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दिल्ली मेट्रो रेल कॉर्पोरेशन लिमिटेड
Delhi Metro Rail Corporation Limited

> REPORT

UITP URBAN RAIL SEMINAR 2023

SUCCESS STORIES OF INDIA AND
SOUTHEAST ASIA

MARCH | 2023



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INTRODUCTION

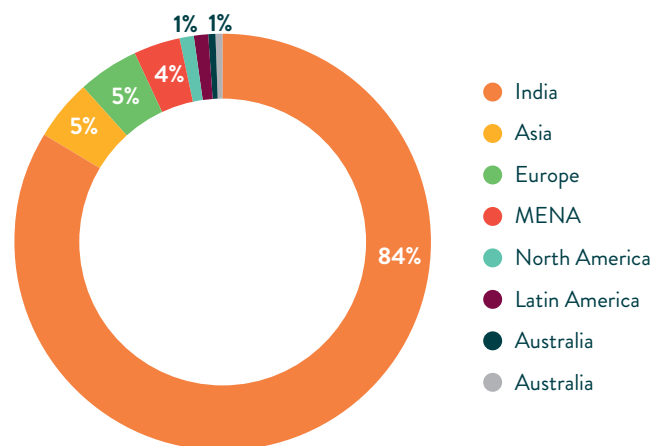
Public transport is one of the most efficient, economically viable and sustainable mode of transportation. It not only provides people with mobility but also enables access to employment opportunities and other needs of citizens of a country. Rise in private mode of transport accompanied by increased congestion in cities and rise in greenhouse gas emissions, has made the policy makers to look back and focus on public transport in Indian cities. Urban Rail systems constitute a significant portion of public transport systems especially in growing and expanding urban areas in India.

Metro rail systems have become one of India's fastest growing public transit system, expanding from a network length of 222 kilometers in 3 cities in 2011 to 697 kilometers in 13 cities by 2021. Further, approval of additional metro rail network of 1,032 kilometers and target to have metro rail network in 100 cities by 2047 by Ministry of Housing and Urban Affairs (MoHUA) will expand the reach of metro systems up to 27 cities. In addition, lighter urban rail systems such as Metrolite and Metro Neo are being conceptualised and developed by many small- and medium-sized cities. With such high developments and long-term targets, there has been an increased focus on reducing costs, digitalisation techniques, and making metro systems more inclusive and sustainable.



Keeping this vision in mind, International Association of Public Transport (UITP) India organised its flagship annual event, UITP Urban Rail Seminar – Success Stories of India and Southeast Asia hosted by Delhi Metro Rail Corporation (DMRC). The sixth edition of the UITP India Urban Rail Seminar was held in New Delhi on 02-03 March 2023. The seminar was sponsored by SYSTRA and the media partners were Rail Analysis, Metro Rail Today, Urban Transport News and Metro Rail & Steel.

The event witnessed more than 200 participants, including representatives from 15 urban rail organisations across the country and several significant stakeholders involved in India's urban rail sector. The seminar encompassed 26 key national and international speakers from key metro organisations such as Delhi Metro Rail Corporation (DMRC), Chennai Metro Rail Limited (CMRL), National Capital Region Transport Corporation (NCRTC), Bangalore Metro Rail Corporation Limited (BMRCL), Delhi Integrated Multimodal Transit System (DIMTS), Maharashtra Metro Rail Corporation Limited (Maha-Metro), L&T Metro Rail Hyderabad, Ministry of Railways, UITP Asia Pacific, East Japan Railway Company, Asia Development Bank (ADB), Keolis Hyderabad MRTS, and SYSTRA, who shared their knowledge and experiences on various topics in the Urban Rail Sector.



Participant's distributions

KEY OUTCOMES FROM EACH SESSION

The event was set about with an Inaugural Session where eminent speakers from the urban rail sector gave an overview of the latest developments, challenges, and opportunities at the global as well as national level in the urban rail sector. The speakers also talked about the need for efficient public transportation systems for the growth in the country. The inaugural session was followed by a Plenary Session where the discussion was focused on the roadmap for urban rail systems in India.

Following is a summary of the key points discussed in Urban Rail Seminar:

INAUGURAL SESSION

The event was set about with an Inaugural session opening remarks given by Mr Shaun Tan, Head of UITP Asia Pacific with a brief introduction on the growth of metro rail systems in India and across the region. The opening remarks was followed by a welcome address by Mr Vikas Kumar, the Managing Director of DMRC who talked on the relation of city's growth and transportation's role in the same. The inaugural address was given by the Guest of Honor, Mr Ashish Kundra, IAS, Principal Secretary and Commissioner of Transport, Government of NCT of Delhi. He talked about the need of integrated public transport including road and rail-based modes to provide wholistic transportation solution to the citizens. Last, the keynote address was given by the Chief Guest, Ms Jaya Varma Sinha, Member Operations and Business Development, Railway Board, Ministry of Railways. She emphasised on India's progress in public transport with support of central level policies, and how clean and green transit systems can become the torch bearer for the country to achieve sustainable development goals. Ms Rupa Nandy, Head, UITP India ended the inaugural with her vote of thanks.

PLENARY SESSION – ROADMAP FOR URBAN RAIL SYSTEMS IN INDIA

The plenary session was an interactive discussion amongst CXOs from National Capital Region Transport Corporation, Chennai Metro Rail Ltd, L&T Metro Rail Hyderabad, and Bangalore Metro Rail Corporation Ltd. The session witnessed a brief discussion on the innovative practices of urban rail in different cities and how they overcame the challenges cities have faced over the years in planning and operating metro systems in the country.

TECHNICAL SESSION – I (DIGITALISATION IN URBAN RAIL)

1. Mr Navin Talwar, CGM, Signalling, DMRC and Mr Kumar Kirteeman, AM/signal DMRC gave a brief overview of measures undertaken by DMRC for digitalisation of systems in DMRC and bringing quality to services.
2. Ms Ritu Singh, General Manager, IT, NCRTC, presented on the topic of cyber security in rail industry, and she explained how rail industry needs to adapt in cyber security.
3. Mr Prashant Tiwari, Head IT, DIMTS gave a presentation on the mechanisms of fare integration of two primary modes of transportation i.e., buses and metro rail.
4. Ms Divya Hosur, GM, (SEMU), BMRCL showcased the smart systems adopted by BMRCL including the smart whatsapp ticking systems.

TECHNICAL SESSION – II (STATION DESIGN AND FUNCTIONS TRENDS)

1. Ms Daria Kuzmina, Rail Manager, UITP made a presentation on the project Stations of the Future, a human centric look on station development for superior passenger experience
2. Ms Ritu Kapila, Chief Architect, NCRTC, spoke on user accessibility and women safety. She explained measure that can be taken for superior safety through station development.
3. Mr Tasuku Takahama, Deputy Director, East Japan Railway Company Singapore (JR East) spoke on the Station Design, and functions trends using the case study of East Japan Railway Company and stating examples of focus on TOD and subsequent land development.
4. Mr Stephane Y Bessadi, Senior Procurement Specialist, ADB gave a presentation on building future rail and urban mobility in ADB projects. He highlighted ADB's procurement value addition that contributes to the urban transport sector.

TECHNICAL SESSION – III (SUSTAINABILITY IN URBAN RAIL OPERATION)

1. Mr Vivek Agrawal, ED planning, DMRC gave an overview of initiatives in green energy and solar. He explained about DMRC's initiative to explore renewable energy to reduce carbon footprint of the organisation.

2. Mr Sakeeb Muhammad, Manager L&E Kochi Metro Rail Ltd and Mr Aniyath Manikandan GM, O&M, discussed Journey of Energy Neutrality through Re-power projects. They explained to the audience the measures taken by KMRL towards 100% Energy Neutrality.

TECHNICAL SESSION – IV (RAIL ASSET MANAGEMENT)

1. Mr Navin Kumar Sinha, ED, Rolling stock, Mahametro, gave a presentation on Cost Optimisation and explained the measures of optimisation undertaken by MMRCL at both project and operation level.
2. Mr Sohail Kumar Mathur, Deputy General Director, IT Keolis Hyderabad explained concept of Rail asset management, and the model to carry out asset management while explaining the focal points.
3. Mr Shaun Tan presented on the topic of performance excellence. He informed that metro systems in Asia are seeing an exponential growth over last few decades. Giving example of three metro operators in Asia, he explained the asset management measure taken up by them.

INAUGURAL SESSION

The event kicked off with the inaugural session having the opening remarks by **Mr Shaun Tan, Head of UITP Asia Pacific**. He highlighted the growth of metro rail systems in India, the measures which may be needed in the future, and then introduced the upcoming panel discussions and technical sessions.



The opening remarks were followed by a welcome address by **Mr Vikas Kumar, Managing Director, Delhi Metro Rail Corporation**. He emphasised how efficient transportation systems make cities the growth engines of the country, and the need of the hour is robust tai-



lor-made transport system that are space saving, low emissions solutions and efficient in the long term. He mentioned about DMRC's several initiatives towards providing efficient and sustainable transport mode for people in Delhi and adjacent cities the success factors for achieving performance level up to pre-covid levels. He invited everyone to join the discussions and looked forward to ideas emerging as a result of the seminar.

Welcome address was followed by the inaugural address by the Guest of Honour, **Mr Ashish Kundra, IAS, Principal Secretary and Commissioner of Transport, Government of NCT of Delhi**. He emphasised on the need for



synergy and integration between bus and metro network and looking at public transportation as an integrated network. He shared that Delhi metro had previously started a feeder service and now, it is going to start 2000 additional 9m electric buses acting as metro and rural feeder service. Secondly, he spoke on the last and first mile connectivity, by giving bulk permits to electric rickshaw and tying-up with fleet aggregator, geofencing their operator so that they are feeding from neighbourhood to metro station. Third, he mentioned about the National Common Mobility Card for bus and metro ticketing introduced by Delhi government for making payments seamless and integrated. Lastly, he emphasised on having transit maps on bus stations for people's convenience and finally, the need of providing seamless bus and rail interchange systems.

Ms Jaya Varma Sinha, Member Operations and Business Development, Railways Board, Ministry of Railway was the chief guest for the seminar. She spoke about how Indian rail traditionally provides regional connectivity and urban connectivity in cities like Mumbai, Kolkata, Chennai and Delhi in the form of local trains at nominal prices. She emphasised that seamless multimodal integration is key to future mobility which is why station design becomes an integral part of the discussion. With increasing urbanisation, the demand for safe, fast, and efficient transit is going to increase. Government of India has focussed on this aspect in their National Urban Transport Policy, which was structured to provide safe, affordable, fast, comfortable, reliable, and sustainable mobility solutions. Transit agencies are expected to provide reliable technology driven solutions especially made for customer satisfaction. She reflected that India has an ambitious target of having at least 100 cities covered by metro network by 2047. The future metro network is developing, handling choke points in cities such as Mumbai and Kolkata. The metro rail policy introduced in 2017 allows public private partnership to obtain federal assistance for new rail projects. This has opened lot of opportunities for private companies across the globe. The policy talks on transit-oriented development, last mile connectivity, and feeder services focusing on rapid growth in cities. Metro rails are affordable, but looking at alternative revenue model becomes important for the system. She highlight-

ed few of the innovative solutions such as metro lite, water metro and more coming up in India presently and in the future.

“Clean and green transit systems shall be the torch bearer for the country to achieve sustainable development goals.”

– Ms Jaya Varma Sinha

She finished the keynote by highlighting that it is up to us to prioritise sustainable and equitable transport solution that benefit the country and so the seminar would bring new learnings and lead the way forward to future policy initiatives.

Ms Rupa Nandy, Head, UITP India ended the inaugural session with vote of thanks.



PLENARY SESSION: ROADMAP FOR URBAN RAIL SYSTEMS IN INDIA

After the inaugural session, Mr Shaun Tan moderated the panel discussion on **roadmap for Urban Rail Systems in India**. The session witnessed a brief discussion on the innovative practices of urban rail in different cities and how they overcame the challenges cities have faced over the years in planning and operating metro systems in the country.

Mr Vinay Kumar Singh, IRSE, Managing Director, National Capital Region Transport Corporation (NCRTC) spoke on the Regional Rapid Transport System (RRTS). He informed that the RRTS project is under implemen-



tation and is integrated with Delhi metro, while providing interoperability, inter-corridor connectivity to passengers on a seamless digital system controlling asset management, long term contracts for maintenance of rolling stocks and operation of assets. He shared his learnings of the project management, and keeping the project running through the pandemic, with several technological interventions, and also future plannings. The projected ridership for the RRTS is 0.8 million in future, and the biggest challenge is bringing people to the system, which would require several multimodal integration and feeder service across the network. Few initiatives for integration include partnership with DMRC for seamless passenger movement, use of NCMC card amongst DTC, Delhi metro and RRTS, introduction of business class coach in trains, and discussion with states to provide feeder services. He also elaborated that the system uses ETCS Level 2 Signalling system, which can run at a headway of 3 minutes, and thus is capable of ferrying 50 to 60 thousand people in each direction.

Mr M A Siddique, Managing Director, Chennai Metro Rail Limited (CMRL) spoke about Chennai's two metro rail corridors of 54 km and their current project of building a metro rail network of length 119 km. He shared the experience of the aftermath of the COVID pandemic,

and the leap back of Chennai metro rail. To increase ridership, CMRL reduced their fare by 20% for regular passengers, introduced digital ticketing, and focussed on last mile connectivity through shared transport, increased



service quality and made bus rides free for women. All these initiatives thus attracted higher number of passengers from diverse background and modes, and increased ridership from 0.14 million pre-pandemic to 0.24 million post pandemic.

“Metro rail is not efficient if it is not crowded”

- Mr M A Siddique

Mr Siddique also talked on CMRL's digitalisation efforts. They have their own BIM system, and all stakeholders are part of it. For the next phase, they have separated their AFC system and AFC hardware system to bring down the cost of AFC during the lifecycle.

Mr Sudhir Chiplunkar, Chief Operating Officer, L&T Metro Hyderabad stated that L&T Metro Hyderabad is the second largest metro rail in India after Delhi metro with an elevated network of 70 km. Post COVID, the biggest challenge was to develop people's confidence in the system, and thus several measures were taken for the





same, such as hygiene improvement, digital payment method introduction for significant time reduction, and focus on customer patronisation. As a result, ridership thus increased by 25-30% post COVID. He mentioned that the system experiences high crowding during peak hours, with highest per car density in the world. Hyderabad metro is looking for new rolling stock, focus on increasing headway, and improving mobility in non-peak hour as well. HUMTA, or the Unified Metropolitan Transportation Authority for Hyderabad is also focusing on integrated network with first and last mile connectivity.



Mr Chiplunkar also showcased their Green Miles initiative in collaboration with IT companies, offering them green miles incentives such as carbon credits if their employees use public transportation. They have also focussed on non-revenue income through renting out optic fibre to highest bidders, telecom towers on station buildings, advertisement spaces, and TOD norms, though providing land on lease for residential purposes near metros is a hassle.

Ms Divya Hosur, General Manager (SEMU), Bangalore Metro Rail Corporation Ltd informed that the Bangalore metro is the fastest growing metro in India with operational length of 56.42 km, and 13.5 km of additional network to be operational soon. BMRCL has successfully achieved the pre-covid ridership of 0.5 million passenger per day and by end of 2023, will have 100 km of network and 1.2 million ridership. BMRCL has focused on the digitalisation of payment methods with 95% of farebox revenue earning from digital payments. The focus in the next few years is increasing ridership with tie-ups with IT parks, industrial hubs, increasing last mile connectivity through e-bikes, incentivising public transport usage by coordinating with Bangalore Metropolitan Transport Corporation. BMRCL's complete network infrastructure



was also revamped for cyber security. Some other digital initiatives that were taken include shifting to HCI infrastructure management, taking assistance of DMRC metro regarding predictive asset analysis and management tools and trials of 5G.



TECHNICAL SESSION I: DIGITALISATION IN URBAN RAIL

The first technical session moderated by Ms Manjari Shrivastava, Assistant Coordinator, I-metro, was on the Digitalisation in Urban Rail. The session witnessed discussion on evaluating innovations in signalling and beyond, cyber security in rail industry, fare integration between metros and buses, and the digital initiatives of BMRCL.



The first speakers of the session were Mr Navin Talwar, CGM, Signalling, DMRC and Mr Kumar Kirteeman, AM/signal DMRC. They elaborated how DMRC is moving from only greenfield project handling for new infrastructure, facilities and services to brownfield projects including maintenance and updation of present systems. Unlike the greenfield projects, the focus is on redeveloping existing facilities by taking into account unknown variables and the challenges associated with time and cost.

These included several projects such as virtual signal implementation, ATS upgradation, replacement of interlocking server, and point machine overhauling. The updation can be of physical component or software components, battling the challenges in a short time window, and seamless functionality of old and new components. The focus has also been on reducing the non-productive time and items needing manual interventions by introducing Integrated Data Management Systems (IDMS) which automatically makes the process transparent. This is applicable for all departments. The use of Remote Health Monitoring Systems (RHMS) also increases the productivity and accuracy of systems with real time

monitoring. The broken rail detection system through audio frequency track circuit technology is one example of how the technological interventions can bring quality to service, safety, and efficiency.

Ms Ritu Singh, General Manager, IT, NCRTC, stated that railway systems must focus on overcoming the threats posed by cyber-attacks.

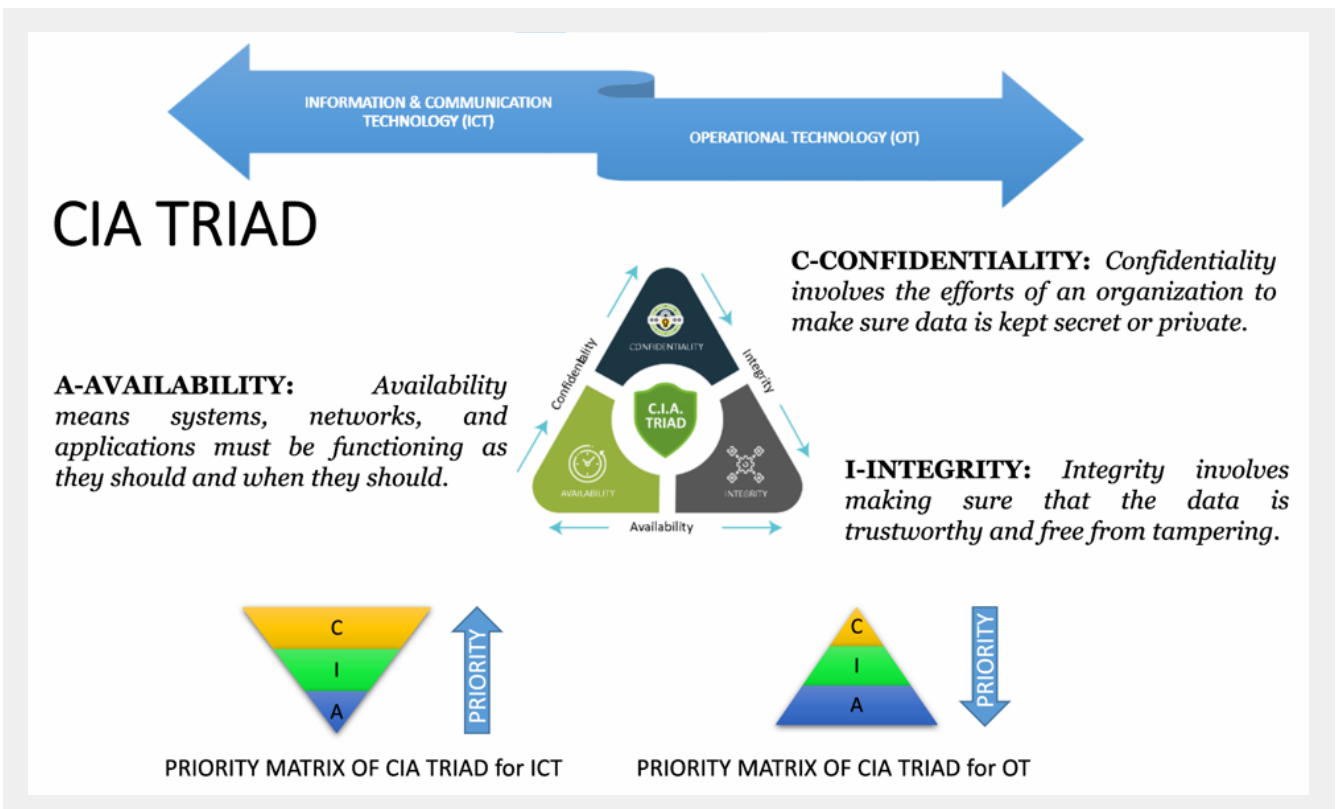
“Cyber security isn’t just an IT subject, but an organisation subject.”

– Ms Ritu Singh





In the transportation sector, most use cases as seen in the industry involve malware, phishing and targeted attack. These attacks are mostly on IT systems rather than OT systems which may proliferate in the OT systems. She elaborated that most attacks on OT systems were seen as insider or misconfiguration attacks. Actors which are cause of attacks are



human actors, technological actor or natural disaster and the actions by them may be malicious or non-malicious. The cyber security goal is confidentiality, integrity, and availability, but the paradigm of which is more important shifts based on the IT systems or OT systems. The cyber security strategy must thus cater to these two requirements.

In the past few decades, there has been a paradigm shift from reactive to proactive measures, which must be adopted by industries. The main component of this security is through people training, skills improvement, having set of defined processes in place on policies and procedures and data and information management. A four-step approach needs to be taken by any organisation that include understanding threat, assessing current maturity level, and assessing future maturity needs in order to figure out the requirement for organisations' policy.



Mr Prashant Tiwari, Head IT, DIMTS made a presentation on the mechanisms of fare integration of two primary modes of transportation i.e., buses and metro rails. He explained that there are four key stakeholders for the ticketing part which are transit operators, transit authorities, OEMs and solution providers and commuters. The ticketing integration between two modes is possible through digital ticketing or fare media such as cards.

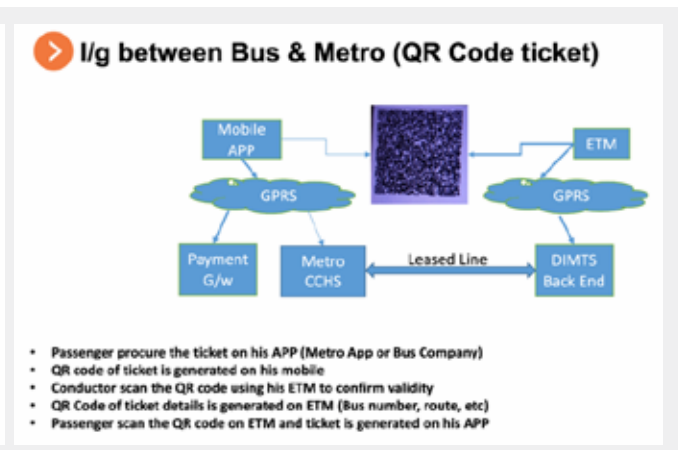
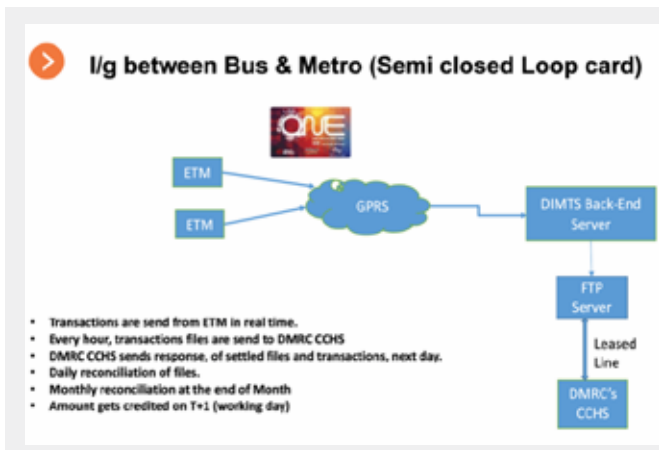
The fare integration however is more complicated, as shown by several use cases such as single ticket used for journey of two modes, monthly pass, and others. The revenue split, policy decisions and pricing factors thus all need some digital footprint for verification. Mr Tiwari thus explained the process of integration of fare through open and closed loop means such as cards, NCMC based, and QR code. He concluded his presentation by highlighting the present scenario in Delhi for DMRC and DTC and cluster buses.

Ms Divya Hosur, General Manager (SEMU), BMRCL showcased the smart ticketing adopted by BMRCL. BMRCL became the first metro rail system to introduce WhatsApp ticketing and Ms Hosur showed the end-to-end ticketing procedure for the same. The BMRCL also has upgraded to AFC systems and carried out pilot runs of NCMC card which would be launched shortly. For the convenience of station controller, the smart flow meters were introduced for all watering purposes. BMRCL also revamped its entire IT network infrastructure, upgraded the IT hardware from 3-Tier Architecture to HCI (Hyper Converged Infra) to improve the IT deliverable. and have also tested the 5G network in order to attract more passenger to the system. All applications for days to day running are built inhouse. A robust end to end public grievances redressal system for travel and other grievances is also being added.

TECHNICAL SESSION II: STATION DESIGN AND FUNCTION TRENDS

The technical session 2 was moderated by Ms Daria Kuzmina, Rail Unit, Knowledge and Innovation, UITP, on the Station Design and Functions Trends. The session witnessed discussion on UITP project on stations, user accessibility and women's safety in stations, experience of East Japan Railway in station design and building future rail and urban mobility in ADB projects.

Ms Kuzmina made a presentation on the project Stations





of the Future, a human centric look on station development for superior passenger experience. The project started with understanding passenger flow on stations and the various touch points to improve, such as retail and ticketing spaces, platform and more. Then, the current trends of station development were seen and how it should change in the future from both passengers and backend point of view. The first report of the project detailed the trends in the thematic areas of demand, tools and means and others. Under the project, the social needs of society, customer expectations, digitalisation and services on stations were studied. The future of station development must have collaborations between stakeholders, capture and share best practices and passenger centric innovation approach is required to improve station experience.

Ms Ritu Kapila, Chief Architect, NCRTC, spoke on user accessibility and women safety. She explained how NCRTC has focused on improving the built environment for the public transport, improving chances of work opportunity for people, especially women, for whom it acted as a backbone. As a transport agency, it is the organisation's responsibility to take up measures to ensure gender equality, inclusivity, and women's safety. NCRTC thus focused on a case study-based gender responsive design through several initiatives such as enabling interoperability for time saving and safety, improving last mile connectivity through providing walking zones, cycling zones, dedicated women's coach, mobile apps, mechan-



ical surveillance, and subways at intersections. Gender equality was sought out in operations of public transport, and till now about 30% of the workforce consisted of women.

Ms Kapila explained that the case study approach, customer interaction and feedback were taken up to understand the station design point. These were analysed and thus, proposals were made to turn these points into seamless travel experience by minimising isolated spots and have perception of safety with physical intervention. Focus was also laid on perimeter security i.e., out of the stations safety by providing well-lit paths, more public spaces, hosting exhibitions and public activities in public spaces that acted as natural surveillance. Psychological aspects such as intuitive lighting and way finding gave perception of safety.

Mr Tasuku Takahama, Deputy Director, East Japan Railway Company Singapore (JR East) made a presentation on the Transit Oriented Development cases of East Japan Railway Company. He gave an overview of the railway operation of JR East, having a network of 7,401 km, hosting 13 million passengers per day, with 12,017 rolling stocks. JR-East business structure includes non-transport business, known as the lifestyle business utilising assets from railway operations. JR East is also involved



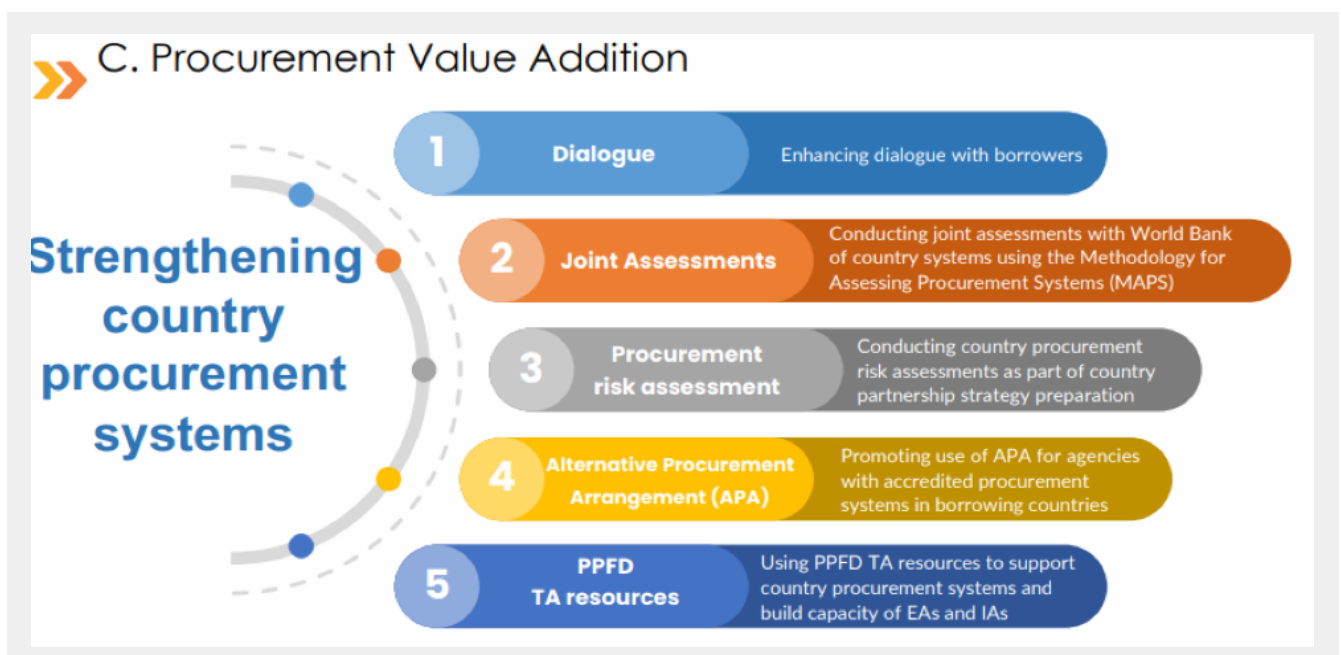
in international business in the form of overseas project of urban rail such as Purple line project in Bangkok, supply of rolling stock in Manila, transfer of used coaches to support Jakarta, and High-Speed Rail project in India. Mr Takahama talked about the transit-oriented development (TOD), and the interventions carried out for the same at the Takanawa Gateway Station, where the first train ran in Japan. Under the TOD, the design development concept was proposed, considerations of urban development master plan were undertaken, and based on which, the guidelines for urban development were drawn. The TOD spaces and station were developed through citizens' participation for design development and de-

termination for city planning. To utilise the land better, and to create space, JR East moved tracks and focused on new city development project close to the Takanawa Gateway station. Despite the competition between various stakeholders during station development, all of them collectively focused on sustainable society for long term benefits of residents.

Mr Stephane Y Bessadi, Senior Procurement Specialist, ADB gave a presentation on building future rail and urban mobility in ADB projects by focusing on three topics. Firstly, he talked about ADB procurement value addition for transport projects by giving an overview of ADB operations. The procurement framework was updated in 2017 that focused on principal based outcomes and all ADB projects undertook strategic procurement planning for comprehensive risk assessment during the project processing time.

Secondly, based on trends in Asia, he explained how the ADB's transport sector portfolio has increased over time. With development, the demand for quality transit system has increased, and Asia Pacific economies will face increase in demand of rapid urban transit which may require high investment. Thirdly, he explained ADB's involvement in financing innovative projects such as India's Delhi-Meerut Regional Rapid Transit System investment project. The 82-km corridor is expected to reduce journey times from three-four hours to about an hour. The project is rail based high speed, high capacity, comfortable and safe commuter service connecting several regional nodes. Project is set to transform regional mobility by focussing on passenger centric approach with preferential services to women, children and the vul-

nerable by providing extensive multi-modal integration across RRTS stations. He concluded by saying that ADB projects focus more on inclusive mobility projects with innovative, integrated projects partnerships focused on climate agenda rather than just creating infrastructure.



TECHNICAL SESSION III: SUSTAINABILITY IN URBAN RAIL OPERATIONS


The third technical session of the day was on sustainability in urban rail operation moderated by Mr Keshav Kumar, VP, Systems and Operation, SYSTRA.

Mr Vivek Agrawal, ED planning, DMRC presented on the topic of green energy and solar initiatives undertaken by DMRC. He explained that DMRC has explored the solar energy sector to reduce carbon footprint of the organisation, and to benefit from lower energy tariffs. Electricity expenditure is 30% of DMRC's total operational cost, and thus seeks long term sustainable solutions to meet their energy needs. DMRC have installed roof top solar plants at metro stations, procured power through open access from off-site solar plant in Rewa, pen access from Waste to Energy plant, and through green building

MRTS Rating systems for the metro stations. Currently, 35% of their total energy consumption is met from green energy. The solar rooftop initiative by DMRC included tenders floated through RESCO model, while only providing for space for installation of solar plants and monthly payments for solar energy to project developers. This model included challenges such as curved roof of stations, 25kV overhead conductor for powering trains below the roof, short available time for maintenance, and withstanding high velocity winds. The onsite solar plant project was successful with reduced energy tariff over the years. However, due to limited space available on rooftop, shifting to offsite renewable energy supply became a meaningful solution for maximising use of renewable energy. Encouraging green buildings gave tangible benefits such as reduction in operating cost and lighting power density, HVAC efficiency, and intangible benefits such as reduced environmental impact.




Mr Sakeeb Muhammad, Manager, L&E and Mr Aniyath Manikandan GM, O&M, Kochi Metro Rail Ltd presented on the topic of journey of energy neutrality through Re-power projects. Kochi Metro Rail Limited is a 50:50 joint venture between Government of India (GOI) & Government of Kerala (GOK) that was formed for providing Kochi a fast, reliable, convenient, efficient, modern, and affordable mode of public transport, as a solution to city's growing transport need. Mr Muhammad explained how Kochi is moving towards energy neutrality through its various rooftop solar projects. By 2023, KM-RL's energy consumption included 57% of solar energy.




Challenges-Roof Top Solar


Selection of Station roof sheet




Translucent and transparent:
Seamless self crimping roof sheet with intermittently placed transparent poly carbonate sheet provided to get day light in the platform



Rigid and durable:
Sheet supplied is adequate considering the weight of module, accessories and men working over the sheet



Module Fixing:
For fixing module and all other accessories, puncturing of sheet is not required (Self crimping) hence water leakage avoided





Mr Navin Kumar Sinha, ED, Rolling stock, Maharashtra Metro Rail Corporation Limited (MMRCL), gave a presentation on cost optimisation. and explained how civil cost in Nagpur Metro was reduced by 9.1% of the DPR cost in construction by reducing the viaduct segment width, turning to parapet casting, and reducing maintenance depot size in project stage. Virtual signals were opted instead of physical signals, single pole for CBTC and CCTV antennas were used, and signalling and telecom equipment were installed in single room. Centralised PF correction system, centralised UPS, manpower reduction by BMS, integrated telecom SCADA and auto dimming platform light were some of the measures adopted in MEP system. In the depot, stabling lines, track length and repair bay lengths were reduced to bring down the cost and within the traction, the number of receiving substation were reduced, and cable size were optimised. Moving on to the O&M cost, he explained that the en-

Like DMRC, these projects followed RESCO model, and has several advantages such as O&M cost reduction, protection from direct sunlight, and others. He concluded by explaining the SPV model and Kerala's strive towards 100% Energy Neutrality.

TECHNICAL SESSION IV: RAIL ASSET MANAGEMENT

The final technical session was moderated by Ms Ira Gupta, Advisory Services Lead, ARUP which talked on Rail asset Management. The session witnessed discussion on cost optimisation, rail asset management, and asset management case studies in Asia.



» MANPOWER OPTIMIZATION THROUGH O&M DIGITIZATION

- **Digitization in O&M reduces the manpower requirement in various fields.**
- **Operation Activities like Station Diary, Equipment Failure Register, Building Maintenance Register, Lost & found registers etc., are digitized for real time reporting and efficient usage.**
- **Maintenance activities are digitized using Asset management system (AMS)**
- **Preventive maintenance (Scheduled) frequencies are defined and maintained in the SAP system**
- **Corrective Maintenance (unscheduled)**
 - **Notifications shall be created and Concern person will be notified automatically through mail/SMS.**
 - **Condition based maintenance can be done analyzing the past data of the equipment.**
 - **DLP Obligations in respective contract conditions hindering the Condition based maintenance**

ergy cost was reduced through Solar PV systems, and future more installations would fulfil 40-50% of Nagpur Metro's energy needs.

Several cost optimisation measures were taken up through digitalisation, such as integration of all subsystems, integrated T-SCADA, BMS & asset management for data analysis and condition based maintenance. Mr Sinha ended his presentation by informing about the extension of its 5D BIM system used during project period to the O&M period and asset tags of each equipment links the 3D models to maintenance module for efficiency.

Mr Sohail Kumar Mathur, Deputy General Director, IT Keolis Hyderabad talked on rail asset management. He discussed the challenges that public transport modes face today due to growing demand for mobility such increasing pressure on finances, resource constraints and high passenger expectations. The asset management system, which is a coordinated activity of an organisation to realise value from its assets and achieve organisational business objectives can be a successful way to tackle these challenges. This strategic plan is driven by long term vision, maintenance 4.0 expert tools and methods, operational excellence approach to maintenance, high skilled digitalised team and asset management and maintenance business communities.

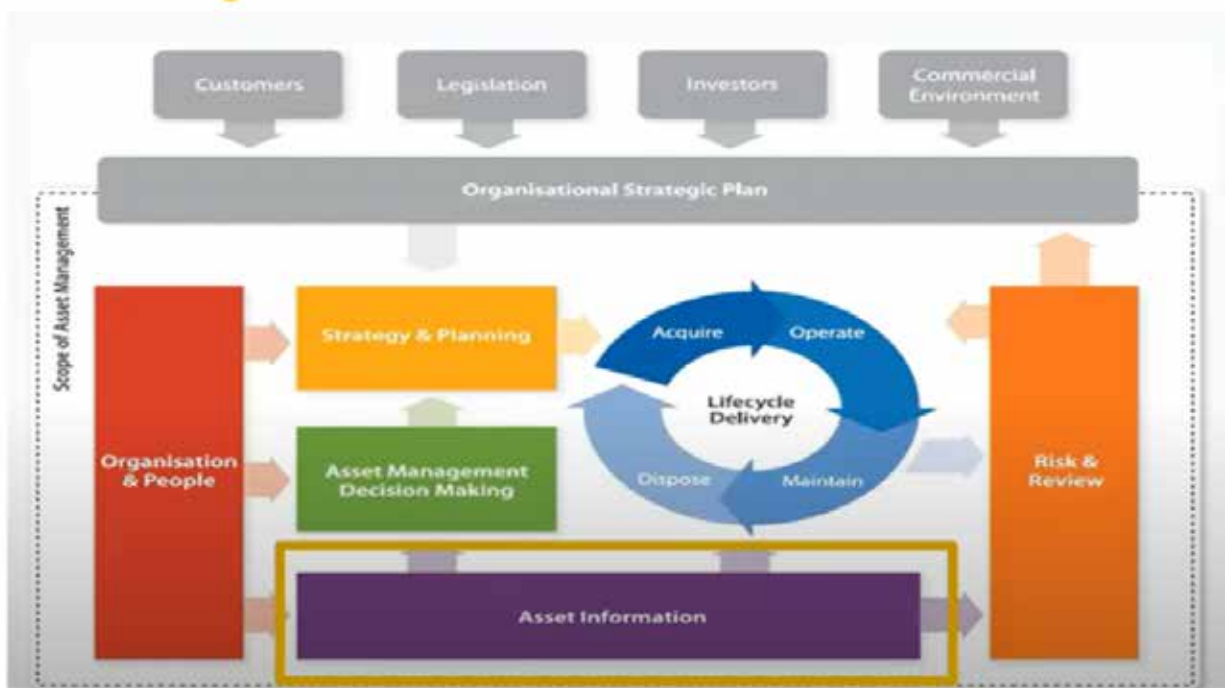
He then explained how asset management decision making is done using asset information strategy, standards,



and systems. This asset information includes targeted outcomes, information required, and decision impacting information. He concluded by informing the audience about Keolis Emblematic ISO certified network that manages more than Euro 50 billion of worth of assets.

Lastly, Mr Shaun Tan, Head of UITP Asia Pacific presented on the topic of performance excellence. The metro systems in Asia are seeing an exponential growth over the last few decades. Giving example of three metro operators in Asia, he explained the asset management measure taken by them. Starting with Singapore metro (SMRT), which has a network length of 200 km with 6 metro and 2 LRT lines, Mr Tan explained that SMRT focused on well-defined scope and plans starting from

Asset Management Model



Source : Institute of Asset Management



2013. Highlighting few initiatives, he explained how track access was made easy and efficient using headphone application saving time on radio comms and email. Next, overhead catenary system monitoring were brought on MVF mounted catenary eye, which inspect the contact wire and improve productivity from 40 nights to 1 night. These measures highly improved the train km performance. Moving on to Hong Kong which has a network of 271km with 9 metro lines and 1 light and airport express, he explained that MTR brought smart mobility management for customers, and smart maintenance for improving efficiency & work quality. Smart maintenance includes underframe inspection robotics and smart train roof pantograph monitoring systems. These measures increase the efficiency and train reliability by several folds. At last, Mr Tan quoted the example of Taipei Rapid Transit network of 153 km with 6 metro lines who introduced the advanced predictive maintenance management system through big data analysis which looks into station, OCC and train crew management. It has thus become the most reliable system of the world.

TECHNICAL VISIT

Day 2 of the seminar included a technical visit for understanding DMRC's rail ecosystem. The participants met with DMRC's officials who explained the significance of metro rail and gave a brief information on metro operations and maintenance for the concerned metro line. The group travelled from Mandi house to Lajpat Nagar metro station on the Violet Line of DMRC running on standard gauge, and then to the Welcome station using the pink line which is newer line and fully automated. During the journey, participants were made aware of all the lines operating in Delhi, the sequence in which the lines were developed and opened to public, and how the network slowly increased to provide wholesome connectivity. **Mr Piyush Goyal, Assistant Manager/train operations** explained the interventions carried out by DMRC involving use of unmanned cars, use of OCC in operations, employee responsibilities and explaining the technical details of the lines. He explained ridership calculation

using AFC and train frequencies, manual calculation on cars, calculation based on entry-exits of passenger, determining the shortest route taken by them and calculation done using defined parameters to make ridership assumption for each line. He detailed the OCC or the Operation Control Centre functions and responsibilities for automated lines of DMRC, determination of train frequency, headway of operation, halt time, dwell time, the schedule and other such factors depending on the line and stations. He enlightened the participants of the 3 command centres in DMRC which would be soon centralise as one. He explained how the OCC is capable of

troubleshooting all issues, especially in automated trains, and that there is no need of train operators most of the time. Still, in DMRC, it is a practice for all their supervisors to operate train for 1 trip each month. Lastly, he explained how in automated trains, the emergency button enables passengers to talk to OCC directly for problem solving. At every station, there are officials who monitor the trains physically as well.

Later, the participants visited the Delhi Metro Rail Academy, understanding the capabilities of the institution and the facilities and trainings it provides to metro officials





all over the country. This is a dedicated training institute set up in 2002 and upgraded in 2019. The academy has trained over 45,000 trainees of DMRC over the years, and also several employees from metros in India and abroad. The academy is accredited with QMS-ISO 9001:2015 for design development and delivery of training programs related to all aspects of project such as operations, maintenance, and management and for all job profiles in metro organisations. The academy boasts a faculty strength of 62 trainers, training for holistic development. The training methods include knowledge-based training having classroom teachings, computer-based training, including CBT train operations, S&T systems, and traction systems, skill-based learnings including driving and ATS simulators, trouble shooting and main-

tenance simulators, demonstration rooms and model rooms, and lastly attitude-based learning, including soft skills, industrial visits, co-curricular activities, and such. The trainings themselves can be for initial training, in-service training, special training, or customised training. The institute is equipped with all necessary arrangements for all trainees to face real life operations. The participants interacted with **Mr Raman Lal Gupta, Dean** and **Mr Mahendra Singh, principal DMRC** to further enquire about the rail academy.

With this visit, the UITP Rail Seminar, finally concluded. UITP would like to thank the sponsors, partners, speakers, and attendees who despite their busy schedules made the seminar such a success.

PROGRAMME OF THE SEMINAR

02 MARCH, 2023

INAUGURAL SESSION

10:00-10:45 IST

- Opening Remarks – **Mr Shaun Tan**, Head of UITP Asia Pacific
- Welcome Address – **Mr Vikas Kumar**, Managing Director, Delhi Metro Rail Corporation Ltd
- Inaugural Address by Guest of Honour – **Mr Ashish Kundra**, IAS- Principal Secretary and Commissioner of Transport, Government of NCT of Delhi
- Keynote Address by Chief Guest – **Ms Jaya Varma Sinha**, Member Operations & Business Development, Railway Board, Ministry of Railways, Government of India
- Vote of Thanks – **Ms Rupa Nandy**, Head of UITP India

PLENARY SESSION - ROADMAP FOR URBAN RAIL SYSTEMS IN INDIA

11:00-12:00 IST

Moderator: Mr Shaun Tan, Head of UITP Asia Pacific

- **Mr Vinay Kumar Singh**, IRSE, Managing Director, National Capital Region Transport Corporation
- **Mr M A Siddique**, IAS, Managing Director, Chennai Metro Rail Limited
- **Ms Divya Hosur**, General Manager (SEMU), Bangalore Metro Rail Corporation
- **Mr Sudhir Chiplunkar**, Chief Operating Officer, L&T Metro Rail Hyderabad

TECHNICAL SESSION I: DIGITALISATION IN URBAN RAIL

12:00 – 13:15 IST

Moderator: Ms Manjari Srivastava - Assistant Coordinator, Indian Metro Rail Organisations' Society (i-Metro)

- Innovations in signaling and beyond – **Mr Navin Talwar**, Chief General Manager - Signaling, Delhi Metro Rail Corporation
- Cybersecurity in Rail industry – **Ms Ritu Singh**, General Manager - IT, National Capital Region Transport Corporation
- Fare integration between metros and buses – **Mr Prashant Tiwari**, Head of IT, Delhi Integrated Multimodal Transit System Ltd
- Digital initiatives of BMRCL – **Ms Divya Hosur**, General Manager (SEMU), Bangalore Metro Rail Corporation

TECHNICAL SESSION II: STATION DESIGN AND FUNCTION TRENDS

14:00-15:15 IST

Moderator: Ms Daria Kuzmina, Rail Unit, Knowledge and Innovation, UITP

- UITP's project on Stations – **Ms Daria Kuzmina**, Knowledge & Innovation, UITP
- User accessibility and women's safety in stations – **Ms Ritu Kapila**, Chief Architect - National Capital Region Transport Corporation
- Experience of East Japan Railway in Station design – **Mr Tasuku Takahama**, Deputy Director East Japan Railway company, Singapore
- Building Future Rail and Urban Mobility in ADB projects – **Mr Stephane Y Bessadi**, Senior Procurement Specialist, Asian Development Bank

TECHNICAL SESSION III: SUSTAINABILITY IN URBAN RAIL OPERATIONS

15:15 – 16:15 IST

Moderator: Mr Keshav Kumar, VP Systems and Operation, Systra

- Initiatives in green energy and solar – **Mr Vivek Agarwal**, Executive Director Planning, Delhi Metro Rail Corporation
- Sustainable and inclusive metro rail systems in India – **Ms Swati Khanna**, Senior Sector Specialist Urban Development and Mobility, KfW Development Bank
- Kochi Metro's experience of renewables – **Mr Aniyath Manikandan**, General Manager - Operation & Maintenance and **Mr Sakeeb Muhammad C**, Manager – Lift & Escalator, Kochi Metro Rail Ltd

TECHNICAL SESSION IV: RAIL ASSET MANAGEMENT

16:30 – 17:30 IST

Moderator: Ms Ira Gupta, Advisory Services Lead, ARUP

- Cost Optimisation initiatives of Mahametro – **Mr Navin Kumar Sinha**, Executive Director Rolling Stock, Maharashtra Metro Rail Corporation Limited
- Rail Asset Management – **Mr Sohail Kumar Mathur**, Deputy General Manager, IT, Keolis Hyderabad MRTS Ltd
- Asset management examples from Southeast Asia – **Mr Shaun Tan**, Head of UITP Asia Pacific

03 MARCH 2023

09:45 – 13:00 IST

Technical Visit to Delhi Metro Rail Ecosystem

- Violent line of Delhi Metro
- Pink line (Automated Line) of Delhi Metro
- Delhi Metro Rail Academy

SPEAKERS

INAUGURAL SESSION



VIKAS KUMAR
Managing Director
Delhi Metro Rail Corporation



ASHISH KUNDR
Principal Secretary &
Commissioner of Transport
Govt of NCT of Delhi



JAYA VARMA SINHA
Member Operations &
Business Development
Ministry of Railways



RUPA NANDY
Head of UITP
India



SHAUN TAN
Head of UITP
Asia Pacific

PLENARY SESSION: PANEL DISCUSSION ON ROADMAP FOR URBAN RAIL SYSTEMS IN INDIA



VINAY KUMAR SINGH
Managing Director
National Capital Region
Transport Corporation



M A SIDDIQUE, IAS
Managing Director
Chennai Metro Rail
Corporation



DIVYA HOSUR
General Manager (SEMU)
Bangalore Metro Rail
Corporation



SUDHIR CHIPLUNKAR
Chief Operating Officer
L&T Metro Rail Hyderabad

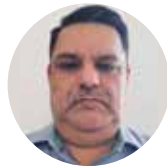


SHAUN TAN
Head of UITP
Asia Pacific

TECHNICAL SESSION I: DIGITALISATION IN URBAN RAIL



DIVYA HOSUR
General Manager (SEMU)
Bangalore Metro Rail
Corporation



NAVIN TALWAR
Chief General Manager-
Signaling
Delhi Metro Rail Corporation



RITU SINGH
General Manager – IT
National Capital Region
Transport Corporation



PRASHANT TIWARI
Head of IT
Delhi Integrated Multimodal
Transit System Ltd



MANJARI SRIVASTAVA
Assistant Coordinator
Indian Metro Rail
Organisations Society

TECHNICAL SESSION II: STATION DESIGN AND FUNCTION TRENDS



RITU KAPILA
Chief Architect
National Capital Region
Transport Corporation



TASUKU TAKAHAMA
Deputy Director
East Japan Railway Company,
Singapore



STEPHANE Y BESSADI
Senior Procurement Specialist
Asian Development Bank



DARIA KUZMINA
Knowledge & Innovation
UITP

TECHNICAL SESSION III: SUSTAINABILITY IN URBAN RAIL OPERATIONS



VIVEK AGARWAL
Executive Director Planning
Delhi Metro Rail Corporation



SWATI KHANNA
Senior Sector Specialist
KfW Development Bank



SAKEEB MUHAMMAD C
Manager – Lift & Escalator
Kochi Metro Rail Ltd



KESHAV KUMAR
VP Systems and Operation
Sysra

TECHNICAL SESSION IV: RAIL ASSET MANAGEMENT



NAVIN KUMAR SINHA
Executive Director Rolling Stock
Maharashtra Metro Rail
Corporation Limited



SOHAIL KUMAR MATHUR
Deputy General Manager, IT
Keolis Hyderabad MRTS Ltd



SHAUN TAN
Head of UITP
Asia Pacific



IRA GUPTA
Advisory Services Lead
ARUP

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ABOUT UITP

UITP- International Association of Public Transport, is a passionate champion of sustainable urban mobility and is the only worldwide network to bring together all public transport stakeholders and all sustainable transport modes and players such as policy decision makers, authorities, operators, supplier and service industry. It has 1900 members from 100 different countries and 13 regional offices. 41% of UITP's membership is under Urban Rail sector if members are divided by modes.

UITP works in the public transport sector through 3 main channels – Advocacy , Research and Networking. Concretely UITP releases publications and statistics, organises events, leads research and innovation projects and delivers training sessions.

In March 2007, UITP opened its first **Indian office in Bangalore** and in December 2019 in **New Delhi**. The prime objective of the Indian office is to better address the specific needs of regional members as well as the Indian public transport sector and its stakeholders.

UITP in India aims to offer assistance and services to public transport organisations in the country through access to knowledge on national and international technical and policy developments in urban mobility, peer reviews, projects and studies on specific issues of concern. There are over 50 UITP members in India.

FOR FURTHER INFORMATION

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PUBLICATIONS

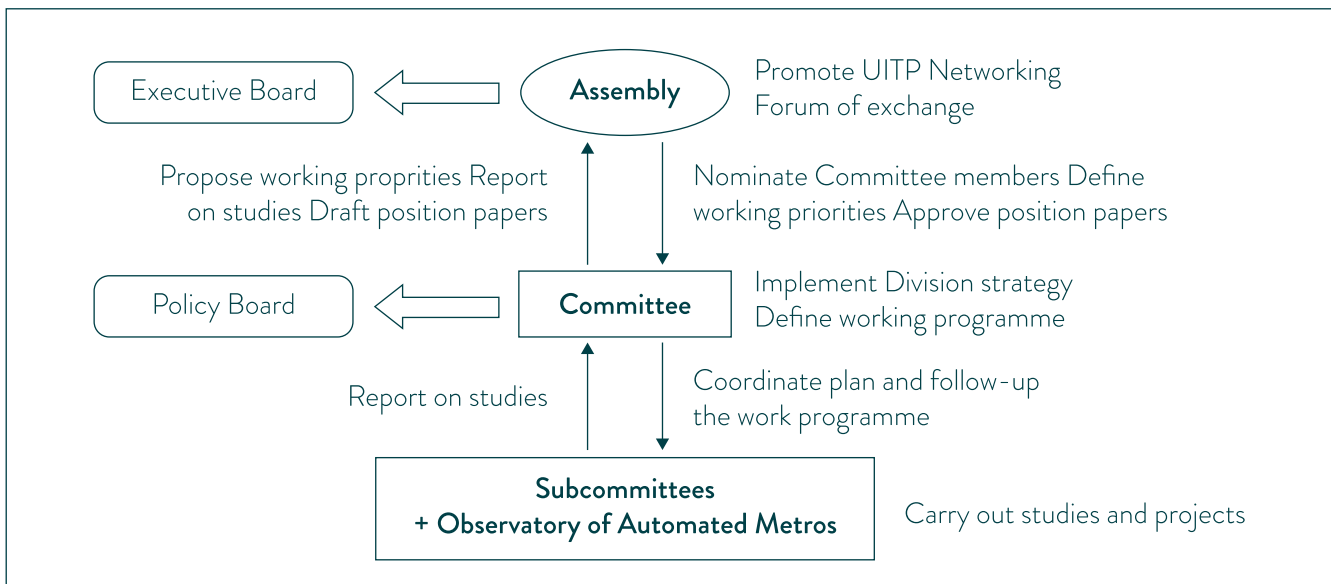
Some key publications from UITP focusing on urban rail are:

- Track circuits conditioned based maintenance (EISS Subcommittee) [LINK](#)
- New functions or improvement of existing CBTC functions (EISS Subcommittee) [LINK](#)
- Impact on metro operation of incidents occurred in high voltage equipment (EISS Subcommittee) [LINK](#)
- Cleanliness in metro systems (Operations Subcommittee) [LINK](#)
- Procedure for retrieving objects dropped on the tracks (Operations Subcommittee) [LINK](#)
- Understanding and improving the total costs of ownership of urban rail systems (VEI Committee) [LINK](#)
- Demand modelling (quick survey) – Operations Subcommittee [LINK](#)

ABOUT UITP METRO DIVISION

The **Metro Division** is composed by close to 100 metro operators (and several organising authorities responsible for the planning of metro systems). Any metro operator member of UITP is de facto a member of the Metro Division.

Within the Metro Division, there are several working structures; not all members participate actively in all of them.



The **Metro Assembly** is the meeting that gathers, usually once a year, the main contacts (CEO, technical directors, etc.) of all UITP Metro Division members. In the Assembly, top level Metro Division members share their news and discuss problems at the highest level in a closed, non-commercial environment. Participant members also receive an update on the technical activities developed by the Division in the course of the year and a preview of upcoming working topics, and can propose new working topics, contributing to shape the future of the Division and the metro sector.

The **Metro Committee** is the strategic and executive force of the Metro Division. It plans, coordinates and monitors the work of the four technical Subcommittees and the Observatory of Automated Metros, and prepares the programme of Metro Assemblies and Conferences. This working body is composed by the Chairpersons of the technical Subcommittees, the Observatory of Automated Metros, and a number of regional representatives.

SUBCOMMITTEES AND REGIONAL BODIES

In general, Subcommittees meet twice a year; membership to the Subcommittees is voluntary – each Metro network applies to become a member according to their own priorities.

The technical Subcommittees are:

- Electrical Installations and Safety Systems (EISS) subcommittee
- Operations Subcommittee
- Fixed Installations Subcommittee
- Rolling Stock Subcommittee
- Observatory of Automated Metros

The work of the Metro Subcommittees is complemented by **Metro Regional Platforms** - exchange forums set in each of the world regions to facilitate exchanges at a closer level among members.

Currently there are 3 active regional platforms

- **Asia Pacific Urban Rail Platform (APURP)**
- **International Rail Forum for North America (IRFNA)**
- **Grupo de Rieles de America Latina** (Latin America Rail Group)

For more information on UITP Metro Division activities, please contact Corentin Wauters

Manager, Knowledge & Innovation corentin.wauters@uitp.org

This is an official Report of UITP, the International Association of Public Transport. UITP has more than 1,800 member companies in 100 countries throughout the world and represents the interests of key players in this sector. Its membership includes transport authorities, operators, both private and public, in all modes of collective passenger transport, and the industry. UITP addresses the economic, technical, organisation and management aspects of passenger transport, as well as the development of policy for mobility and public transport worldwide.

This Report was prepared by UITP India.



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