates 400 midi-bio-CNG buses and will operate 80 e-

Opening remarks by the Chairperson in the session

  buses. Similarly, EV Urja is a battery swapping tech provider.
  - o My BYK is a successful Public Bicycle sharing company. Indore introduced PBS service in March 2022. It deployed 1000bicycles and 100 stations 3 months before deadline. Now it is bringing 100 e-bikes in Indore.
  - o 100 E-rickshaws are operating in Indore. A new start-ups number of e- charges for public which increased from 46 to 200.
  - o Indore has been selected for collaboration by AICTSL because it has start-ups oriented eco-system with administrative, political, technological, financial, market and other miscellaneous support.

Outcome

- Startups should explore retrofitting of buses with new technology and battery swapping for electric vehicles. Funding by the government to this initiative will go a long way.
- Environment needs to be created to assure the large capital providers in this area for their return on the investment so as to make electric buses economically viable.

- Public-Private partnership is encouraged with companies like Chalo who have expertise in technology for electric buses.

- New technology should be in a position to lower down the cost of operation for STUs. Reliability of service is critical in increasing bus ridership.

- In smaller cities like Dehradun where average trip length is smaller an integrated transport plan with different modes be prepared to make electric city bus more effective.

- Cost of electric bus needs to be reduced with technological disruption. City mobility plan should be in sync with City Master Plan to make public transportation successful in the city.

- The session came to the conclusion that electric buses are the way forward in order to reduce the tailpipe emission form existing buses. PPP option using technology to reduce overall cost can make the electric buses successful. Integrated mobility system is required to cover end to end needs of the commuters.

Audience in the session

Round Table 4:- Street for All (Sponsored by WRI)

With ever-increasing surge in the vehicular population since industrialization, Indian cities have focused on improving their infrastructure to meet this increasing demand and prioritizing the movement of private motor vehicles. Streets play a larger role in urban life, acting as enablers for commerce and leisure. Streets are places where citizens meet, interact, celebrate festivals, and buy goods for their everyday needs. Census data shows that around 48% Indians commute by either walking or cycling. However, the infrastructure to support this mode of transportation across Indian cities has a long way to improve. Absent or broken footpaths, insufficient walking space, unsafe crossings, lack of refuge spaces are common sights in our cities which shows a clear need of providing infrastructure for all users. The national, state & city govts. and urban practitioners have undertaken several efforts over the last decade to transform streets in Indian cities. However, the key challenge of moving beyond pilots remains.

This session facilitated the exchange of ideas and experiences around improving streets, between various representatives from across the country, spanning governments at the center, states and cities.

Chairperson	Mr. Dhawal Ashar, "Program Head Urban Transport & Road Safety", WRI India
Moderator -	Mr. Aswathy Dilip, Managing Director, ITDP India
Speakers -	i. Adv. M. Anil Kumar, Mayor, Corporation of Kochi
	ii. Mr. Biju Prabhakar IAS, Secretary, Transport & CMD, KSRTC, Govt. of Kerala
	iii. Mr. Om Prakash Mishra, Special Commissioner, Delhi Transport Department
	iv. Ms. Sarika Chakravarty, Sr. Sector Coordinator, NIUA
	v. Ms. Swati Khanna, Senior Sector Specialist Urban Development and Mobility, KFW
	vi. Ms. Charmie Parekh, CEO, Silvassa Smart City
	vii. Mr. Abhimnayu Prakas, Regional Lead, Asia and Africa, Global Designing Cities Initiative

viii. Mr. Rishav Gupta, IAS, CEO, Indore Smart City Development Limited, Additional Commissioner, Indore Municipal Corporation, CEO, Atal Indore City Transport Service Limited, Indore Smart City Development Limited

ix. Ms. Nithya Ramesh, Director, Janagraha

x. Mr. Shashank Achanthodi, CM Fellow, Govt. of NCT of Delhi

xi. Mr. Gerald Ollivier, Lead Transport Specialist, The World Bank

xii. Ms. Sarika Panda, Director, Nagarro Founder Trustee, Raahgiri Foundation

xiii. Mr. Prasanna Desai, Practising Architect, Urban Designer & Director PVP College of Architecture, Pune, Prasanna Desai Architects

xiv. Dr. Navdeep Asija, Traffic Advisor to Government of Punjab and Director, Punjab Road Safety & Traffic Research Centre, Department of Home, Government of Punjab

xv. Mr. Dhirendra Khadgata, IAS, Municipal Commissioner, Rohtak, Govt. of Haryana

Highlights of Discussion

- As per census 2011, 48% Indians commute by either walking or cycling. As regards growth in vehicular population number of total registered vehicles increased from 55 million in 2000 to 368 million in 2022.

- High capacity infrastructure like freeways, expressway,

Panelist sharing their views in the session

flyovers, etc. are being built in large cities across the country. Now, Metro Rail as

Mass Transit Solution is in operation in about 20 cities and will be made operational in 50 cities within next two decades. But NMT infrastructure such as walkways and cycle tracks has not been constructed which reflect in poor quality of urban life.

- The impact of poor NMT infrastructure and lack of facilities for all road users may have been one of the causes for 1.3 million people killed and 5 million people injured due to road crashes in India in the last decade. Road crashes are estimated to cost the Indian economy between 3 to 5 percent of the GDP a year.

- A study on India's urbanization (NCE India Report) indicates high economic growth in cities with compact urban forms. In cities where quality of life deteriorated economic growth also slowed down.

- To have a complete street for all users is not just an engineering problem because it has many users and many uses. Hence streets must not be designed as just conduits of traffic rather as quintessential public spaces where walking, cycling and public transport is given fare space of road ROW.

- Where walking is enjoyable and accessible to all, women, children elderly including differently abled can spend quality time.

Participants in the session

The Public transport sector plays a critical role in the nation's economy. With the ever-increasing need for connectivity, the focus of policymakers is now on developing a sustainable form of transport. India has already committed to net-zero emissions by 2070 and transport sector is expected to be a key contributor in meeting this target. Both Central and State governments have already taken several concentrated efforts in this direction including increasing awareness regarding usage of cleaner and greener alternate fuels, vehicles with cleaner, greener, and sustainable transport.

In light of this, the session focused on identifying the key challenges in various initiative towards transition to clean and green transportation with a focus on e-mobility, capacity building of public transit authorities and other institutional stakeholders for greater uptake in e-mobility. The session initiated conversation on the role of private sector in developing sustainable transport and various institutional, financial, regulatory, and planning interventions required at State/ City level. It further provided insights on the measures which may be adopted to scale up the adoption of e-mobility. The following experts participated in the session.

Moderator -	Mr. Mohammad Saif Athar, Partner, PwC India
Speakers -	i. Ms. Anja Fourie, Principal Portfolio Manager, KfW India Program
	ii. Mr. Laghu Parashar, Program Manager, Sustainable Urban Mobility and e-mobility, GIZ India
	iii. Prof. Shivanand Swamy, Director Emeritus, Centre of Excellence in Urban Transport (COE-UT), CEPT University Ahmedabad
	iv. Mr. Prasanna Patwardhan, Chairperson & Managing Director, Prasanna Group of Companies
	v. Mr. Rohit Pathania, Ola Mobility India
	vi. Ms. Vaishakhi Shah Director - PwC India
	vii. Mr. Subash Dhar, Senior Researcher at UNEP Copenhagen Climate Centre, Denmark

viii.   Mr. Kaushal Kumar Sahu, Sr. Project Officer - Transport, ADB

Panelists sharing their views with the participants

F Conclave : India at 75 Mobility For All

The UMI-2022 had organised one Conclave Session on the important aspect of conference theme focusing on Aatma Nirbhar India-Vocal for Local in sustainable urban mobility. It emphasized on thinking locally by linking with the main thrust on vocal for local Aatma nirbhar. It explored the growth and challenges of the metro, vision and plans on localization technological advancement and smart mobility with an aim to have affordable, efficient and sufficient metro functioning.

As cities grow and transport systems find it increasingly difficult to meet the growing travel demand, innovative systems are emerging around the world. In many cases, advances in information technology have allowed a more optimal use of transport systems to facilitate a better use of available capacity. In other cases innovations have enabled public and shared transport systems to become more convenient.

Further, the country under the visionary leadership of Hon'ble Prime Minister Shri Narendra Modi, is focusing on several initiatives towards energy- efficient and low- carbon transport like providing mass transit systems in more than 50 cities, hybrid & electric mobility, improved emission standards ,etc. In order to promote indigenization and reduction in cost, the specifications of various metro rail components like rolling stock, signaling & telecom systems, electrical & electromechanical systems and civil engineering structures have been standardized. New public transport mobility paradigms such as Metro Neo, Metro Lite, RRTS, and augmented city bus services are being implemented under "Make in India".

Accordingly, this session sought to answer the following questions:

- Indigenous engineering and system technologies for sustainable transport systems.
- Energy efficiencies towards alternative fuel and electrification. Policies and practices for reframing urban mobility so that "no one is left behind".
- NCMC card making way for much smarter Indian mobility system.
- Leveraging non- fare revenue sources for improving the financial sustainability.
- Home grown original equipment manufacturers (OEMS) at an affordable cost and adapted to Indian conditions. Eminent experts shared their views in the session.

Chairperson -	Dr. O.P. Agarwal former OSD (UT MOUD and D.G. IUT (India)
Panelist -	i. Mr. Vikas Kumar, Managing Director, Delhi Metro rail Corporation (DMRC)
	ii. Ms. Mahua Acharya, Managing Director,

Convergence Energy Service Limited, India

iii. Mr. Mukund Kumar Sinha, Transport specialist Asian Development Bank (ADB)

iv. Mr. Thampy Koshy, CEO, Open Network for Digital Commerce (ONDC)

v. Dr. PC Sehgal, Former Managing Director, Mumbai Rail Vikas Corporation (MRVC)

vi. Mr. Mohit Dubey, Co-Founder and Chief Executive Officer, Chalo Mobility Pvt. Ltd.

vii. Mr. Rajeev Joisar, Head of Commercial, India and South Asia, Alstom

Speaker making presentation in the session

Panelist exchanging their experiences

G.   Valedictory and Closing Session

The valedictory session of the 15th UMI-2022 conference was held on 6th November 2022 from 15.30 hours onwards in the presence of a large number of dignitaries, delegates and award winners. Shri Arif Mohammed Khan, Hon'ble Governor of Kerala was the chief guest in the session. Shri Kaushal Kishore, Hon'ble Minister of State for Housing and Urban Affairs, Government of India and Adv. Antony Raju, Hon'ble Minister for Transport, Government of Kerala graced the occasion. Brief outcome of the session is as under:-

Welcome address : Shri Biju Prabhakar, Secretary (Transport), Government of Kerala

Opening Remarks : Dr. D.P. Roy Chief Secretary, Government of Kerala

Address by Shri Loknath Behera, Managing Director, Kochi Metro Rail Corporation Ltd.

Address by Adv. Antony Raju, Hon'ble Minister for Transport, Government of Kerala

Valedictory Address by Shri Kaushal Kishore, Hon'ble Minister of State for Housing and Urban Affairs, Government of India

Address by Chief Guest Shri Arif Mohammed Khan, Hon'ble Governor of Kerala

Distribution of Awards for "Excellence in Urban Transport" by Shri Arif Mohammed Khan, Hon'ble Governor of Kerala and Shri Kaushal Kishore, Hon'ble Minister of State for Housing & Urban Affairs, Government of India

Launch of UMI 2023 by Shri Arif Mohammed Khan, Hon'ble Governor of Kerala and Shri Kaushal Kishore, Hon'ble Minister of State for Housing & Urban Affairs, Government of India

Vote of Thanks : Shri Jaideep, OSD (UT) & Ex-Officio JS, Ministry of Housing and Urban Affairs, Government of India

While welcoming Shri Arif Mohammed Khan, Hon'ble Governor of Kerala, Shri Kaushal Kishore, Hon'ble Minister of State for Housing & Urban Affairs, Adv. Antony Raju, Hon'ble Minister for Transport, Government of Kerala and other dignitaries on the dais, Scholars, researchers, industry experts, distinguished award winners, senior center and state government officials, delegates

Welcome address by the Secretary (Transport), Govt. of Kerala

and participants, Shri Biju Prabhakar, Secretary (Transport), Government of Kerala mentioned that 3 days conference ended after thread bare deliberations on various topics and aspects under the main theme Azadi @75-Sustainable Atamanirbhar Urban Mobility. All the Technical Sessions and Round Table Discussions were organized under the three day wise focused sub-theme. On first day the focus of various sessions was on Sustainable Zero Emission. Day 2 discussions revolved around the sub-theme on Inclusive Mobility emphasizing Sab Ka Sath, Sab Ka Vikas and Sab Ka Prayas. On third day the sub theme confined to Future Mobility- Safe, Affordable, Accessible and Efficient. In all, apart from Inaugural and Valedictory session the conference had 10 Technical sessions. 5 Round Table Discussions, 2 Plenary Sessions and one Conclave. Organizing the conference was really a challenging but it went successfully and we had a novel experience. A number of international and national level experts delivered thought provoking presentations. They also wanted to do something innovative for improving the efficiency of urban transport system in Indian cities. Make in India and vocal for local have been the hall marks in various deliberations and need to be a part of continuous efforts. Expo showing latest development in urban transport technology, industry and services has been a great attraction for the delegates and participants: Entries from States/ Cities for awards in Excellence in Urban Transport is a special feature of the conference and the winners are to receive the awards in this session. A Research Symposium has added value to the Conference where young professionals/ researchers presented their well searched papers on the topical areas of interest. The conference has rightly highlighted the vision 2047 when we will have better urban transport system with higher modal share for public transport. Concluding his welcome speech he thanked Ministry of Housing and Urban Affairs, Govt. of India for giving an opportunity to Govt. of Kerala for organizing this conference in Kochi.

- Dr. V.P. Joy Chief Secretary, Govt. of Kerala in his opening remarks stated that Urban Mobility India-2022 conference has been a land mark event organized in the beautiful landscape setting of Kochi: Various sustainable transport projects are being implemented in Kerala. Public transport in the State use the modern technology and has initiated action on using hydrogen as a fuel. Experts from India and

Address by the Chief Secretary, Govt. of Kerala

abroad in this conference at Kochi have dwelt on the transport system for tomorrow which will

provide a guide for all the planners and policy makers involved in the urban transport planning and development. He pointed out for a strong need for integrating urban planning and transport so as to give a fillip to the growth of economy. He congratulated everyone associated with the organization of the conference which deliberated on a wide array of subjects related to the theme.

-       In his address Shri Loknath Behera, Managing Director, KMRL Ltd. mentioned that more than 1200 delegates participated in the conference. It has been a unique experience. He said that from Kerala, Kochi Metro Rail Corp. Ltd has closely collaborated with

Address by MD, KMRL

MoHUA and IUT to work out the nitty-gritty of the conference to make it lively, interesting and interactive. For this he thanked MoHUA for providing this opportunity and reposing the full confidence in KMRL. As a collaborator KMRL shared the responsibility for making all the logistic arrangements for the conference and published daily newsletter sharing the day long deliberations.

-       Adv. Antony Raju, Hon'ble Minister for Transport, Govt. of Kerala said that it is his privilege to address the august gathering in this concluding session of the Urban Mobility India – 2022 Conference. He said that promotion of transport planning is part of development program in every district of Kerala state. Public Transport system is being evaluated in the state and necessary re-structuring is being done. Local self-government is also involved in this exercise. He highlighted that Govt. Of India also appreciated the Govt.

Address by Transport Minister, Govt. of Kerala

of Kerala venture in public transport system in the cities in Kerala. He mentioned about various initiatives taken by Kerala in terms of water metro, multi-modal integration, use of Hydrogen as fuel. Kerala is proud to receive awards for its initiatives from Govt. of India. Actions have also been taken for promoting e-mobility. Electric buses are plying in

Trivandrum city. Technical innovation taken by Kochi Metro are being shared and tried across Indian cities.

- In his Valedictory address Shri Kaushal Kishore, Hon'ble Minister of State, MoHUA lauded the significant progress made in city transport in India. He said that since the first UMI Conference held in 2008 we have come a long way in promoting the cause of urban transport particularly public transport and mass rapid transit system: Theme of the conference is very Apt and Aatma Nirbhar urban mobility is the need of the time. New possibilities be explored and propagated for wider

Address by Minister of State, MoHUA, GoI

dissemination and replication. Electric Mobility, water metro as developed by Kochi are the major attraction and be part of city development in this Amrit Kal. Aatama Nirbhar Bharat is a major initiative launched by Hon'ble Prime Minister Shri Narender Modi Ji. It has to be taken earnestly in making urban mobility sustainable and self-reliant: By electric bus, use of solar energy in Metro to the optimum level will help in reducing the pollution and to achieve the objective of Ek Bharat, Shresth Bharat and Swasth Bharat: By 2047 when we will complete 100 years of independence actions be taken right now to make our country a developed nation in terms of technology, health, science in all other fields. We should strive for vocal for local.

- In his address the Chief Guest Shri Arif Mohammed Khan, Hon'ble Governor of Kerala said that sustainable development will only be achieved when our ideas become truly inclusive and particularly urban mobility has to be inclusive and for this continuous efforts be made right

Chief Guest delivering his address

at the stage of design and implementation so as to make the system efficient, effective and fruitful. He endorsed the views of the Transport Minister, Govt. of Kerala highlighting the several projects taken up by central and state government for the promotion of public transport. As part of this KRSTC initiated "Grama Vande" for which support is being provided by the local self-government,

city circular services are designed similar to major metro buses which bagged awards from the center. The A.I. based camera surveillance by the MVD, the check post modules for hassle free movement and the subsidies for E-Autos and charging stations have been highlighted in the event.

- **Award Ceremony**

Awards for "Excellence in Urban Transport" were given by Shri Arif Mohammed Khan, Hon'ble Governor of Kerala and Shri Kaushal Kishore, Hon'ble Minister of State for Housing & Urban Affairs, Government of India to the winning state/ UTs and cities. Ministry of Housing and Urban Affairs had constituted an Awards Selection Committee for the 15th UMI-2022 comprising 9 members under the chairmanship of Dr. O.P.Agarwal Former OSD (UT) MoUD, GoI and DG, IUT. The committee had 4 online meeting. A total of 81 entries were received from 35 cities (13 states and 4 UTs) for awards in 12 different categories. The committee first shortlisted the entries for each category based on a review of the documents submitted. The shortlisted entries were than invited to make presentations before the committee over a period of 2 days on 20th and 21st October2022 virtually to highlight their achievement and justification for final selection. Based on the presentations made and deliberations by the committee the following entries were recommended for awards along with necessary justification.

Category 1 - City with the Most Sustainable Transport System

The Committee recommended **Ahmedabad** as the **winner** and has noted the following in respect of this entry:

Ahmedabad city offers best-in-class mobility and accessibility to all its citizens with successful operation of AMTS, BRTS and Metro systems in a convenient and environment friendly manner. It has implemented sustainable bus operations management through reengineering process approach, digital ticketing, phasing out diesel buses and operationalizing its entire BRT bus fleet with EV/CNG buses, implementing solar energy based stations and depot electricity generation with reduced pollution at source and promoting more non-motorized transport modes for giving end to end connectivity and sustainable mobility to its citizens.

Category 2 - City with the Best Public Transport System

The Committee recommended **Navi Mumbai** as the **winner** and has noted the following in respect of this entry:

Navi Mumbai Municipal Transport (NMMT) was the first in Mumbai Metropolitan Region to start the AC bus services in 2009. As on date, fleet includes more than 60% environment friendly & pollution free 180 Electric Buses, 109 CNG Buses & 2 Hybrid Buses. NMMT has implemented comprehensive Intelligent Transport Management System (ITMS) project with latest technology and features in 2017 into one complete package for proper management, better utilization and ease in public transport services to commuters. It has adopted and implemented gross cost contract (GCC) model based on PPP to reduce operational losses & save capital cost, as well as commercial development of public transportation for sustainable development of transport.

The Committee recommended **Thiruvananthapuram** for a **commendation** award and has noted the following in respect of this entry:

Thiruvananthapuram city has implemented 3 distinctive city services to develop a people friendly public transport, which is sustainable, eco-friendly, informative, technologically advanced system with first and last mile door step connectivity through e-Autos. Major achievements of this project are reduced traffic congestion, pollution, reduction in accidents and faster commuting. The city is also providing information, maps, interchanges bus stops, transit signages, and informative bus stop boards and removed the linguistic barriers for public and tourists.

Category 3 - City with the Best Non-Motorised Transport System

The Committee recommended **New Town, Kolkata** as the **winner** and has noted the following in respect of this entry:

New Town, Kolkata has developed a robust bicycling infrastructure in the city to reduce carbon footprint and provide last mile connectivity. The city has a seamless network of dedicated cycle tracks that are segregated, well-lit, rider-friendly and easy to navigate. Further, CCTVs installed all along, make the tracks safe, especially for women cyclists. The city has also introduced bicycle training camps and app-based public bicycle sharing system to promote cycling. An Apex Committee for Cycling and a Non-Motorized Transport Cell have also been constituted.

Category 4 - City with the Best Safety and Security System & Record

The Committee recommended **Davanagere** as the **winner** and has noted the following in respect of this entry:

Davanagere, a small city in Karnataka, has achieved best safety and security features through introduction of separate Police Command and Control Centre for city surveillance with real time monitoring of the live feeds from 248 cameras, review of the recorded feeds, public address system to monitor people, vehicles, location of objects and controlling with mobile surveillance vehicles for patrolling with real time streaming integrated with Programmable Controller Communication Commands (PCCC). After implementing the above facilities with 90% accuracy, city has registered 29,080 violations, which has helped to reduce accidents, detect and resolve thefts and other crimes.

Category 5 - City with the Best Intelligent Transport System (ITS)

The Committee recommended **Chennai** as the **winner** and has noted the following in respect of this entry:

Chennai has introduced a bus app, which provides key services to passengers for efficient use of buses. The app lists all bus routes, detects nearby bus stops within 1 km radius, information on buses arriving in real time at all the bus stops with high accuracy. Around 1,47,000 people have downloaded the app so far, which has unique bus fleet number for the entire fleet to enable commuters to easily identify their respective buses and other benefits like SOS button facility, interactive grid view of bus stops, map view of the nearest bus stops, trip planner, inclusive bilingual option (Tamil and English) and facility for registering complaints.

Category 6 - City with the Most Innovative Financing Mechanism

The Committee recommended **Bhopal** as the **winner** and has noted the following in respect of this entry:

Under AMRUT -II (FY 2021-22), Govt. of Madhya Pradesh sanctioned funds for procurement of 150 diesel buses to Bhopal City Link Ltd. (BCLL) for bus operations on gross cost contract

(GCC) hybrid model. BCLL has provided 40 % viability gap funding of CAPEX cost of bus (up to Rs.10 lakh per bus) towards successful bus operations and has undertaken innovations of a dedicated fare collection agency for providing revenue over and above operation cost, besides retaining advertisement rights and various other sources of revenue (Rs.5.5 crore per year approx.) to enlarge its operation within the city with financial sustainability.

Category 7 - City with Best Record of Public Involvement in its Transport Planning

The Committee recommended **Thiruvananthapuram** as the **winner** and has noted the following in respect of this entry:

With the introduction of City Services in Thiruvananthapuram City by Kerala State Road Transport Corporation (KSRTC) in association with Local Self Governments (LSGs) coupled with the initiative of Grama Vande Services, the objectives of public transport reaching 100% of its population, with a reliable, accessible, cheaper mode of transport have been fulfilled to make a sustainable and environmentally friendly city. This is unique initiative of public joining hands with government to meet their transportation needs. This has a unique financial model in which the KSRTC and LSG share the costs. LSGs can take sponsorship from organizations, individuals, trust, etc. to mitigate the costs. This is also a participatory model in which people can decide the bus routes, timing and types of buses. Public can also sponsor the buses for operating in their area through Gram Panchayat. This helps to improve connectivity of the remote areas. It is worth mentioning KSRTC and LSGs now share the responsibility of service operation, in order to ensure the viability of the bus operation into extended bus route network.

Category 8 - City with Best Freight Transport System

The Committee did not shortlist and recommend any entry in this category because the applications were not relevant.

Category 9 - City with the Best Green Transport Initiative

The Committee recommended **Indore** as the **winner** and has noted the following in respect of this entry:

AICTSL and IMC have envisioned a sustainable, clean and green public transportation system in the city that has uniquely combined clean fuel strategy for public transport buses with circular wastes management practices to generate clean fuel – bio CNG – for buses. Based on 100% waste segregation and zero waste discharge model, AiCTSL and IMC generate bio CNG from the wet waste to run buses in the city. At present, 430 city transport buses covering 7,7400 kilometres per day run on around 17,400 kg of bio-CNG per day. Plan to increase the fleet by 700 to 1,000 buses is currently underway. To make this possible, IMC collects and treats approximately 543 tons per day (TPD) segregated wet waste every day and generates bio CNG with 95% of methane purity and has successfully implemented the biomethanation plant under PPP model. This innovation provides green and affordable energy and the much-needed organic fertilizer. It brings down the carbon footprint of city bus system and manages waste, besides creating a healthy environment by reducing atmospheric methane emission.

Category 10 - Metro Rail with the Best Multimodal Integration

The Committee recommended **Lucknow** as the **winner** and has noted the following in respect of this entry:

Lucknow Metro is a Mass Rapid Transit System (MRTS) providing a safe, fast, reliable, comfortable, environment friendly and barrier free public transport to the people of Lucknow. Lucknow Metro joined hands with Lucknow Municipal Corporation for providing the payment facility to the GoSmart card users through which passengers can use their "GoSmart Card" to make payments for the property tax at ticket counters. Lucknow City Bus integrated with LMRC for providing feeder bus services. The metro line was planned in a manner to connect all major inter transport hubs, covering majority of commercial areas and education institution.

Over these glorious 5 years, Lucknow Metro has served over 5.5 crore passengers with a green, clean and safe public transport.

The Committee recommended **Delhi** for **commendation** and has noted the following in respect of this entry:

Delhi Metro Rail Corporation Ltd. (DMRC) has a vast network of 390.14 Kms and 286 stations, catering to an average of 2.48 million passengers daily DMRC is working with a vision of "commuting experience to be customer's delight." To provide seamless interchange and connectivity between different first and last mile connectivity modes. It has introduced physical infrastructure revamped at several stations, integration with Regional Rapid Transit System (RRTS) stations and Inter State Bus Terminus (ISBTs), introduction of various feeder modes, such as electric buses, e-autos, e-rickshaws, cab aggregator services and non-motorised transport by way of public bicycle sharing services, App based payment mechanism in IPT modes and DMRC smartcard to pay fares in DTC, DIMTS and DMRC buses. DMRC has launched India's 1st Fast Tag and UPI based Smart Parking.

Category 11 - Metro Rail with the Best Passenger Services and Satisfaction

The Committee recommended **Bangalore** as the **winner** and has noted the following in respect of this entry:

With a punctuality of 99.85% as on date, Namma Metro in Bengaluru is operational over a length of 56 km with 52 Metro Stations, achieving an average daily ridership of 5 lakh passengers with highest ever ridership of 8.33 lakh recorded on a particular day. Various commuter friendly services like 'Implementation of NCMC', 'Mobile QR Ticketing System', 'Public Grievance Redressal System' and 'Convenient Smart Card Recharges' have been adopted to attract commuters. Emphasis is given on increasing the existing feeder bus network, provision of parking spaces at Metro Stations, encourage non-motorized transport (NMT) with

parking spaces for bicycles, including YULU e-bicycles, improve pedestrian integration by providing well paved, unencumbered and continuous footpath with provision of foot overbridge (FOBs) and ramps at stations. Space has been allocated at some select stations for providing pre-paid taxi service & bike sharing facilities as part of improving first & last mile connectivity.

Category 12 - Running trophy for the State/UT, which has implemented Best Urban Transport Projects during the previous year

The Committee recommended **Bhubaneswar** as the **winner** and has noted the following in respect of this entry:

Unwavering support of Government of Odisha has encouraged Bhubaneswar, CRUT to formulate policies promoting Social and Gender Inclusivity for its commuters and staff with 50% reservation for women conductors, 100% reservation for women, transgender and socially disadvantaged people as drivers of Mo E-Ride, concession on Mo Bus fare for differently abled people/ senior citizens, provision of women drivers for Mo Bus and gender sensitive transit infrastructural designs. Bhubaneswar, CRUT has been instrumental in mainstreaming marginalised communities by offering beneficiaries of Mo E-Ride with holistic technical and hands-on training along with developing their soft skills, optimum utilisation of resources by refurbishing old buses and expanding Mo Bus route network to meet the growing demands of public. The zero emission EVs of Bhubaneswar, CRUT have paved the way for Green Mobility. Adhering to its core values, CRUT has been able to create a public transport ecosystem that is inclusive, sustainable, smart, safe and accessible to all.

List of Award Winners and Commendations

Cat.	Award Category	Winner	Commendation
1	City with the Most Sustainable Transport System	Ahmedabad - Ahmedabad Janmarg Limited	
2	City with the Best Public Transport System	Navi Mumbai - Navi Mumbai Municipal Transport Undertaking	Thiruvananthapuram - Kerala State Road Transport Corporation
3	City with the Best Non-Motorized Transport System	Kolkata - New Town Kolkata Green Smart City Corporation Limited	
4	City with the Best Safety and Security System & Record	Davanagere - Davanagere Smart City Limited	

Cat.	Award Category	Winner	Commendation
5	City with the Best Intelligent Transport System (ITS)	Chennai - Metropolitan transport corporation Ltd, Chennai	
6	City with the Most Innovative Financing Mechanism	Bhopal - Bhopal City Link Limited	
7	City with Best Record of Public Involvement in its Transport Planning	Thiruvananthapuram - Kerala State Road Transport Corporation	
8	City with the Best Freight Transport System	None were short listed as the applications were not relevant.	
9	City with the Best Green Transport Initiative	Indore - Indore Municipal Corporation	
10	Metro Rail with the Best Multimodal Integration	Lucknow - Uttar Pradesh Metro Rail Corporation Ltd.	Delhi - Delhi Metro Rail Corporation Limited
11	Metro Rail with the Best Passenger Services and Satisfaction	Bangalore - Bangalore Metro Rail Corporation Limited	
12	Running trophy for the State / UT, which has Implemented Best Urban Transport Projects during the previous year	Bhubaneshwar - Capital Region Urban Transport (CRUT)	

Vote of thanks

Shri Jaideep OSD (UT) & E.O.JS MoHUA proposed a vote thanks. He expressed his gratitude

to the Shri Pinarayi Vijayan, Hon'ble Chief Minister of Kerala for delivering the inaugural address. He expressed his sincere thanks to Shri Hardeep Singh Puri, Hon'ble Minister, Ministry of Housing and
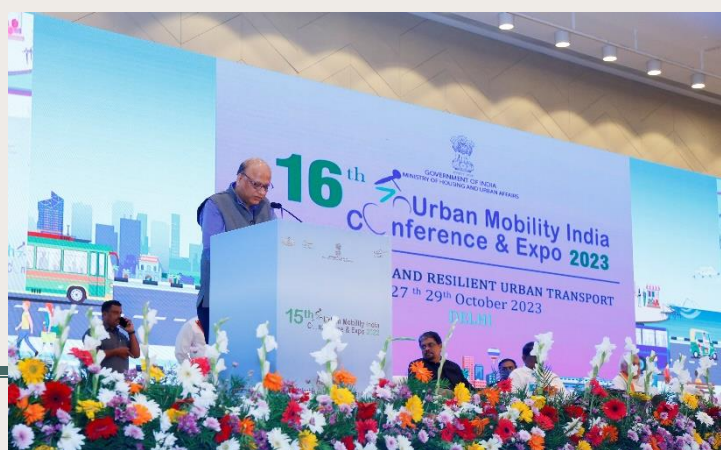
Vote of thanks by OSD (UT) & E.O. JS, MoHUA

Urban Affairs and Petroleum and Natural Gas, Government of India for sparing his valuable time and gracing the inaugural Session as well as delivering the special address. He thanked Shri Manoj Joshi, Secretary, MoHUA for his guidance in organizing the conference. He expressed his thanks to Shri Arif Mohammed Khan, Hon'ble Governor of Kerala for gracing the valedictory session and delivering veledictory address. He thaked Shri Kaushal Kishore, Hon'ble Minister of State for Housing and Urban Affairs, Government of India, Adv. Antony Raju, Hon'ble Minister for Transport, Government of Kerala for their presence in the valedictory session and addressing the gathering. He was thankful to Dr. D.P. Roy Chief Secretary, Government of Kerala, Shri Biju Prabhakar, Secretary (Transport), Government of Kerala, Loknath Behera, Managing Director, Kochi Metro Rail Corporation Ltd. for their presence and address on this occasion. He thanked all the chairpersons of the sessions, delegates and participants in the conference for their contribution. He thanked the press and media persons for their presence in the conference. Last but not the least, he thanked Kerala metro rail corporation, his colleagues in the ministry and IUT Team for their involvement in organizing the conference.

Glimpses of Award Ceremony

H.   Research Symposium

The thirteenth Research Symposium, as part of 15th Urban Mobility India Conference 2022, was held during 4 – 5 November, 2022 at Kochi. The event was held under the aegis of the Ministry of Housing and Urban Affairs, Government of India and was coordinated by the Sustainable Transport Lab (IST Lab) Indian Institute of Science (IISc) Bangalore in association with Cochin University of Science and Technology (CUSAT) and in Collaboration with Institute of Urban Transport, Prof. Ashish Verma IST Lab IISC, Bangalore coordinated the organization of the Research Symposium. The symposium is a platform to highlight the current research activities in urban transport carried out by academic and research institutes, especially by young researchers. Eligible participants were either existing or recently passed out (Not earlier than May, 2021) students of PG/ Ph.D. The purpose of the Research Symposium was to encourage young researchers working in various facets of urban transport to present their research work and provide them with an opportunity for networking with fellow researchers and professionals, enhance the capacity building of young researchers in the field of urban transport and contributing towards building up of research data base, etc. dissemination and identification of research thrust in the country.

In consonance with the theme of UMI conference "Azadi@75 – Sustainable Aatma Nirbhar Urban Mobility" Abstracts for the papers under Research Symposium were invited on the following broad topics.

- Electric and Clean Urban Mobility
- Sustainable Transportation Planning
- Public Transport and NMT
- Road Safety and Emission
- Smart city, Smart Mobility and Sustainable Urban Freight.
- Urban Transport Governance
- Traffic Engineering

Participation

In all, 71 abstracts were received pertaining to different urban mobility themes as mentioned above. Out of the 71 abstracts received, 6 were desk rejected for either not following the submission guidelines or for not being relevant to any of the themes and the remaining 65 abstracts were sent to reviewers for further scrutiny. Further 4 papers were rejected based on reviewer suggestions. Based on the review comments and reviewer decisions, 60 abstracts were selected and invited to submit their full manuscripts. A total of 40 full papers were

received for second round of review. A double-blind review process, which is followed by most of the peer reviewed journals, was adopted throughout and it was made sure that all the papers were reviewed by at least two reviewers. The review scores and comments for the full papers were sent to the authors. Subsequently 37 papers were provisionally selected under the condition that the review comments are addressed satisfactorily. Following the redressal of review comments, the authors were asked to submit their presentations which are being presented in this research symposium. These papers were presented in 8 sessions with 4 to 5 papers being presented in each of the sessions. There was one session each on electric and clean urban mobility; sustainable transport planning; urban transport planning; smart city, smart mobility and urban freight; traffic engineering; safety and emissions and two sessions on public transport and NMT.

Accordingly, the Research Symposium was conducted in eight sessions which were moderated by a chair/ co-chair as detailed out below:

Session 1		
Chair: Prof. Ashish Verma, Department of Civil Engineering, IISc Bangalore		
Theme of session of research Symposium	**Authors/ Presenter**	**Paper Title**
Electric and Clean Urban Mobility	Mallikarjun Patil, Bandhan Bandhu Majumdar, Naveed Farooz Marazi and Prasanta K. Sahu	Travel Behaviour Analysis based investigation to Estimate the Willingness to Pay for Electric Two-wheeler Infrastructure Attributes
	Mahima Soni and Sanjay Gupta	Comprehensive Framework for Adoption of Electric Vehicles: A Case Study of Jaipur City
	Furqan A. Bhat and Ashish Verma	What drives the Adoption of Electric Four-Wheelers in India? An Investigation of the Reasons For and Against
	Piyush Saxena	Assessing Electric Vehicle (EV) Readiness of an Indian City: A Case Study of Lucknow, Uttar Pradesh
	Aninda Bijoy Paul, Virenkumar Dhudhat, Gaurang Joshi and Dr Sanjaykumar Dave	A Meta-analysis of Barriers to adoption of Electric Vehicles in India
Session 2		
Chair: Prof. Vinay Maitri, Former Dean and Professor of Planning, School of Planning and Architecture (SPA), New Delhi		
Theme of session of research	**Authors**	**Title**

Symposium		
Sustainable Transport Planning	Monika Singh and Sanjay Gupta	Travel Behaviour of Women in Delhi-Pre & During-Covid Scenario
	Michael Maria Joseph, Oswald Graber, Manoranjan Parida and Uttam Kumar Roy	Aerial Ropeway as a Mode of Urban Transport: Review of the Technology and its Suitability for Hill Cities in India
	Aitichya Chandra, Hemanthini Allirani and Ashish Verma	Investigating the Effects of Individual and City Tier Characteristics on Motorized Two-Wheeler Usage Behaviour: A Multilevel Modelling Approach
	Shivani Khurana	Equitable Accessibility Planning to Public Facilities: Case Study of Faridabad, Haryana
	Ubaid Illahi, Gayathri Harihara Subramanian and Ashish Verma	Choice modelling-based policy evaluation for gender-inclusive mobility

Session 3:

Chair: Prof. P. K. Sarkar, Vice President, IUT and Retired Professor, School of Planning & Architecture, Delhi

Theme of session of research Symposium	Authors	Title
Urban Transport Governance	Ashish Verma, Sanjay Gupta, Monika Singh, Greg Marsden, Louise Reardon, Morgan Campbell and Gayathri Harihara Subramanian	A critical review of India's Urban Governance reforms and its impact on transport sector: Case Studies of Bangalore and Jaipur
	Aditya Pitale, Shubhajit Sadhukhan and Manoranjan Parida	Assessing the Disparity in Connectivity of Multiple Unit Trains in the National Capital Region
	Rohit Singh Nitwal, Almas Siddiqui and Ashish Verma	Review of Transportation Relevant UN SDG targets and their association with Sustainable Transport Indicators
	Ayushi Shah and Gaurang Joshi	Sustainable Mobility: A Review of Policies for Pricing, Taxation and Incentives
	Minal Shetty, Shalini Sinha and Jayita Chakraborty	Impact of parking pricing & regulations on user behaviour

Session 4:

Chair: Mr Abhijit Sarkar, Ex-Secretary (State Transport Authority), Delhi

Theme of session of research Symposium	Authors	Title
Public	Nidhi Piludaria, Dr. Shalini Sinha	Role And Impact of Public Bicycle

Transport and NMT	and Dr. Shaily Gandhi	Sharing System in Ahmedabad City
	Lakshmi R and Dr.Nitika Bhakuni	Women Safety in Public Transport – A Case of Ahmedabad
	Ravi Kant, Shubhajit Sadhukhan and Ramesh Anbanandam	Investigating Priority Intervention of Crosswalk Facilities in Roorkee City: A Grey Relation-Based Importance Satisfaction Analysis
	Manaswinee Kar, Shubhajit Sadhukhan and Manoranjan Parida	Prioritisation of Criteria Influencing Park-and-Ride Location Decision Using An Enhanced Fuzzy AHP

Session 5:

Chair: Dr. Sanjay Gupta, Professor Transport Planning and Dean Research, School of Planning and Architecture

Theme of session of research Symposium	Authors	Title
Smart City, Smart Mobility and Sustainable Urban Freight	Suruchi Suruchi and Dr. Kshama Pumtambekar	Role Of Unmanned Aircraft System for Post Disaster Responses-India
	Bhavani Shankar Balla, Agnivesh Pani and Prasanta K. Sahu	Enhancing the Transferability Accuracy of Urban Freight Demand Models using a Novel Establishment Typology
	Saloni Gupta and Sanjay Gupta	An empirical investigation into Electric Vehicle Adoption in Urban Freight- A case study of Delhi
	Sarah Alexander, Shalini Sinha and Khelan Modi	Smart Data for Performance Monitoring of City-Bus Services – A Case Study of Ahmedabad

Session 6: Public Transport and NMT

Chair: Dr. Shalini Sinha, Centre Head & Principal Researcher, CoE-UT

Theme of session of research Symposium	Authors	Title
	Akshaya Paul, Qamar Sharif	Assessment of utilization of the foot over bridges in Delhi
	D. Sai Kiran Varma, Shalini Rankavat and Anuj Bhardwaj	Comprehensive Analysis of post-COVID-19 Changes in Behaviour and Perception of Public Transit (Bus/Metro) Users in the Urban Region of a Medium-Sized City of India-Noida/Greater Noida Region (Delhi NCR)
	Shreepati Jha, Agnivesh Pani, Harish Puppala, Dr. Ankit Gupta, Prasanta Sahu and Basuraj	Evaluating the Differential Accessibility Levels of Existing Public Transport Before and After an Aerial Ropeway

	Bhowmik	Transit Service: A Case Study of Varanasi
	Meghna Verma, Ann Das and Sneha Rikhi	Analysing factors influencing usage of Metro Services in Bengaluru, India
	Mahima Kanojia and Shubhajit Sadhukhan	Investigating the Attributes Influencing Pedestrian Behaviour of Commuters for Enhancing Accessibility of Metro Stations: A Case Study of Delhi, India

Session 7:

Chair: Dr Sewa Ram, Head of Department School of Planning and Architecture (SPA), New Delhi

Theme of session of research Symposium	Authors	Title
Traffic Engineering	Subhada Nayak, Mahabir Panda and Prasanta Kumar Bhuyan	Delay Analysis of Motorized Three-Wheelers at Roundabouts in Urban Indian Context
	Aninda Bijoy Paul, Shriniwas Arkatkar, Gaurang Joshi and Atul Kishore	Effectiveness of Traffic Signs and Road Furniture on Compliance & Road user Behavior - A Novel Indian Rural Road Case Study
	Manisha Biswal and Prasanta Kumar Bhuyan	Shapley Additive Explanation Method (SHAP) for Assessing Motorized Two-Wheeler Level of Service at Signalized Intersections
	Sujeet Sahoo, Chaganti Sudha and Prasanta Kumar Bhuyan	Performance Analysis of Signalized Intersections from Truck Drivers Perspective
	Manan Monga and Shubhajit Sadhukhan	Measuring Commuters' Willingness-to-Pay for Bicycle-Friendly Infrastructure in Indian Cities: A Case Study of Patna

Session 8:

Chair: Manoj. M, Assistant professor, Department of Civil Engineering, IIT Delhi

Theme of session of research Symposium	Authors	Title
Safety and Emission	Nipun Choubey, Karthika Ps, Gangadhar Reddy and Ashish Verma	Detecting social groups using low mounted camera in mass religious gatherings
	Karthikeyan Baskar	Spatial Distribution Pattern of Pedestrian Road Accidents in a South Asian City: A Case Study of Chennai
	Karthika Ps, Nipun Choubey, Chetan Thakur, Ashish Patil and Ashish Verma	An experimental study on the behavior of social groups in pedestrian bidirectional flow
	Siddharth Jain and Shalini	Investigation of transport

	Rankavat	pollutant emissions and their associated health impacts in North Indian Region

- The top 3 papers for 3 best paper awards, as first, second and third, are as under:-

Details of the best paper awardees
First:
       Name: Furqan A. Bhat
       Affiliation: PhD Student, IST Lab Indian Institute of Science, Bangalore
       Title: What drives the Adoption of Electric Four-Wheelers in India? An Investigation of the Reasons For and Against

Second:
       Name: Ubaid Illahi
       Affiliation: IST Lab Indian Institute of Science, Bangalore
       Title: Choice Modelling-Based Policy Evaluation For Gender-Inclusive Mobility

Third:
       Name: Sarah Alexander
       Affiliation: Center for Excellence in Urban Transport, CEPT University
       Title: Smart Data for Performance Monitoring of City-Bus Services – A Case Study of Ahmedabad

Certificates being given to presenters of research papers

Day 0- 3.11.22 (Thursday)- 14:00 to 18:00 hrs- Registration
Vembanad Foyer Area

Day 1 – 4.11.22 (Friday)- Sustainable Zero Emissions

Time	Event
09:00 – 11:00	Registration **Vembanad Foyer Area**
11:00 – 11:30	Inauguration of the Exhibition **Vembanad Hall**
11:30 – 13:00	Inaugural Session **Liwa Hall (1, 2 &3)**
13:00 - 14:30	**Inaugural Lunch** **Vembanad Hall**

14:30 – 16:00	Session 1 Climate Change and Urban Transport Impact (Grand Salon 1)	Session 2 Planning for Bus based Public Transport (Grand Salon 2)	Round Table 1- Urban Transport Startups – Ideation and Follow up Action' (GIZ) (Grand BallRoom 1)	French Country Seminar (Grand BallRoom 3)
	Session Chair: Dr. Mangu Singh, Ex-MD, DMRC **Co-chair:** Mr Gerald Ollivier (Lead Specialist, Transport), World Bank 1. Ms Ritu Ahuja, The World Bank 2. Mr Karthik Ganesan, Fellow and Director - Research Coordination, CEEW 3. Ms Bianca Bianchi Alves, The World Bank 4. Ms. Rohini Balasubramanian, Sustainability Expert, ADB 5. Prof Ashish Verma,	**Session Chair:** Dr. Surendra Kumar Bagde, Additional Secretary, Ministry of Housing & Urban Affairs, Government of India **Context Setting and Presentation:** Mr. Pawan Mulukutla, Director, Integrated Transport, Electric Mobility and Hydrogen, WRI India Mr. Vivek Ogra, Partner, Ernst & Young **Panel Discussion:** 1. Mr. KVS Chaudhary, Municipal Commissioner, Bhopal	**Moderator**: Mr Narendra Verma, Advisor, GIZ and Mr Vivekanand Kotikalapudi, Technical Expert, GiZ **Speakers:** 1. Mr. Hiranmay Mallick, CEO & Co-Founder, TUMMOC 2. Mr. Manjunath R S, Director, FAIRTIQ India Pvt Ltd 3. Mr. Amit Gupta, Co-founder, gogoBus 4. Mr. Sujith Nayar, CEO & Co-Founder,	**Opening Address** on Indo-French partnership in sustainable urban mobility - Mr. Eric Fajole, Trade Commissioner, Director of Business France South Asia **Preliminary Remarks** - Mr. Bruno Bosle, Director of French Development Agency (AFD) **Key Address** Mr. Christian Laugier, Group Business Development Director, Egis and Mr. Fabrice Morenon, Managing Director, SNCF Hubs and Connexions **Moderators**: 1. Ms. Jyoti

Day 1 – 4.11.22 (Friday)- Sustainable Zero Emissions			
	Professor, Transportation Systems Engineering (TSE) Convenor, IISc Sustainable Transportation Lab (IST Lab), IISC Bangalore 6. Mr. Ankush Malhotra, Urban Mobility Expert and Head of Department- Urban Planning and Transit Development- SYSTRA, Systra	2. Mr. Rohit Srivastava, Vice President & Head, Tata Motors Limited 3. Mr. Sachin Nijhawan, Chief Revenue Officer, Switch Mobility Ltd.	Beckn Foundation, Bengaluru, Karnataka 5. Ms. Hadar Weinberger, Head of Product at Ev-Edge, Tel Aviv, Israel 6. Mr. Manraj Singh Bains, Director & Co-founder, Unitrans Mobility Solutions Pvt Ltd	Vijayan NAIR, Urban and Resilience Sector Portfolio Manager, AGENCE FRANÇAISE DE DÉVELOPPEMENT 2. Mr. Sumit Gupta, Business France, French Embassy **Speakers:** 3. Mr. Aurelien Sostaponti, Team Leader, Business France, French Embassy 4. Ms. Morgane Castnier, Director Clients, Marketing, Technologies, SNCF Gares & Connexions 5. Mr. Benjamin Fauchier Delavigne, Sales Director, Asia, POMA 6. Ms. Vashuda Sharma, Chief Commercial Officer India, Egis 7. Mr. Guillaume Bruniquel, International Director, SHERPA ENGINEERING 8. Mr. Nitin John Khandagale, Director, Sydac Simulation Technologies India Private Limited

Day 1 – 4.11.22 (Friday)- Sustainable Zero Emissions				
				9. Mr. Hari Somalraju, Managing Director, Systra MVA Consulting (India) Pvt. Ltd. 10. Mr. Anurag Somvanshi, Head of Business Development, Systra MVA Consulting (India) Pvt. Ltd. 11. Mr. Thameem Kamaldeen, Managing Director – Signalling India Cluster, Alstom
16:00 – 16:30	**Tea Break** **Liwa Foyer Area**			
16:30 - 18:00	**Conclave- Aatmanirbhar India- Vocal for Local (V4L) in sustainable urban mobility** **Liwa Hall (1 & 2)** **Chairperson:** Dr O.P. Agarwal, Former OSD (UT), MoUD and DG, IUT (India) **Panellist:** 1. Mr Vikas Kumar, Managing Director, Delhi Metro rail Corporation (DMRC) 2. Ms. Mahua Acharya, Managing Director, Convergence Energy Services Limited, India 3. Mr. Mukund Kumar Sinha – Transport Specialist, Asian Development Bank (ADB) 4. Mr Thampy Koshy, CEO, Open Network for Digital Commerce (ONDC 5. Dr PC Sehgal, Former Managing Director, Mumbai Rail Vikas Corporation (MRVC) 6. Mr Mohit Dubey, Co-founder and Chief Executive Officer, Chalo Mobility Pvt Lmt. 7. Mr Rajeev Joisar, Head of Commercial, India and South Asia, Alstom			

Day 2 – 5.11.22 (Saturday)- Inclusive Mobility- Sab Ka Sath Sab ka Vishwas Sab ka Prayas			
6:00 to 8:00 AM- Kochi Cycle Ride with Women Trained under "Cycle with Kochi" organised by Kochi Municipal Corporation & GIZ Register at https://forms.gle/2zkR4kJ6oMzCXMdz8			
09:30 – 11:00	**Research Symposium 1: Electric and Clean Urban Mobility (Grand Salon 1)** **Chairperson-** Prof. Ashish Verma, Professor & Convenor, IISc Sustainable Transportation Tab. (IST Lab.), IISc Bangalore IST Lab **Rapporteur**: Mr. Furqan A. Bhat **Authors:** 1. Mallikarjun Patil, Bandhan Bandhu Majumdar, Naveed Farooz Marazi and Prasanta K. Sahu 2. Mahima Soni and Sanjay Gupta 3. Furqan A. Bhat and Ashish Verma 4. Piyush Saxena 5. Aninda Bijoy Paul, Virenkumar Dhudhat, Gau rang Joshi and Dr Sanjaykumar Dave	**Research Symposium 2: Sustainable Transport Planning (Grand Salon 2)** **Chairperson:** Prof. Vinay Maitri, Former Dean and Professor of Planning, School of Planning and Architecture (SPA), New Delhi **Rapporteur:** Mr. Aitichya Chandra **Authors:** 1. Monika Singh and Sanjay Gupta 2. Michael Maria Joseph, Oswald Graber, Manoranjan Parida and Uttam Kumar Roy 3. Aitichya Chandra, Hemanthini Allirani and Ashish Verma 4. Shivani Khurana	**Research Symposium 3: Urban Transport Governance (Grand BallRoom 1)** **Chairperson:** Prof. P. K. Sarkar, Vice President, IUT and Retired Professor, School of Planning & Architecture, Delhi **Rapporteur:** Ms. Almas Siddique **Authors:** 1. Ashish Verma, Sanjay Gupta, Monika Singh, Greg Marsden, Louise Reardon, Morgan Campbell and Gayathri Harihara Subramanian 2. Aditya Pitale, Shubhajit Sadhukhan and Manora njan Parida 3. Rohit Singh Nitwal, Almas Siddiqui and Ashish Verma 4. Ayushi Shah and Gaurang Joshi 5. Minal Shetty, Shalini Sinha and Jayita Chakraborty	**Research Symposium 4: Public Transport and NMT (Grand BallRoom 3)** **Chairperson:** Mr Abhijit Sarkar, Ex-Secretary (State Transport Authority), Delhi **Rapporteur: Ms.** Hemanthini A. R. **Authors:** 1. Nidhi Piludaria, Dr. Shalini Sinha and Dr. Shaily Gandhi 2. Lakshmi R and Dr.Nitika Bhakuni 3. Ravi Kant, Shubhajit Sadhukhan and Ramesh Anbanandam 4. Manaswinee Kar, Shubhajit Sadhukhan and Manoranjan Parida

Day 2 – 5.11.22 (Saturday)- Inclusive Mobility- Sab Ka Sath Sab ka Vishwas Sab ka Prayas				
		5. Ubaid Illahi, Gayathri Harihara Subramanian and Ashish Verma		**Invited talk** on the -"Public Transport demand-supply gap assessment tool" by Mr. Krishna Khanna, Research Analyst, CEEW.
11:00 – 11:30	Tea Break **Vembanad Hall**			
11:30 – 13:00	**Session 3 GatiShakti Master Plan - the role of Cities (Grand Salon 1)** **Session Chair:** Mr. Anurag Jain, IAS: Secretary - Ministry of Commerce and Industry, Department for Promotion of Industry and Internal Trade, Government of India **Moderator**: Mr Deepak Baindur, Program Manager, GiZ **Speakers:** 1. Dr. Jivisha Joshi Gangopadhyay, Deputy Secretary, Logistics Division, DPIIT, MoCI 2. Mr Kaizar Dev	**Session 4 "Sustainable PPP" in bus transport (Grand Salon 2)** **Session Chair & Moderator:** Dr. Surendra Kumar Bagde, Additional Secretary, Ministry of Housing & Urban Affairs, Government of India **Context Setting and Presentation** Mr. Madhav Pai, Executive Director, WRI India. Mr. C.K Goyal, Senior Vice President DIMTS **Panel**	**Session 5 Gender inclusive Mobility (Grand BallRoom 1)** **Session Chair:** Ms. V. Manjula - Commissioner, Directorate of Urban Land Transport (DULT), Bangalore **Context setting and moderator**: Ms Krishna Desai, Technical Advisor, GIZ **Speakers:** 6. Ms. Dipti Mahapatro, General Manager at Capital Region Urban Transport (CRUT); Officer on Special Duty, Odisha State Road Transport Corporation (OSRTC); Secretary, Berhampur Development Authority; and Deputy CEO at Ganjam Urban Transport Service Ltd. 7. Dr. Kalpana Vishwanath, Co-Founder and CEO, Safetipin	**Round Table 2 Integrating Urban and Transport Planning as a statutory process (USAID)- (Grand BallRoom 3)** **Session Chair:** Mr. Soumitri Das, Project Management Specialist (Environment), USAID **Moderator:** Ms Himani Jain, Senior Programme Lead, CEEW **Speakers** 1. Mr. Martin Lutz, Senate Department for

Day 2 – 5.11.22 (Saturday)- Inclusive Mobility- Sab Ka Sath Sab ka Vishwas Sab ka Prayas				
	Barman, Additional Director (Logistics), Deptt. of Industries & Commerce, Govt of Tripura 3. Prof Shivanand Swamy, Director Emeritus, CoE-UT, CRDF-CEPT 4. Dr. Pawan Kumar, Associate Town and Country Planner, Town & Country Planning Organisation, Ministry of Housing and Urban Affairs, GoI 5. Mr Iftikhar Ahmad Hakim, Chief Town Planner, Kashmir and Additional Charge of Director Planning and Coordination, J&K ERA	**Discussions** 1. Mr. Biju Prabhakar, IAS, Transport Secretary, Kerala Government 2. Mr. Prasanna Patwardhan, Chairperson & Managing Director, Prasanna Group of Companies 3. Mr. Rohit Srivastava, Vice President & Head, Tata Motors Limited 4. Mr. Gerald Ollivier, The World Bank 5. Shri. Arun Bothra, Transport Commissioner, Govt. of Odisha	8. Ms Meera Sundararajan, Gender and M&E Expert and Team Lead at the Gender and Policy Lab, Greater Chennai Corporation. 9. Ms Priya Singh, Cofounder and Director, Chalo Mobility	Environment, Mobility, Consumer and Climate Protection (new), Head of Air Quality Management, Berlin, Germany, 2. Ms. Pramoda Gode, Senior Expert, Electric Mobility & Sustainable Transportation 3. Ms. Surabhi Kureel, Associate Director, IPE Global 4. Dr O.P. Agarwal, Former OSD (UT), MoUD and DG, IUT; 5. Mr K. J. Sohan, Former Mayor, Kochi Municipal Corporation 6. Mr. G.P Hari,

Day 2 – 5.11.22 (Saturday)- Inclusive Mobility- Sab Ka Sath Sab ka Vishwas Sab ka Prayas				
				Executive Officer, KMTA, Kochi
				7. Dr. Rajender Pensiya, IAS, Director, Directorate of Urban Transport, Uttar Pradesh
				8. Mr. Ajit Sharma, GM, Finance, DMRC
				9. Dr. Shalini Sinha, Centre Head & Principal Researcher, CoE-UT
				10. Prof. (Dr.) Ashish Verma, IISC & Convenor, Sustainable Transportation Lab (IST Lab);
				11. Mr. Subash Dhar, Senior Researcher at UNEP Copenhagen Climate Centre,
				12. Mr. Kaushal Kumar Sahu, Sr. Project Officer -

Day 2 – 5.11.22 (Saturday)- Inclusive Mobility- Sab Ka Sath Sab ka Vishwas Sab ka Prayas				
				Transport, ADB 13. Mr. A.K Gupta, Additional Director, RCUES, Lucknow
13:00 – 14:30	**Lunch Break** **Vembanad Hall**			
14:30 – 16:00	**Session 6** **Smart Mobility Solutions & Mobility as a Service (MaaS)** **(Grand Salon 1)** **Session Chair :** Mr Abhijit Sen Gupta, Director India (Asia Pacific Smart Card Association) **Moderator**: Mr Narendra Verma, Advisor, GIZ **Speakers** 1. Mr. Sujith Nayar, CEO & Co-Founder, Beckn Foundation, Bengaluru, Karnataka 2. Mr. Shailendra Kaushik, Co-founder, Cities Forum, Dubai 3. Mr. GP Hari, Special Officer, Kochi Metropolitan Transport Authority , Kerala	**Session 7** **Common Issues for Indian Metro Systems (Restricted Session for Managing Director of Metros, India)** **Session Chair and Moderator:** Mr. Jaideep, OSD & E.O. JS, Ministry of Housing & Urban Affairs, Government of India **Panellist** 1. Mr. A Siddique, Chennai Metro Rail Corporation 2. Mr Arjum Parwez, Bangalore Metro Rail Corporation 3. Mr. N V S Reddy, Hyderabad	**Session 8:** **Realizing the Potential of Transit-Oriented Development in India (ADB)** **(Grand BallRoom 1)** **Moderator** – Mr Sharad Saxena, Principal Transport Specialist, Asian Development Bank (ADB) **Speakers:** 1. Ms. V. Manjula - Commissioner, Directorate of Urban Land Transport (DULT), Bangalore 2. Mr Abhay Kantak, CRISIL 3. Mr. Mukut Sharma, National Capital Region Transport Corporation Limited, (NCRTC) 4. Mr Anil Kumar Kokate, Director, Mahametro 5. Mr Amit Sharma, Staff Consultant, ADB 6. Mr. Norio Saito, Director, ADB **Rapporteurs** 7. Mr. Saugata Dasgupta, ADB Official 8. Mr. Ashok Srivastava, ADB Official 9. Mr. Ashish Ranjan, ADB Official	Round Table 3 Collaboration between the Government and technology startups to make EV city buses successful in India (Chalo) (Grand BallRoom 3) Session Chair: Mr. Anurag Jain, IAS: Secretary - Ministry of Commerce and Industry,, Department for Promotion of Industry and Internal Trade, Government of India Moderator : Ms. Vaidhehi Ravindran, Partner, Lightrock India Speakers: 1. Mr. Biju Prabhakar, IAS CMD, KSRTC

Day 2 – 5.11.22 (Saturday)- Inclusive Mobility- Sab Ka Sath Sab ka Vishwas Sab ka Prayas			
	4. Ms. Hadar Weinberger, Head of Product at Ev-Edge, Tel Aviv, Israel 5. Mr Kishore Nathani, Principal Advisor, UMTC 6. Ms Reji Nair, Senior Director, STQC, Ministry of Electronics & Information Technology	Metro Rail Corporation 4. Mr. KVB Reddy, L & T Metro Rail Limited 5. Mr. Vikas Kumar, Delhi Metro Rail Corporation 6. Mr. Brijesh Dixit, Nagpur Metro Rail Corporation 7. Mr. Jitendra Tyagi, Uttrakhand Metro Rail Corporation 8. Mr.Suheel Kumar, Lucknow Metro Rail Corporation 9. Mr. U.J.M. Rao, Andhra Pradesh Metro Rail Corporation 10. Ms. Ashwin Bhide, Mumbai Metro Rail Corporation Ltd. 11. Mr. Alok Kapoor, Pune Metro /	**Facilitators** 10. Ms. Marie Kristine Estrella, ADB 11. Ms. Cheska Angelie Llamas, ADB	2. Ms. Mahua Acharya, MD and CEO, CESL 3. Mr. Arun Bothra, IPS, Transport Commissioner, Odisha 4. Mr. Radhakrishnan, IAS, Commissioner, NMC 5. Mr. Rahul Yadav, IAS, Municipal Commissioner, Jammu 6. Mr. Manuj Goyal, IAS, Municipal Commissioner, dehradun

Day 2 – 5.11.22 (Saturday)- Inclusive Mobility- Sab Ka Sath Sab ka Vishwas Sab ka Prayas				
		Tata Realty		
		12. Mr. Vinay Kumar Singh, National Capital Regional Transport Corporation		
		13. Mr. P. Ramesh, IAS, Jaipur Metro Rail Corporation		
		14. Mr. Loknath Behera, Kochi Metro Rail Corporation		
		15. Mr. Sahadeva Singh, Director (Projects& Planning), Gujarat Metro Rail Corporation		
		16. Mr. Ajay Sharma, Director (Projects), Madhya Pradesh Metro Rail Corporation		
		17. Mr. Karamali, Director, Kolkata Metro Rail Corporation		
		18. Sh. D.K Ujjainia,		

Day 2 – 5.11.22 (Saturday)- Inclusive Mobility- Sab Ka Sath Sab ka Vishwas Sab ka Prayas				
		SE (UT) 19. Sh. Ravi Prakash, Director (UT) 20. Sh. Yogesh Antil, Deputy Secretary (MRTS-I) 21. Ms. Rachna Kumar, Deputy Secretary (UT-II)		
16:00 – 16:30	**Tea Break** **Liwa Foyer Area**			
16:30 – 18:00	**Plenary Session 1 – Strengthening the Ecosystem to Accelerate Shift to Public Transport** **Liwa Hall (1 & 2)** **Session Chair:** Dr O.P. Agarwal, Former OSD (UT), MoUD and DG, IUT **Panellists** 1. Dr Brijesh Dixit, Managing Director, Maharashtra Metro Rail Corporation Limited (Maha- Metro) 2. Mr Vinay Kumar Singh, Managing Director, National Capital Region Transport Corporation Limited, (NCRTC) 3. Mr Mihir Sorti, Senior Project Officer (Transport), ADB 4. Mr Mohammad Athar Saif, Partner, PWC, India 5. Mr. Laghu Parashar, Deputy Project Head, SMART-SUT, GIZ 6. Mr. Thierry Desclos, Director of Project at CEREMA, France			

Day 3 – 6.11.22 (Sunday)- Future Mobility -Safe, Affordable, Accessible and Efficient				
09:30 – 11:00	**Research Symposium 5: Smart City, Smart Mobility and Sustainable Urban Freight (Grand Salon 1)** **Chairperson**: Dr. Sanjay Gupta, Professor Transport Planning and Dean Research, School of Planning and Architecture **Rapporteur:** Ms. Hemanthini A. R**.** **Authors:** 1. Ms. Suruchi and Dr. Kshama Pumtambekar 2. Bhavani Shankar Balla, Agnivesh Pani and Prasanta K. Sahu 3. Saloni Gupta and Sanjay Gupta 4. Sarah Alexander, Shalini Sinha and Khelan Modi **Invited talk** on	**Research Symposium 6: Public Transport and NMT (Grand Salon 2)** **Chairperson:** Dr. Shalini Sinha, Centre Head & Principal Researcher, CoE-UT **Rapporteur:** Ms. Almas Siddique **Authors:** 1. Akshaya Paul, Qamar Sharif 2. D. Sai Kiran Varma, Shalini Rankavat and Anuj Bhardwaj 3. Shreepati Jha, Agnivesh Pani, Harish Puppala, Dr. Ankit Gupta, Prasanta Sahu and Basuraj Bhowmik 4. Meghna Verma, Ann Das and S neha Rikhi 5. Mahima Kanojia	**Research Symposium 7; Traffic Engineering (Grand BallRoom 1)** **Chairperson:** Dr Sewa Ram, Head of Department School of Planning and Architecture (SPA), New Delhi **Rapporteur:** Mr. Furqan A. Bhat **Authors:** 1. Subhada Nayak, Mahabir Panda and Prasanta Kumar Bhuyan 2. Aninda Bijoy Paul, Shriniwa s Arkatkar, Gau rang Joshi and Atul Kishore 3. Manisha Biswal and Prasanta Kumar Bhuyan 4. Sujeet Sahoo, Chaganti Sudha and Prasanta Kumar Bhuyan 5. Manan Monga and Shubhajit Sadhukhan	**Research Symposium 8: Safety and Emissions (Grand BallRoom 3)** **Chairperson:** Prof. Manoj, M, IIT Delhi **Rapporteur:** Mr. Aitichya Chandra **Authors:** 1. Nipun Choubey, Karthika Ps, Gangadhar Reddy and Ashish Verma 2. Karthikeyan Baskar 3. Karthika Ps, Nipun Choubey, Chetan Thakur, Ashish Patil and Ashish Verma 4. Siddharth Jain and Shalini Rankavat **Overview and vote of thanks:** Prof. Ashish Verma, Professor & Convenor, IISc Sustainable Transportation Tab. (IST Lab.), IISc Bangalore IST Lab

Day 3 – 6.11.22 (Sunday)- Future Mobility -Safe, Affordable, Accessible and Efficient

	the-"Public Transport demand-supply gap assessment tool" by Mr. Krishna Khanna, Research Analyst, CEEW.	and Shubhajit Sadhukhan		
11:00 – 11:30	Tea Break **Vembanad Hall**		
11:30 – 13:00	**Session 9** **Future Fuels –** **(Grand Salon 1)** **Session Chair:** Mr Ravi Prakash, Director, Urban Transport, Ministry of Housing & Urban Affairs, Government of India **Moderator:** Mr Abhijit Sarkar, Ex-Secretary (State Transport Authority), Delhi **Speakers:** 1. Mr Amit Bhatt, Managing Director, ICCT 2. Dr. Himani Jain, Senior Programme Lead, and Krishna Khanna, CEEW 3. Dr Sewa Ram, Head of Department School of	**Session 10** **Multimodal Integration** **(Grand Salon 2)** **Session Chair:** Dr. Sanjeev Kumar Lohia, Sr Advisor (Rail & Urban Mobility) The World Bank & Former MD & CEO, IRSDC Moderator and Context Setting: Mr Anjum Parvez, Managing Director, BMRCL **Speakers:** 1. Dr. Shalini Sinha, Centre Head & Principal Researcher, CoE-UT 2. Mr Rajneesh Porwal, Vice President, Urban Mass Transit Company (UMTC) 3. Mr Madhav Pai, Program Executive	**Round Table 4** **Street for All** (WRI) **(Grand BallRoom 1)** **Moderators** Mr. Dhawal Ashar, "Program Head Urban Transport & Road Safety" , WRI India Mr Aswathy Dilip, Managing Director, ITDP India **Speakers** 1. Adv. M Anil Kumar, Hon'ble Mayor, Kochi 2. Mr. Biju Prabhakar IAS, Principal Secretary, Transport & CMD, KSRTC, Govt of Kerala 3. Mr. Om Prakash Mishra, Special Commissioner, Delhi Transport Department 4. Ms. Sarika Chakravarty, Sr. Sector Coordinator, NIUA 5. Ms. Swati	**Round Table 5** **Sustainable Transport Development - Focus on E Mobility (PWC)** **(Grand BallRoom 3)** **Moderator:** Mr. Mohammad Saif Athar Partner, PwC India **Speakers:** 1. Ms Anja Fourie, Principal Portfolio Manager, KfW India Program 2. Mr Laghu Parashar, Program Manager, Sustainable Urban Mobility and e-mobility, GIZ India 3. Profr Shivanand Swamy, Director Emeritus, Centre of Excellence in Urban

Day 3 – 6.11.22 (Sunday)- Future Mobility -Safe, Affordable, Accessible and Efficient			
Planning and Architecture (SPA), New Delhi 4. Ms Anumita Roy Chowdhary, Executive Director Research and Advocacy, Centre for Science and Environment (CSE) 5. Prof. Aravind Purushotham an Vellayani, Prof and Chair of Energy Conversion, University of Groningen 6. Mr Artemii Iarchevskii, Private consultant, Ex-head of Metro, Tramway, Buses and Hubs Development Division at Moscow Government Department of Transport, Russia	Director- Sustainable Cities Transport, WRI 4. Mr Ravi Jain, Pay craft, ADB Resource Person 5. Ms Bianca Bianchi Alves, The World Bank 6. Mr V Ajith Kumar, Managing Director, Kerala Rail Developmen t Corporation Lmt. (K-rail) 7. Ms Aditi Singh, Principal Consultant, Mott Macdonald and Mr Amit Kumar, Project Director, Mott Macdonald	Khanna, Senior Sector Specialist Urban Development and Mobility, KFW 6. Ms. Charmie Parekh, CEO, Silvassa Smart City 7. Mr. Abhimnayu Prakas, Regional Lead, Asia and Africa, Global Designing Cities Initiative 8. Mr. Rishav Gupta, IAS, CEO, Indore Smart City Development Limited, Additional Commissioner , Indore Municipal Corporation, CEO, Atal Indore City Transport Service Limited, Indore Smart City Development Limited 9. Ms. Nithya Ramesh, Director, Janagraha 10. Mr. Shashank Achanthodi, CM Fellow, Govt. of NCT of Delhi 11. Mr. Gerald Ollivier, Lead Transport	Transport (COE-UT), CEPT University Ahmedabad 4. Mr Prasanna Patwardhan, Chairperson & Managing Director, Prasanna Group of Companies 5. Mr Rohit Pathania, Ola Mobility India 6. Ms. Vaishakhi Shah Director - PwC India 7. Mr. Subash Dhar, Senior Researcher at UNEP Copenhagen Climate Centre, Mr. Kaushal Kumar Sahu, Sr. Project Officer - Transport, ADB

Day 3 – 6.11.22 (Sunday)- Future Mobility -Safe, Affordable, Accessible and Efficient				
			Specialist, World Bank 12. Ms. Sarika Panda, Director, Nagarro Founder Trustee, Raahgiri Foundation 13. Mr. Prasanna Desai, Practising Architect, Urban Designer & Director PVP College of Architecture, Pune, Prasanna Desai Architects 14. Dr. Navdeep Asija, Traffic Advisor to Government of Punjab and Director, Punjab Road Safety & Traffic Research Centre, Department of Home, Government of Punjab 15. Mr. Dhirendra Khadgata, IAS, Municipal Commissioner, Rohtak, Govt. of Haryana	
13:00 –14:30	**Lunch Break** **Vembanad Hall**			
14:30 – 15:30	**Plenary Session 2:** Urban mobility - Vision 2047 **Liwa Hall (1 & 2)** **Session chair**: - Mr. Jaideep, OSD & E.O. JS, Ministry of Housing & Urban Affairs, Government of India **Context Setting** - Mr. Loknath Behera, Managing Director, Kochi Metro rail Limited (KMRL)			

	Day 3 – 6.11.22 (Sunday)- Future Mobility -Safe, Affordable, Accessible and Efficient	
	Panelist's 1. Ms Anumita Roy Chowdhary, Executive Director, Research and Advocacy, Centre for Science and Environment (CSE) 2. Mr Subhash Dhar, Senior Researcher, UNEP Copenhagen Climate Centre 3. Mr Mukund Kumar Sinha, Transport Specialist, ADB 4. Ms. Sarika Chakravarty, Sr. Sector Coordinator, Shelter & Transport), National Institute of Urban Affairs (NIUA) 5. Mr Abhay Bhakre, DG, Bureau of Energy Efficiency, Government of India 6. Mr Sushil Kumar, Managing Director, Uttar Pradesh Metro Rail Corporation Limited	
15:30 17:00	**Valedictory Session** **Liwa Hall (1 & 2)**	
17:00 onwards	**High Tea-** **Liwa Foyer Area**	

Annexure II: List of Sponsorers

S. No.	Category	Name of Organization
1	Lead Sponsor	Kochi Metro Rail Ltd.
2	Diamond Sponsor	Gujarat Metro Rail Corporation Limited
3	Diamond Sponsor	Chennai Metro Rail Limited
4	Platinum Sponsor	Delhi Metro Rail Corporation Ltd.
5	Platinum Sponsor	Bangalore Metro Rail Corporation Ltd.
6	Platinum Sponsor	National Capital Region Transport Corporation
7	Gold Sponsor	Mumbai Metropolitan Region Development Authority
8	Gold Sponsor	Maharashtra Metro Rail Corporation Limited
9	Gold Sponsor	Chalo Mobility Pvt. Ltd.
10	Silver Sponsor	Mumbai Metro Rail Corporation Ltd.
11	Bronze Sponsor	DIMTS
12	Bronze Sponsor	Systra
13	Bronze Sponsor	Monnet International Ltd.
14	Other Sponsor	Patna Metro Rail Corporation Ltd.
15	Other Sponsor	Uttar Pradesh Metro Rail Corporation Ltd.
16	Other Sponsor	Mumbai Metro One Pvt. Ltd.
17	Other Sponsor	Indian Metro Rail Organizations' Society
18	Other Sponsor	Madhya Pradesh Metro Rail Corporation Limited
19	Other Sponsor	Uttarakhand Metro Rail Urban Infrastructure & Building Construction Corporation Ltd.
20	Other Sponsor	Andhra Pradesh Metro Rail Corporation Ltd.
21	Other Sponsor	Aadinathbulk

Annexure III: List of Exhibitors

S. No.	Category	Name of Organization
1	Exhibitor	Indian Oil Corporation Ltd.
2	Exhibitor	Paycraft
3	Exhibitor	Gujarat Metro Rail Corporation Limited
4	Exhibitor	Maharashtra Metro Rail Corporation Limited
5	Exhibitor	National Capital Region Transport Corporation
6	Exhibitor	Unitrans
7	Exhibitor	Bangalore Metro Rail Corporation Ltd.
8	Exhibitor	Loopway
9	Exhibitor	Kochi Metro Rail Ltd.
10	Exhibitor	Kerala Motor Vehicle Department
11	Exhibitor	Kerala State Tourism Department
12	Exhibitor	Kerala Rail Development Corporation Limited
13	Exhibitor	Rajagiri School of Engineering & Technology, Kochi
14	Exhibitor	State Water Transport Department.
15	Exhibitor	Shoonya Campaign
16	Exhibitor	Delhi Metro Rail Corporation Ltd.
17	Exhibitor	DAMM Cellular Systems India P Ltd
18	Exhibitor	Cochin Smart Mission Limited
19	Exhibitor	Chennai Metro Rail Limited
20	Exhibitor	Tata Motors

S.No.	Name of Organization	Category
1	GIZ: Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH	**Knowledge Partner**
2	PricewaterhouseCoopers Private Limited	**Knowledge Partner**
3	WRI India	**Knowledge Partner**
4	Council on Energy, Environment and Water (CEEW)	**Knowledge Partner**
5	French Embassy	**Knowledge Partner**
6	Asian Development Bank (ADB)	**Knowledge Partner**

Annexure V : List of Media Partners

S.No.	Name of Organization	Category
1	Rail Analysis	Media Partner
2	Metro Rail News	Media Partner
3	Metro Rail Today	Media Partner
4	Urban Transport News	Media Partner
5	Traffic Infratech	Media Partner
6	Urban Update	Media Partner

Annexure VI: Abbreviations and Acronyms

Atmanirbhar Bharat	-	Atmanirbhar Bharat Abhiyaan
ADB	-	Asian Development Bank
AFD	-	Agence Francaise de Developpement (Frence Development Agency
AFCS	-	Automatic Fare Collection System
ASCL	-	Agartala Smart City Limited
BEST	-	Brihanmumbai Electric Supply and Transport
BMRCL	-	Bengaluru Metro Rail Corporation Ltd
BMTC	-	Bangalore Metropolitan Transport Corporation
BRTS	-	Bus Rapid Transit System
DRDO	-	Defence Research and Development Organisation
CEO	-	Chief executive officer
CNG	-	Compressed Natural Gas
CRUT Bhubaneshwar	-	Capital Region Urban Transport
EESL	-	M/s Energy Efficiency Service Ltd.
ESCBS	-	Efficient and Sustainable City Bus Service
E.V.	-	Electric Vehicles
FAME Scheme	-	Faster Adoption and Manufacturing (Hybrid) and Electric Vehicle Scheme
GC Model	-	Gross Cost Model
GEF	-	Global Environment Facility
GHG	-	Green House Gas
GIZ	-	Deutsche Gesellschaft für Internationale Zusammenarbeit (German Society for International Cooperation)
GMDA	-	Gurugram Metropolitan Development Authority
GPS	-	Global Positioning System
GST	-	Goods & Service Tax
GTFS	-	Google Transit Feed Specification
HUMTA	-	Hyderabad Unified Metropolitan Transport Authority
IT	-	Information Technology / Intelligent Transport
ITMS	-	Intelligent Transport Management System
ITS	-	Intelligent Transport System
JNNURM	-	Jawaharlal Nehru National Urban Renewal Mission

KMRCL	-	Kolkata Metro Rail Corporation Limited
KMTA	-	Kerala Metropolitan Transport Authority
KSRTC	-	Karnataka State Road Transport Corporation
LDV	-	Light Duty Vehicle
LRT	-	Light Rail Transit
LTA	-	Land Transport Authority
OCC	-	Operation Control Centre
Maas	-	Mobility as a Service
MMI	-	Multi-model Integration
MRT	-	Metro Rail Transit
NCMC	-	National Common Mobility Card
NCRTC	-	National Capital Region Transport Corporation
NMC	-	Nagpur Municipal Corporation
NMT	-	Non Motorised Transport
NUTP	-	National Urban Transport Policy
OLA, UBER	-	Shared Taxi Service
OEM	-	Original Equipment Manufacturer
OSRTC	-	Odisha State Road Transport Corporation
OSD & E.O.J.S	-	Officer on Special Duty & Ex-Officio Joint Secretary
PBS	-	Public Bicycle Sharing
PHPDT	-	Peak Hour Peak Direction Traffic
PPP	-	Public Private Partnership
ROW	-	Right of Way
PRTS	-	Personal Rapid Transit System
RRTS	-	Regional Rapid Transit System
SARAL		Safe, Accessible, Reliable, Advane and Low Carbon
SDGs	-	Sustainable Development Goals
Self-reliant India Campaign	-	Self or Sufficient India
STUs	-	State Transport Undertaking
SOPs	-	Standard Operating Procedure
SPA New Delhi	-	School of Planning and Architecture
SPV	-	Special Purpose Vehicle
SUT	-	Sustainable Urban Transport
TCO	-	Total Cost of Ownership

TOD	-	Transit Oriented Development
TUMI	-	Transformative Urban Mobility Initiative
WRI	-	World Resources Institute
IPT	-	Intermediate Public Transport
UMI	-	Urban Mobility India
ULBs	-	Urban Local Bodies
UTF	-	Urban Transport Fund
UVC	-	Ultra Violet Colour
VRV	-	Variable Refrigerant Volume
VTS	-	Vehicle Tracking System

IUT FAMILY

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