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Improving Urban Mobility-Towards Seamless & Integrated Multimodal Transit Stations

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Abstract

While urban development accelerates the process of economic growth, it also makes growth lead to huge Urban infrastructure requirements. Transport sector is an essential component of the Urban Infrastructure. Changing travel habits, convenience, speed and reliability, as well as evolving customer expectations has led to the development of mass transit systems in various cities in India. The development potential of these systems is huge as it offers considerable opportunities. However, the requirement of greater detailing in the provision of better services to the end user in the mass transit project planning stage needs to be further worked upon. The sustainability of the system is immensely dependent upon the comprehensive planning of network and stations along with effective interchange with other modes of transport. To encourage modal shifts in favour of rail based public transport systems, it is imperative to plan an integrated transport infrastructure with a focus on physical planning and design so that the entire system along with other modes are supportive of each other and not competitive. RITES has contributed in the development of Multimodal Integration plans for Esplanade and Sealdah areas for the State Government, Kolkata. The Integrated Plans for both the areas sets out an ambitious aim to improve the public transport share by creating a pleasant urban realm. A number of alternative proposals for both the areas were developed and extensively consulted with the different stakeholders to agree on an Integrated Plan. Multimodal Integration needs to be extended to other cities of similar nature where different modes of transport work in tandem to provide the integrated mobility platform.

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1. Introduction

Urbanisation is a continuing phenomena in developing countries as people from rural areas move to cities. India's urban population increased from 286 million to 377 million between 2001 and 2011. Out of the total 1.31 billion population of the country, 410 million (about 32% of the population) live in urban areas and contribute to 63% of the Gross Domestic Product (GDP).

With such upsurge in the urbanization, it is projected that by 2050, the urban areas will house approximately 50% of the population (814 million) and contribute to 75% of the GDP. Urban areas are likely to become dominant drivers of the country's economic growth and consequently the demand for key urban infrastructure service such as water, transportation, sewage treatment, housing etc. is likely to increase drastically.

India's transport sector is large and diverse and is one of the essential components of the Urban Infrastructure services. Despite the increasing levels of urban mobility in Indian cities, access to places, activities and services are becoming more difficult in terms of convenience, cost and time. The mobility needs are evolving with the increasing demand for urban mobility. Changing travel habits, demand for services to increase convenience, speed and reliability, as well as evolving customer expectations towards individualization and sustainability requires a paradigm shift. Therefore, the focus has to be shifted towards strengthening the urban transport supply in a way that it could respond effectively to the issues at hand and, at the same time, be in synchronisation with the broader policy goals for achieving seamless, reliable, sustainable, environment-friendly and affordable transportation systems.

2. MRTS-Global Scenario

There has been a growing interest for the relevance of rail-based systems to address the mobility needs of the expanding population in the cities. Globally, metros have evolved as a major form of public transport as they rank high in terms of passenger carrying capacity, speed, convenience, energy efficiency and environmental sustainability. The rapid increase in the number of rail-based systems across the world is an indication of the importance of metros in facilitating mobility, particularly in large urban areas.

As of 2015-16, 162 cities in more than 55 countries around the world host approx 173 metro rail systems covering a total length of more than 13,240 km. In Asia, China and India are two countries where metro rail network is expanding very fast. Last 15 years have seen a considerable expansion in terms of metro systems and infrastructure. A total of 194 new metro lines pertaining to both existing and new networks, accounting for approximately 40% of the length of metro infrastructure worldwide, have been inaugurated in this period.

In terms of total length of metros till 2015-16 (Table 1), Asian cities accounted for 52.8%. European cities also depend heavily on metro systems for urban mobility, and accounted for more than 62 million daily riders or 25% of global ridership, and 28% of global metro length. The world's largest or most used metro systems are Tokyo (Japan), Seoul (Republic of Korea) and Beijing (China).

Table 1. Distribution of Global Metro Network

Continent	Cities	Length (km)	Stations	Yearly Ridership (Million)	Share of Length (%)
Africa	3	135.5	131	1483	1.0
Asia	79	6995	4663	32380	52.8
Europe	55	3699	3486	14891	27.9
Latin America	12	587	504	3524	4.4
North America	23	1823	1509	5599	13.8
Total	**172**	**13,240**	**10,293**	**57,877**	**100**

The highest share of the metro infrastructure is in Asia, the continent also being home to five of the ten longest networks in the world. Shanghai and Beijing are the world's longest networks, both surpassing 500 km. Shanghai has the largest passenger metro rail length (~588 km) with the highest passenger ridership of 14.1 million passengers/day in the year 2016. Chinese metro systems, have experienced significant passenger growth over the past few years. Taken all together, metro systems in Asia carry over 135 million passengers per day, nearly half the world total.

3. Metro - Indian Scenario

Public Transport in Indian cities has principally been restricted to State owned buses, Intermediate Public Transport (IPT) systems and taxi cabs. Some cities like Kolkata, Mumbai and Chennai also have an extensive suburban railway network as part of their existing mass transport infrastructure.

The Planning Commission's Twelfth Five-Year Plan for urban transport has recommended that all Indian cities with a population over 2 million should start planning rail transit projects and cities with a population over 3 million start constructing the metro rail systems. HPEC investment estimated that the total expenditure of urban infrastructure to be Rs. 39.2 lakh crore over 20 years. An estimated investment for development of metro rail systems in Indian cities is 4.5 lakh crore. (Source: Planning Commission, 2011).

In line with Twelfth Five Year plan recommendations, several plans to develop numerous metro rail systems in major Indian cities have been put in place by the Ministry of Urban Development in collaboration with State Governments. Many of these projects, which are being funded by the Government of India, State Governments and soft loans from international funding agencies, are being implemented through Special Purpose Vehicles (SPV). The Indian metro rail sector is one of the world's largest ongoing infrastructure development programmes. With financial assistance from the Central and State Governments, the cities of Kolkata, Chennai, Delhi, Jaipur, Mumbai, Kochi and Bangalore currently have operational metro systems. Twenty Five other Indian cities have metro systems in various stages of planning, design, execution and expansion.

The development potential of metro rail sector is huge, as it offers considerable opportunities. However, the requirement of greater detailing in the provision of better services to the end user in the metro project planning and design stage needs to be highlighted. The sustainability of MRTS system is immensely dependent upon the comprehensive planning of the network, stations along with effective interchange with other modes of transport. Therefore, it is imperative to plan an integrated network with multimodal transport system so that the entire MRTS system along with other modes are supportive of each other and not competitive.

4. Towards Seamless & Rapid Multi Modal Integration

The emerging need for an integrated & rapid transport network (Fig. 1) creates an opportunity for the development of interchange hubs, facilitating efficient interchange from one mode of transport to another. The development of urban transport projects involving interchange hubs with different modes of transport should include multimodal integration as an essential component of planning.

The interchange hub can become the fulcrum of inter-modality and provide seamless journeys, efficient interchanges, and accessibility for all, and further promote public transport. With billions of dollars being spent on metro rail projects in the country, it is imperative to understand the need for, and the effectiveness of multimodal integration in metro systems. A world-class public transport system (seamless, rapid, incorporating best practice interchange hubs), will also help in meeting the social, economic and environmental needs of a thriving and growing city, including the support in the continued economic development. Some of the adequacy of the integrated system include:-

- Meeting the increasing demand for travel by public transport;
- Improving access to facilities and services in urban centres;
- Providing links between neighbourhoods and employment, education and other opportunities;
- Easing congestion
- Improving quality of life
- Acting as a catalyst for socio-economic and physical regeneration in local communities;

- Removing barriers for disabled people, children, senior citizens, etc with reduced mobility
- Providing safer and more secure journeys.

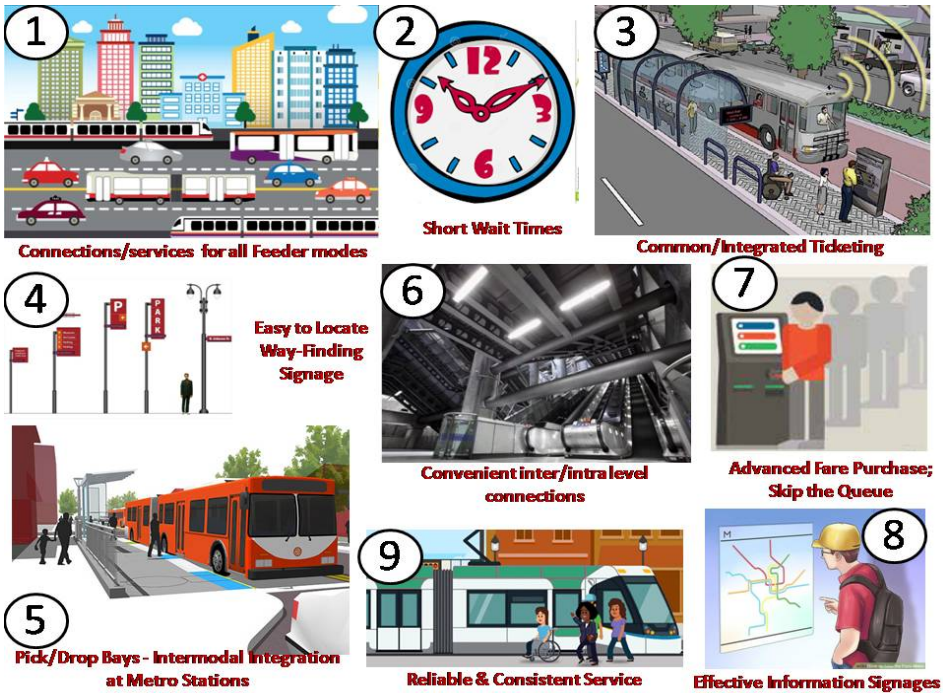

Fig. 1. Various Levels of an Integrated Mass Transit System

Primarily Integration occurs at five levels viz. Institutional, Operational, Physical Fare and Information. The most efficient systems are those which have achieved all these five forms of Integration along with route integration; integration with other public transport systems; integration with private motorized transport including park and ride facilities, integration with non-motorized modes (through easy access for pedestrians and/or bicycle parking and allowing bicycles onto public transport vehicles); and fare integration: allowing the users to travel throughout the urban public transport system with a unified ticketing system. These types of connections complement public transport systems, as feeder services, to provide door-to-door connectivity and allow for expanded coverage of the metro rail system.

4.1. Planning Parameters and Identification of Stakeholder Requirements

The lessons learnt from the international case studies and Indian Scenario, certain parameters were identified as required for the development of an interchange hub;

- Efficient, Convenient & Optimal Overall Design
- Promoting the use of public transport
- Conformity & Contribution to Land-Use Planning
- Efficient use of Space
- High Quality Public Realm & Place making
- Harmonised Policy Perspective & Stakeholder Participation

Table 2 identifies the requirement of different stakeholders at an interchange hub.

Table 2. Requirements of different stakeholders at an Interchange Hub

Daily Commuters	Tourists, Leisure Commuters	Operators	Commercial Vendors	Govt Agencies/Depts.
Fully accessible Minimal journey times & distances Minimum pedestrian vehicle conflicts seamless integration Reliability Free from passenger congestion Free from externalities like rain, winds, humidity Real time information Maximum convenience Convenient shopping/eyes on the streets Safety	Staff presence Simple & intuitive way finding Service & local information Pleasant ambience Cleanliness	Fast, simple & convenient connection point between services Efficient movement of passengers Minimal obstruction among operators Efficient movement of public transport vehicles Built in recovery time & resilience to service disruption Passenger & vehicle safety & security Ticket sales Minimizing operating costs Parking	High passenger/visitor numbers High quality mixed land use Servicing arrangements Parking Loading/unloading of goods A recognizable, attractive location	Space & time efficient transport interchange Economic growth & regeneration Access to jobs & services Better services to passengers Greater modal choices Protection of built & natural environment Improved safety & security Improved local image & character Development of sense of place Strong sense of community with events, sports and recreation, and an arts and culture scene

To meet the evolving customer needs, RITES has adapted to the new challenges by continuously providing new/innovative solutions and finding ways to reinvent mobility solutions. RITES aims to support cities in shaping the multimodal systems of metro rail and has voluntarily facilitated an open dialogue between urban mobility stakeholders in various States/Cities in India. RITES professionals had extensive discussions with State Government on the need and importance of last mile connectivity and intermodal integration - more so for important metro stations/interchanges. Transport Department, Government of West Bengal accordingly, initiated Last mile connectivity projects to benefit the people of Kolkata and help achieve and maintain the desired modal split in favour of public transport. Master Planning Exercise at Esplanade and Sealdah metro station areas were taken up for better integration of metro systems/ stations, bus systems, tram, IPT, private modes and pedestrians to ensure rapid, seamless, technologically driven, state of the art multimodal integration to meet the expected traffic in the area and to provide with convenient and faster transfers.

5. Metro Systems in Kolkata

Kolkata Metro was the first metro railway in India, opening for commercial services from 1984 operated by the Ministry of Railways. Metro Network in Kolkata consists of one operational line of 27.22 km from Noapara to Kavi Subhash with ten other lines in various phases of planning, design & construction. There are 300 metro services daily carrying over 6.2 lakh passengers making it the second busiest metro system in India.

East - West Corridor of Kolkata Metro from Howrah Maidan to Salt Lake Sector-V is under implementation by Kolkata Metro Rail Corporation (KMRCL) with length of 16.55 km having 12 Metro Stations (6 Underground & 6 Elevated). The corridor is underground for a length of 10.8km from Howrah Maidan to Subhash Sarovar via Esplanade and the remaining 5.7km is elevated up to Salt Lake Sector-V. Presently, there is a total of 134 km of Metro network under various stages of planning & construction.

As part of the East West Metro Corridor study, RITES has developed a four stage demand model for the Study Area that includes Kolkata Municipal Corporation, Howrah Municipal corporation, Salt Lake Municipality and

Rajarhat new Town. The total trips estimated for the base year (2017) are 124.8 lakh. The population and employment is expected to increase to 89.62 lakh and 39.39 lakh respectively by 2035.

Kolkata already has a good share of public transport (about 70%) owing to marginal household income, congested roads and limited ROW availability. The horizon year demand model for the city indicates that by 2035 approx 71% trips will be performed by PT. With over 150 km metro network being planned to be operational by 2030, the travel pattern is likely to undergo a major change and it will also help in maintaining the modal share in favour of Public transport. The share of metro in total trips is likely to increase from about 7% now to about 29% in 2035.

A number of studies suggests environmental and social benefits of using rail based public transport systems that tend to increase as the system expands and matures in the city. These benefits include reduction in private vehicle usage, reduce the impact of the road based PT systems by reducing the emissions & pollution levels and create development and travel pattern with lower carbon impacts. Travellers who switch from private vehicles and buses to rail based public transportation significantly reduce energy use and GHG emissions.

6. Multimodal Transport Integration at Esplanade and Sealdah

The Last mile connectivity guidelines for rail transit systems of Ministry of Housing and Urban Affairs is laid out to achieve multiple benefits including:

- Expand the reach of transit through infrastructure improvements
- Maximise multimodal benefits and efficiencies
- Guide strategic investments for the benefit of public

The Master Plan project for the Esplanade Area sets out an ambitious aim to improve the public transport share that can help create pleasant urban realm where people and businesses can thrive.

6.1. Planning for Esplanade Metro Interchange

Esplanade, known to be the Central Business District (CBD) of Kolkata, located north of Maidan is also referred as “lungs of Kolkata”. It houses the Victoria Memorial, the Eden Gardens, Fort William and the Shaheed Minar and is an important employment destination. Esplanade is also one of the iconic tourist attractions of the city with large & open areas near the River Ganges where contrasting lifestyles and philosophies thrive in, where people eat, shop, walk and attend offices. Since, Esplanade will become a major transport hub in near future, an exercise has been taken up for integrating the following:

- Existing Esplanade Metro Station of under operation Noapara – Kavi Subhash Metro Corridor and further extension from Noapara to Dakshineswar is under construction.
- Proposed Esplanade Metro Station of East-West Metro Corridor.
- Esplanade Metro Station of Joka - Esplanade Metro Corridor (under planning stage).
- Existing Tram terminal.
- Bus terminals for both inter and intra city buses.
- Eden Gardens, the largest cricket stadium of India is located about 600m away from Esplanade Metro Station.

A Multimodal Integration Plan for Esplanade Area has been prepared to facilitate effective passenger and vehicular movement at all the three metro stations to meet the passenger demand for the horizon years. Where "Place making" can be categorized under the two broad elements:

- Make transit a community asset
- Seamlessly integrate transit, urban development and the public realm.

The major land-use activities (Fig 2) are-

- Offices/governmental buildings- Raj Bhawan, Vidhan Sabha, Income tax building, ordinance factory board etc. along with other office buildings like Kolkata high court, town hall etc. in proximity.

- Commercial Landuse- dense commercial areas -New market area.
- Sports Centre- Eden Gardens, largest cricket ground of India lies in the vicinity of the area. Apart from this the areas have clubs like Mohammaden sporting club, Dalhousie athletic club, Rangers club, The City of Athletic club etc.
- Hotels/hospitality- Area is marked by the presence of hotels like Grand Oberoi hotel, Esplanade Inn etc.
- Transport hub- Esplanade bus terminal, Esplanade tram terminal and metro
- Station of Naopara-Kavi Subhash corridor, two proposed metro stations of Joka-Esplanade Corridor & East West Metro corridor
- Green areas- Huge green spaces like Manohar Das Tarang, which acts as green belt and breathing space for city.

Four alternative proposals were developed to provide key renewal solutions & improve the access/dispersal facilities at Esplanade. Extensive stakeholder consultation with Transport department, PWD, Traffic Police, Railways, KMRCL, RVNL were carried out to agree on an Integrated Plan.

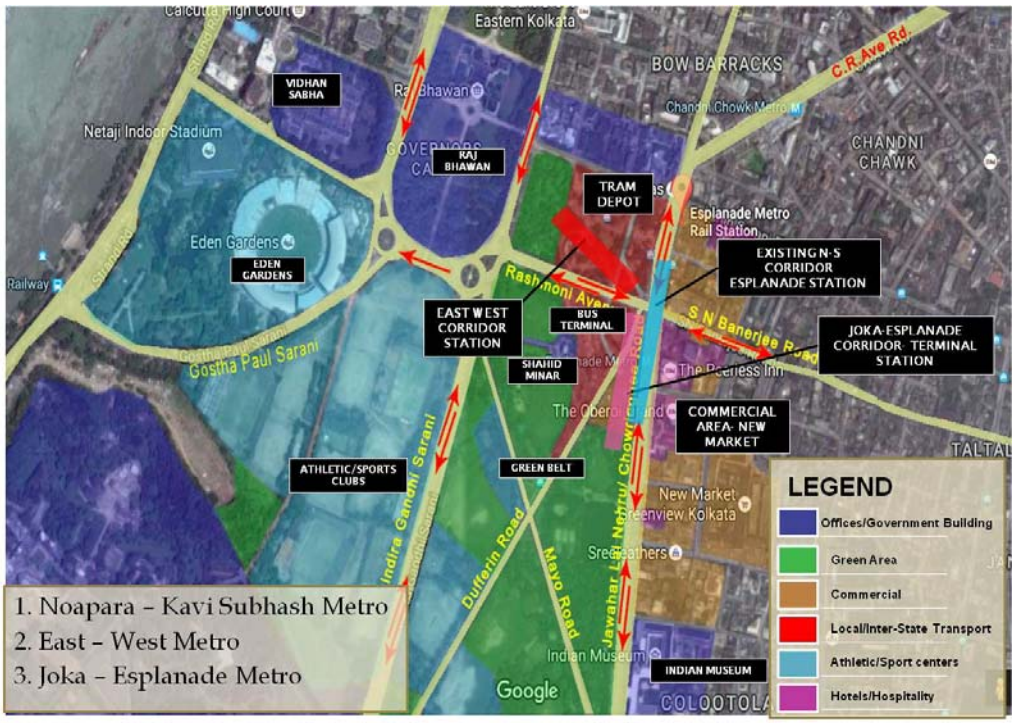

Fig. 2. Land Use Activity at Esplanade Area

6.2. Components of the proposed Integrated Master Plan

The focus was to ensure a fully integrated travel value chain to foster seamless, multimodal mobility while ensuring the increase in the overall attractiveness of public transport by service extension in terms of design & construction. Some of the salient features of the Integrated Master Plan (Fig 3) include:

- Visionary Multimodal Design Approach: A visionary urban mobility design approach (aligning priorities with proposals to achieve mobility objectives), to ensure the right balance between demand and supply with a consensus between stakeholders was planned
- Design Interventions includes:
  - ✓ Revival of the area as per the Master Plan – Improved local image and character
  - ✓ Promote inclusive mobility for all with state of the art facilities for disabled, segregated facilities for pedestrians

- ✓ Segregated infrastructure as Common area for Interchange passengers between the bus, metro and private modes
- ✓ Space allocation for Traffic Police officials to maintain safety and security
- ✓ Urban traffic control systems giving priority to public transport at traffic lights
- ✓ Park and Ride facilities
- ✓ Cycle Parking Facilities to encourage non-motorised transport
- ✓ Equitable distribution of road space with street design and establishing speed limits
- ✓ Traffic-calming measures to optimize street-usage conditions and improve quality of life of the adjacent land use.
- ✓ Implementation of ITS: Adopting principles of legible design and interchange zone management from the outset that are intuitive for all users, supporting information and well integrated with their surrounding urban context.
- ✓ Improving quality of static and real-time information e.g. through the introduction of contextual journey planners, with online booking and real-time travel information, to ease seamless travel across the various public and private transport modes.

- Mobility Supply Solutions: Responding to increasing demand for urban mobility and to consumer and business needs for seamless, multimodal urban mobility requires cities to extend their public transport offering and adapt it from "delivering transport/construction" to "delivering integrated solution provider". This transformation can be achieved through an increase of customer experience via service offering extension through partnerships and alliances with third parties via introduction of innovative business models and partnerships on E-portal systems, Applications etc.

6.3. Planning for Sealdah Metro Interchange

A similar exercise at Sealdah Area was taken up for multimodal integration. Sealdah railway station is one of the major/busiest railway stations and an important suburban rail terminal. KMRC is presently constructing a station at Sealdah as part of the E-W metro corridor. In addition, Rajabajar Tram Depot is in the vicinity of the Railway Station. Sealdah Station area acts as a Multi Modal Transit Interchange hub providing interchange from Railways to Buses, auto-rickshaws, Taxies, Private vehicles and even tram services.

Sealdah will become one of the major transport hub in view of intra and intercity rail terminal, tram depot, metro station, surrounding important landuses, pedestrian and vehicular access from important roads such as AJC Bose Road, Narkeldanga Main Road, Convent Lane and Canal Road. This Interchange Hub has a great potential to promote the use of Public Transport and reduce vehicular congestion on roads. Walkability within the interchange hub and in the surrounding area, especially on the drop off and pick up points between transport modes is essential. The land use activity map for the Sealdah Station area along with the issues relating to intermodal integration is presented in Fig 4. Fig 5 shows all the interchange points around Sealdah Station.

Sealdah Flyover has a hawkers market underneath it. In addition, footpaths of the service lanes of Sealdah Flyover including some part of Railway Land are completely occupied by multiple layers of encroachment from hawkers and vendors. The pedestrians have to walk along the main carriageway of the service lanes. Along the western service lane, small vehicles can access the area from the side of Prachi Cinema. B. B Ganguly Street has been completely pedestrianised owing to the high pedestrian footfall and metro construction. The operationalisation of Metro services shall increase footfall in the area. Most hawkers and vendors along service lanes have installed stalls made up of bamboo, wood and plastic sheets. These materials used by vendors and hawkers pose additional threat towards fire safety and emergency evacuation of the area. Vehicular access along the service lane along the eastern side of Sealdah flyover near Railway Station is completely prohibited. The service lane is encroached by extension of shops under flyover and hawkers/ vendors along footpaths and carriageway of service lanes (Fig 6).

RITES formulated a set of macro level and micro level proposals and they were discussed in detail at stakeholder consultations held with Transport Department, PWD, Traffic Police. The proposals were also verified on site with officials of PWD and Traffic Police.

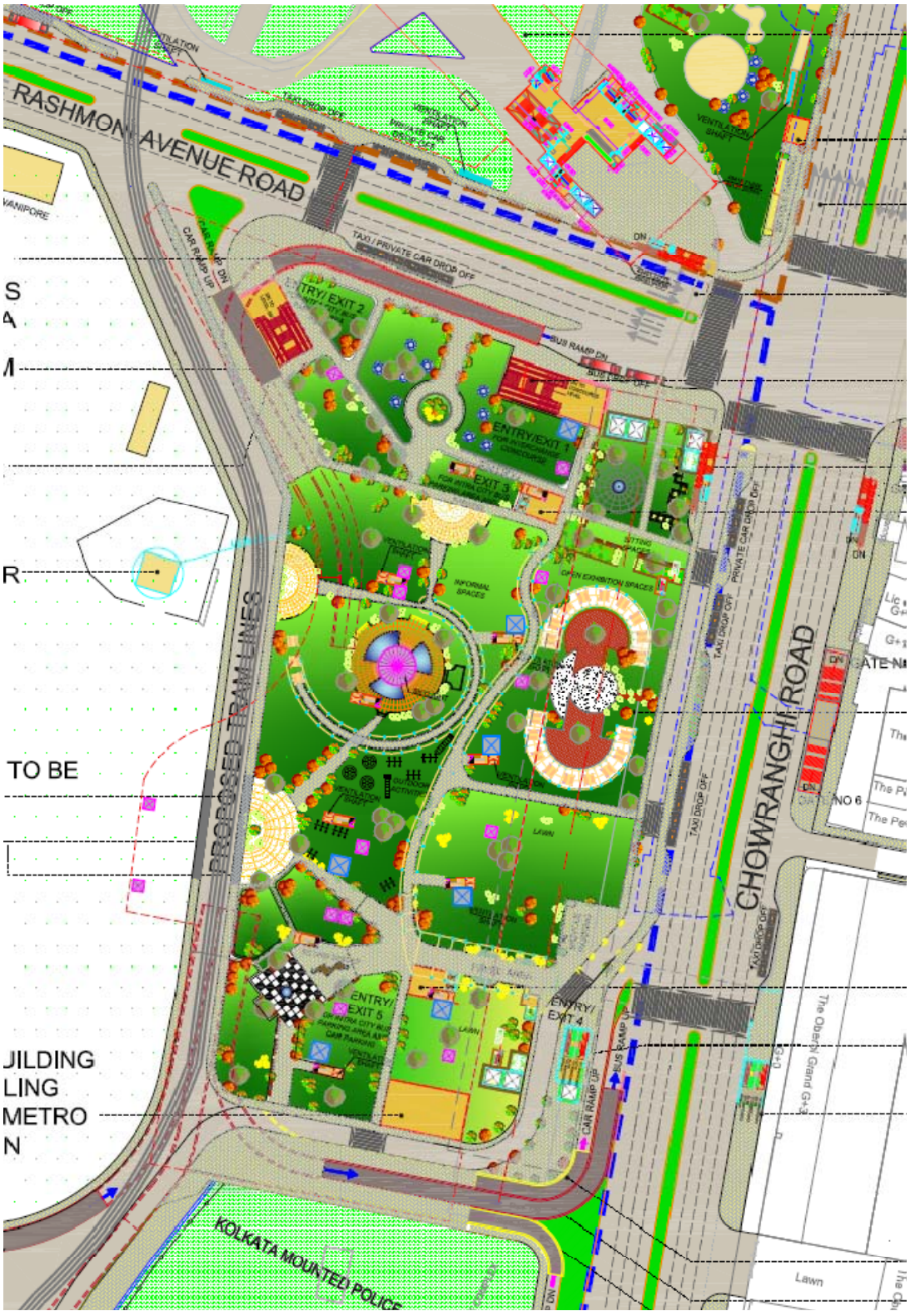

Fig. 3. Traffic Integration Master Plan for Esplanade Area

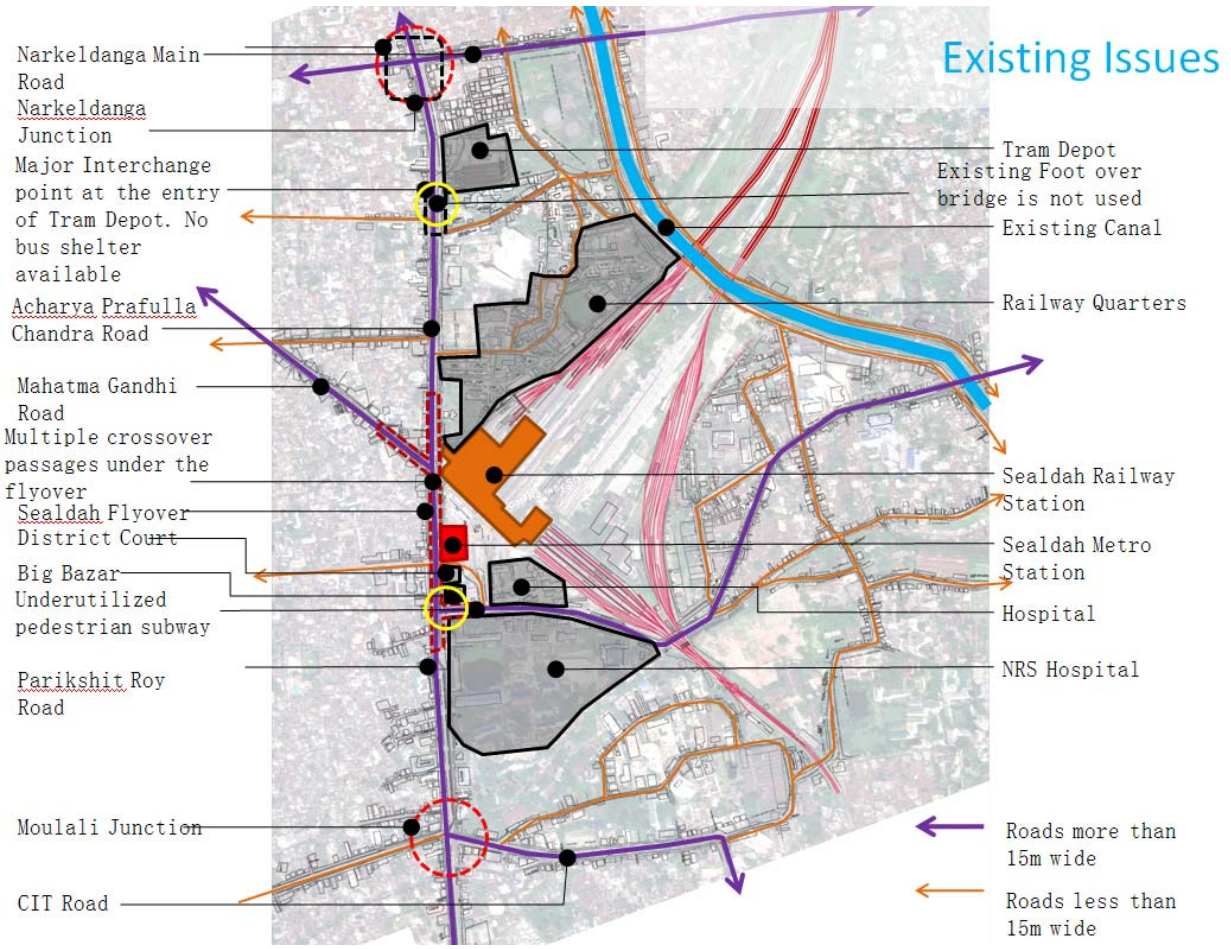

Fig. 4. Land Use Activity Map for Sealdah Area

6.4. Proposal Formulation for Sealdah Area

Fig 7 presents the macro level proposals for Sealdah Area and described in subsequent sections.

- Proposal-A: A new arm from the existing sealdah flyover on the western side is proposed to connect the railway station building and provide pick and drop off bays on the first level. This will ease out the only entry/exit from the Big Bazaar side. It will also provide a separate access directly from the Sealdah Flyover.
- Proposal-B:Existing ROB on the Parikshit Roy Lane and Beleghata Road to be strengthened and widened
- Proposal-C:Extension of the proposed flyover arm towards Beleghata ROB, to intersect Parikshit Roy lane and then further go along boundary of Railway Line to second ROB of Convent Lane, from where the elevated road traverses along Covent Lane and ramps down till the intersection with CIT Road.
- Proposal-D:Proposed connection from the widened ROB and at-grade widening of Guri Pada Road to connect the Canal South Road
- Proposal-E:A new Road is proposed adjacent to canal connecting the widened Guri Pada Road and Dhapa Road. Dhapa Road is also proposed to be widened at-grade to connect EM Bypass
- Proposal-F:Govind Khatik road is proposed to be widened to 4-lane divided carriageway from existing 2-lane road till the Topsia more

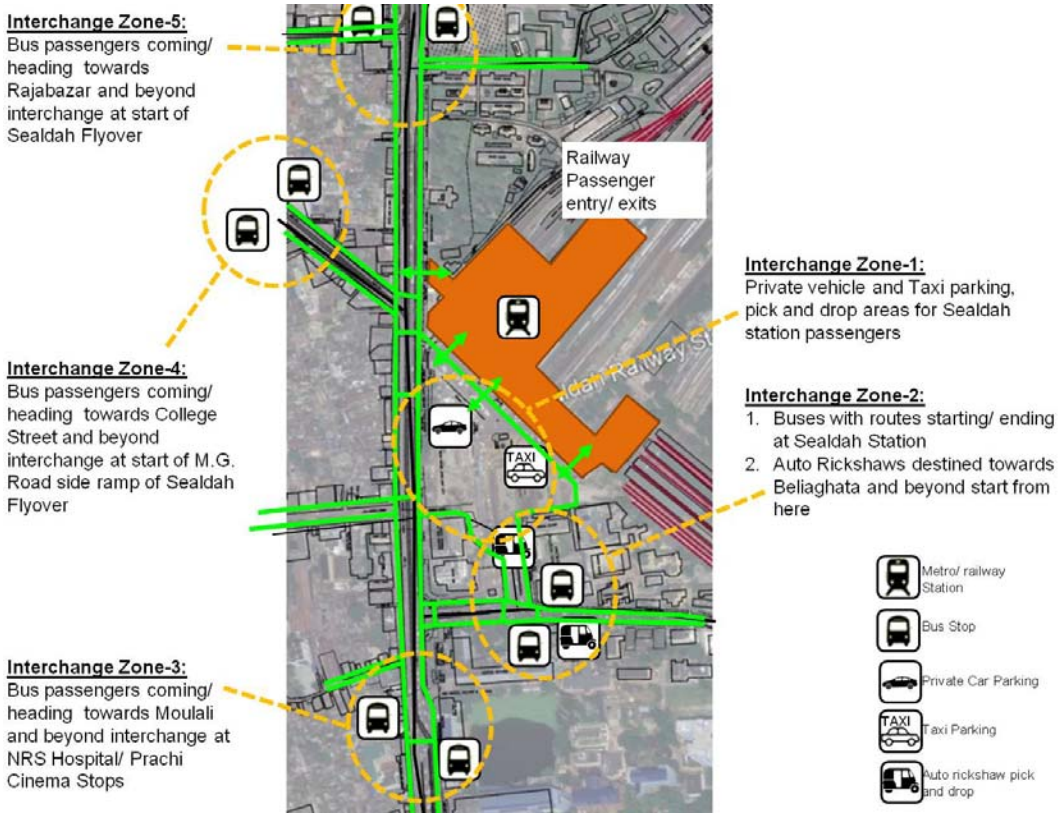

Fig. 5. Interchange Points around Sealdah Station

Fig. 6. Existing characteristics at Sealdah Station Area

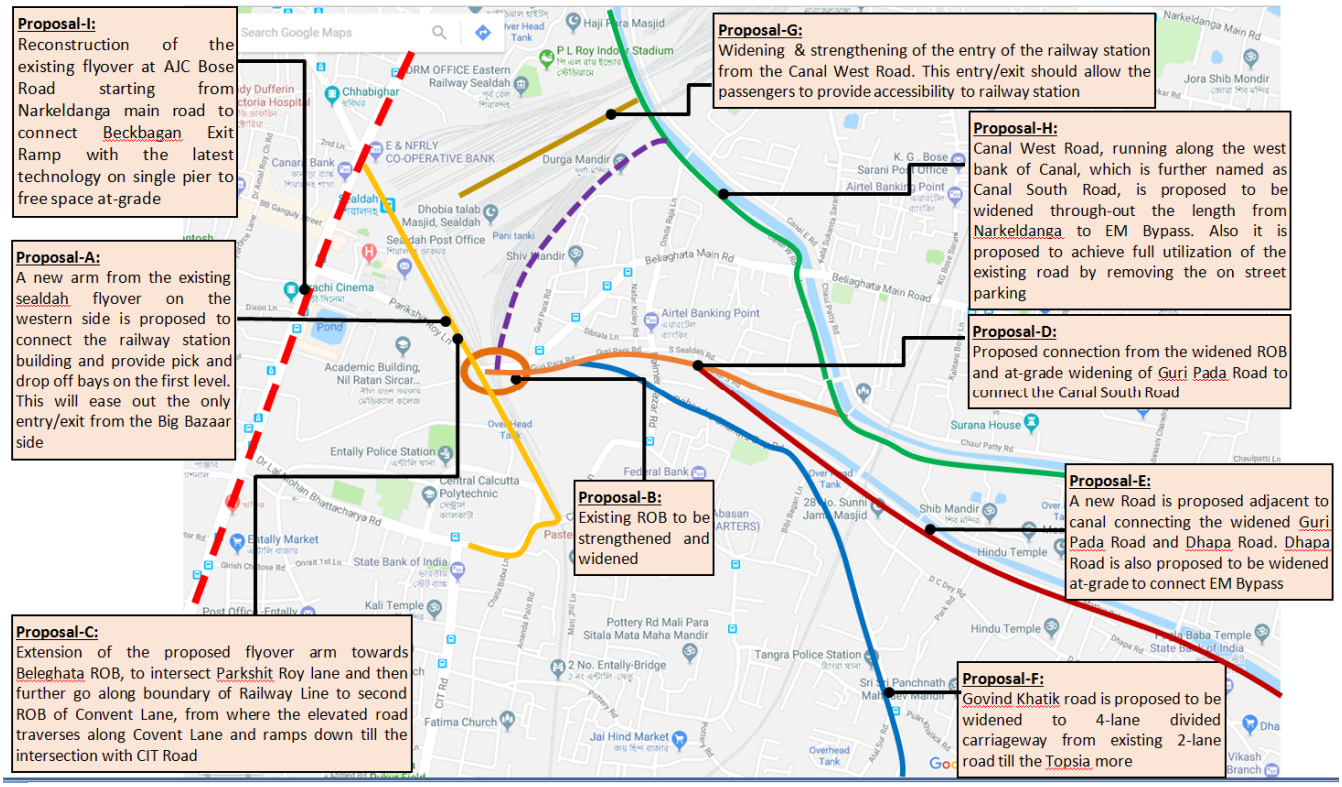

Fig. 7. Macro Level Proposals for Traffic Decongestion

- Proposal-G:Widening & strengthening of the entry of the railway station from the Canal West Road. This entry/exit should allow the passengers to provide accessibility to railway station
- Proposal-H:Canal West Road, running along the west bank of Canal, which is further named as Canal South Road, is proposed to be widened through-out the length from Narkeldanga to EM Bypass. Also it is proposed to achieve full utilization of the existing road by removing the on street parking.
- Proposal-I:Reconstruction of the existing flyover at AJC Bose Road starting from Narkeldanga main road to connect Beckbagan Exit Ramp with the latest technology on single pier to free space at-grade.
- Proposal Options for Sealdah Area: Taking proposal I into consideration two options for Sealdah Area have been developed. Option 1 considers the existing flyover on AJC Bose Road on as is where is basis and the rest of the proposals demarcated on the Topographic Map. Option 2 considers the reconstruction of AJC Bose Road Flyover and along with the other proposals.

Fig 8 presents the Multimodal Integration and accessibility improvement proposals around Sealdah Station Area. Fig 9 presents the 3d view of the proposal after implementation.

- Proposal-1:Area between Railway Station, Metro Station, Sealdah Flyover, District Court, Big Bazar and the two hospitals is to be designed for Multi Modal interchange area, with designated pick and drop, parking facilities, pedestrian plazas etc. An underground subway connection is proposed to connect directly from the metro station upto the Railway station building. Access to the existing underpass to be improved.
- Proposal-2: At-Grade Pedestrian Footway connecting railway station, metro station, district court, Big Bazar, existing Pedestrian Under Pass (PUP) underneath Sealdah Flyover across the Parikshit Roy Lane and NRS Hospital in front of NRS Hospital is proposed. Direct connectivity to these institutions and building are proposed at suitable levels.

- Proposal-3: A pedestrian FOB from Railway Station upto Raja Bazar Tram depot with entry/ exit is proposed. It would be accommodated along the western edge of APC Bose Road with regular entry/ exit on either sides of the road. The existing FOB near Tram Depot shall be reconstructed as a part of the new proposed FOB from Sealdah Station upto Tram Depot.
- Proposal-4: Raja Bazar Tram depot is proposed to be regenerated as a Multi Modal Interchange Hub (Terminal cum depot). The service lane in front of Tram Depot upto Narkeldanga Main Road on north and upto Athletic Club Ground towards south is to be redesigned and retrofitted accordingly.

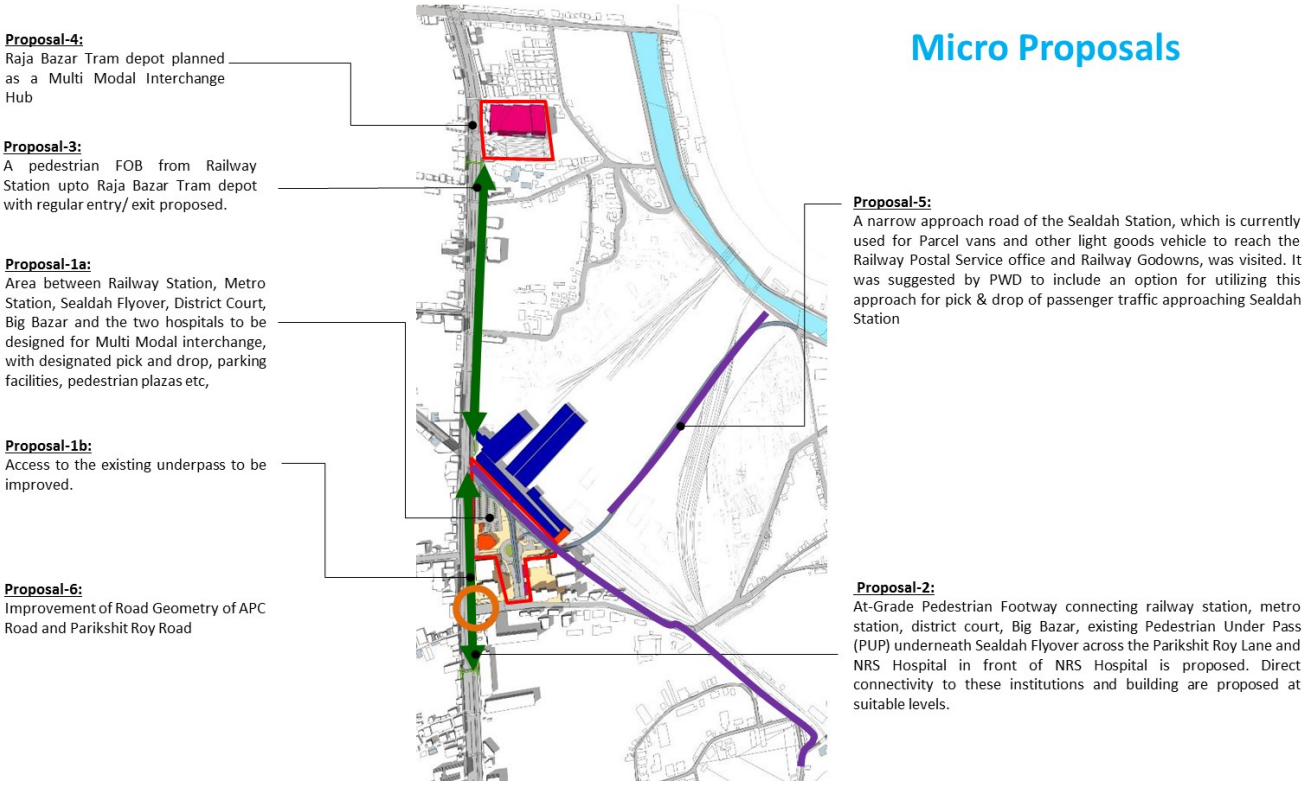

Fig. 8. Micro Level Proposals for MMI & Accessibility Improvement around Sealdah Station Area

Fig. 9. 3D View of the proposal after Implementation

7. Way Forward

A well designed and integrated multimodal transport hub will not only aid in shifting the private vehicle users towards the public transport system but also from the road based public transport systems towards rail based public transport system. The benefits include reduction in private vehicle usage followed by less road congestion and also create development and travel pattern with lower carbon impacts.

Extensive metro network will drastically modify the travel behaviour of the people of Kolkata and therefore, a seamless and rapid integration of different modes of transport with state of the art pedestrian facilities with the metro network will be essential at all important stations. This needs to be taken up extensively at the planning and design stage of the mass transport system. Area of around 50 m-100 m from the centre of a mass transit station may be given to the transit authority for development of an integrated transit hub with pedestrian facilities and simultaneously creating an urban transport realm. The area delineated for the redevelopment around the mass transit stations may be marked as an Orange Zone and modification in the zonal/development plan to suit the transit requirements may be taken up. The modification in the zonal/development plans may be initiated by the nodal agency of the city.

Multimodal Integration needs to be extended to other cities of similar nature where different modes of transport work in tandem to provide the integrated mobility platform.

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