



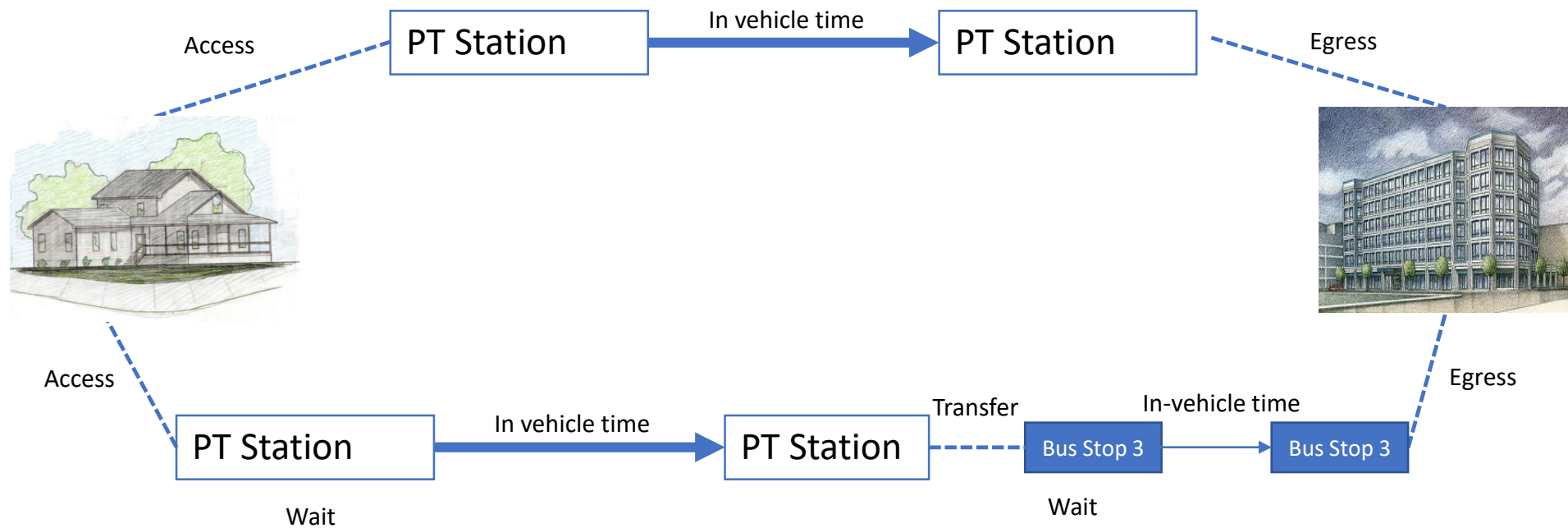
Framework for assessing Multimodal Integration in Indian Cities

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CEPT University

Structure

- Definition and Context
- MMI Components
- Multimodal integration assessment framework – 4MI

Public transport travel



Passengers consider the entire journey experience while making travel choices

What is Multimodal Integration?

- Combines public transport with other modes - NMT, IPT, private vehicles, other PT modes to provide seamless and door-to-door travel alternatives for commuters
- Often used interchangeably with 'integrated public transport' or 'integrated transport' (Janic & Reggiani, 2001)
- Means to reduce private car use and facilitate shift to sustainable modes of travel

Status of MMI in Indian Cities

Heavy investments in rapid transit modes in Indian cities

Indian cities are adopting various multimodal strategies realizing its relevance

- Feeder bus services & e-autos, introduction of smart cards, multi-modal hubs, travel apps
- Rapid transit modes often planned independently to other modes

Commuters faced with:

- Onerous transfers,
- Increased wait times
- Higher travel costs
- Poor ridership levels

Unattractive public transport - unable to facilitate mode shift

Objectives of MMI



**Improve delivery
of PT services**



**Improve
passenger comfort
and convenience**



**Improve access to
major facilities
and activity
centers**



**Bring efficiency &
increased revenue
for PT operators**



**Facilitate shift to
sustainable modes**

CORE AREAS OF MMI



1. Network & service integration



2. Physical integration



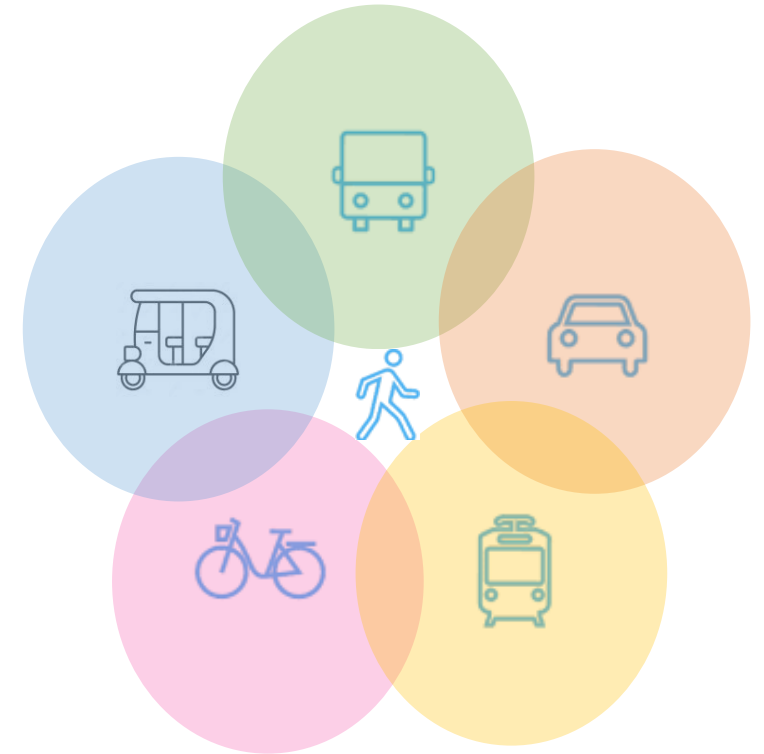
3. Fare integration



4. Information integration

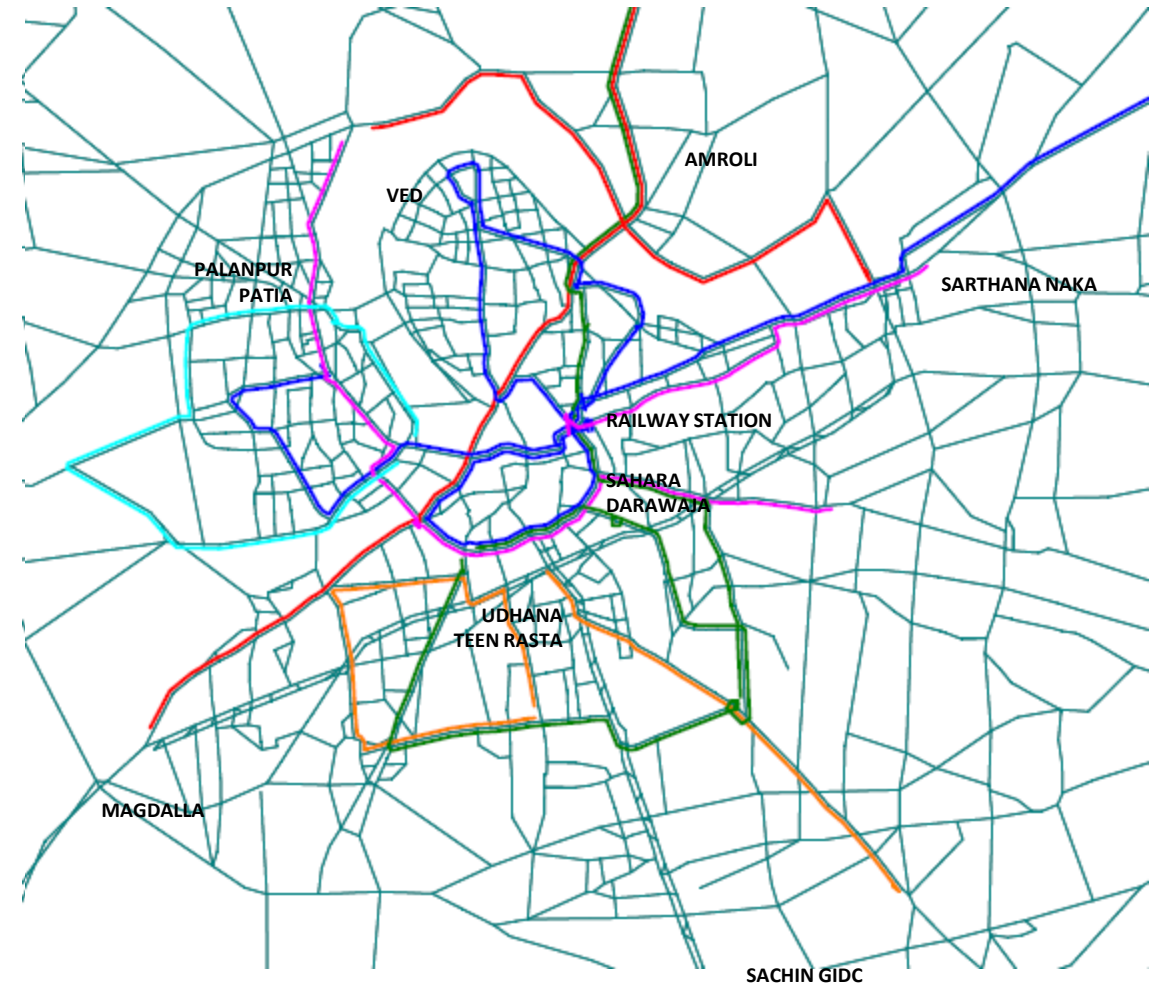


5. Institutional integration



1. Network and Service Integration

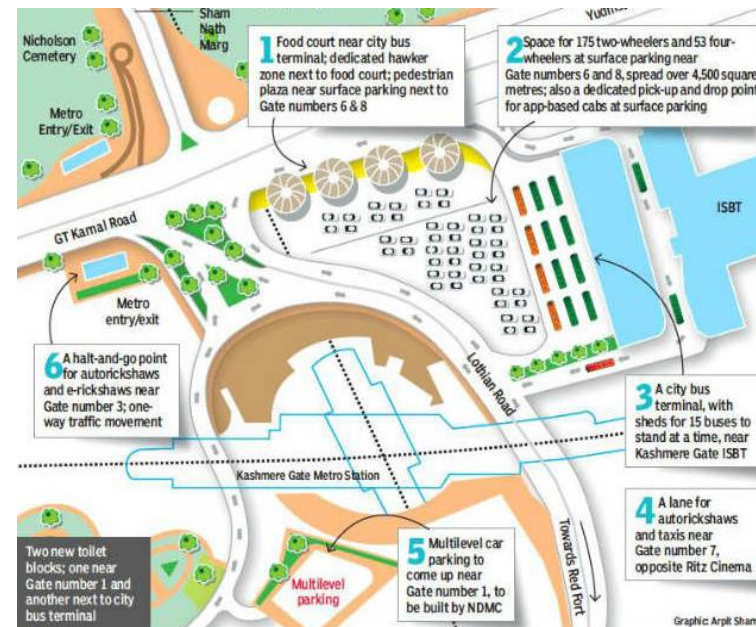
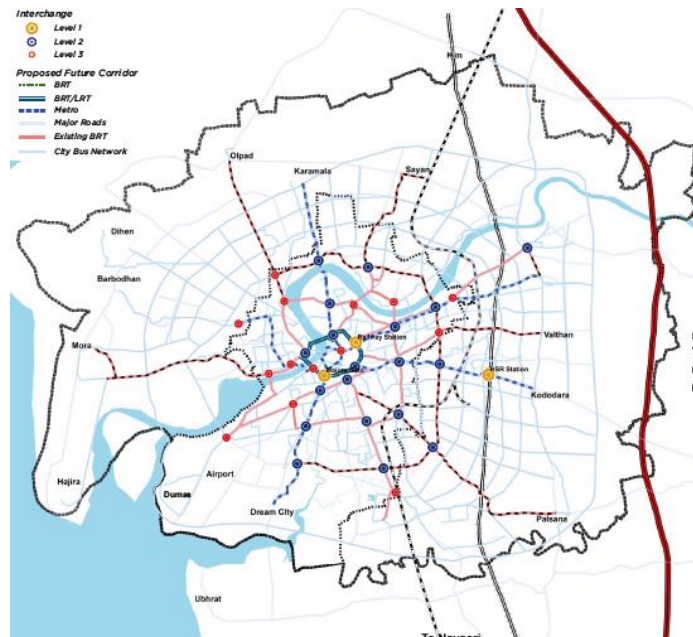
- Deals with linking up of routes & services across different modes to create a network
- Services are coordinated to ensure easy transfers
- Increases the PT service/catchment areas, accessibility and connectivity in city
- Improves PT accessibility



2. Physical integration

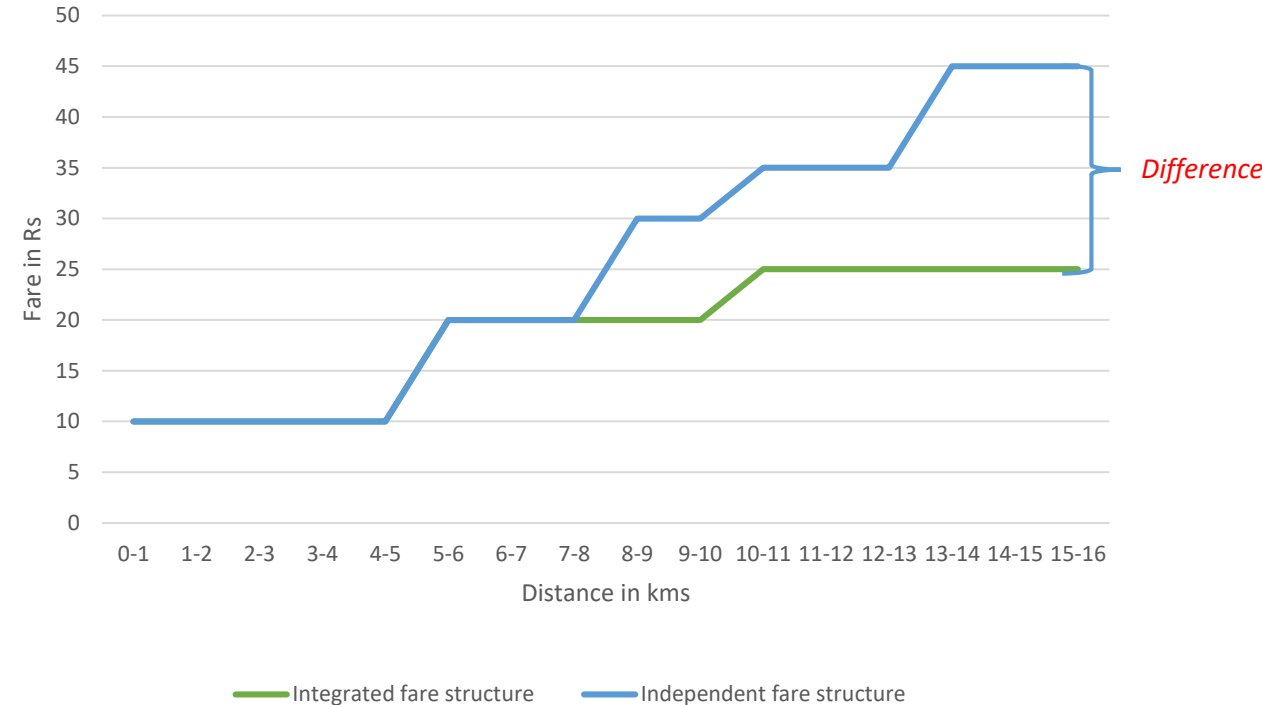
Bringing stops/stations of various modes within close proximity of each other and improves last mile connectivity

Facilitate easy transfers and improve attractiveness of multi-modal transport systems



3. Fare integration

- Integrated fares removes transfer penalties -enables payment as a single journey
- Single tickets - Eliminates purchase of separate tickets for different modes
- Makes travel attractive, affordable and convenient



4. Information integration

- Information to help passengers make informed decisions regarding their travel
- Information at various stages:
 - Prior to the start of the journey
 - Enroute
- Information about:
 - Stops/stations
 - On-board travel
 - Services (real-time)
 - Way-finding



<https://chalo.com/chalo-app>

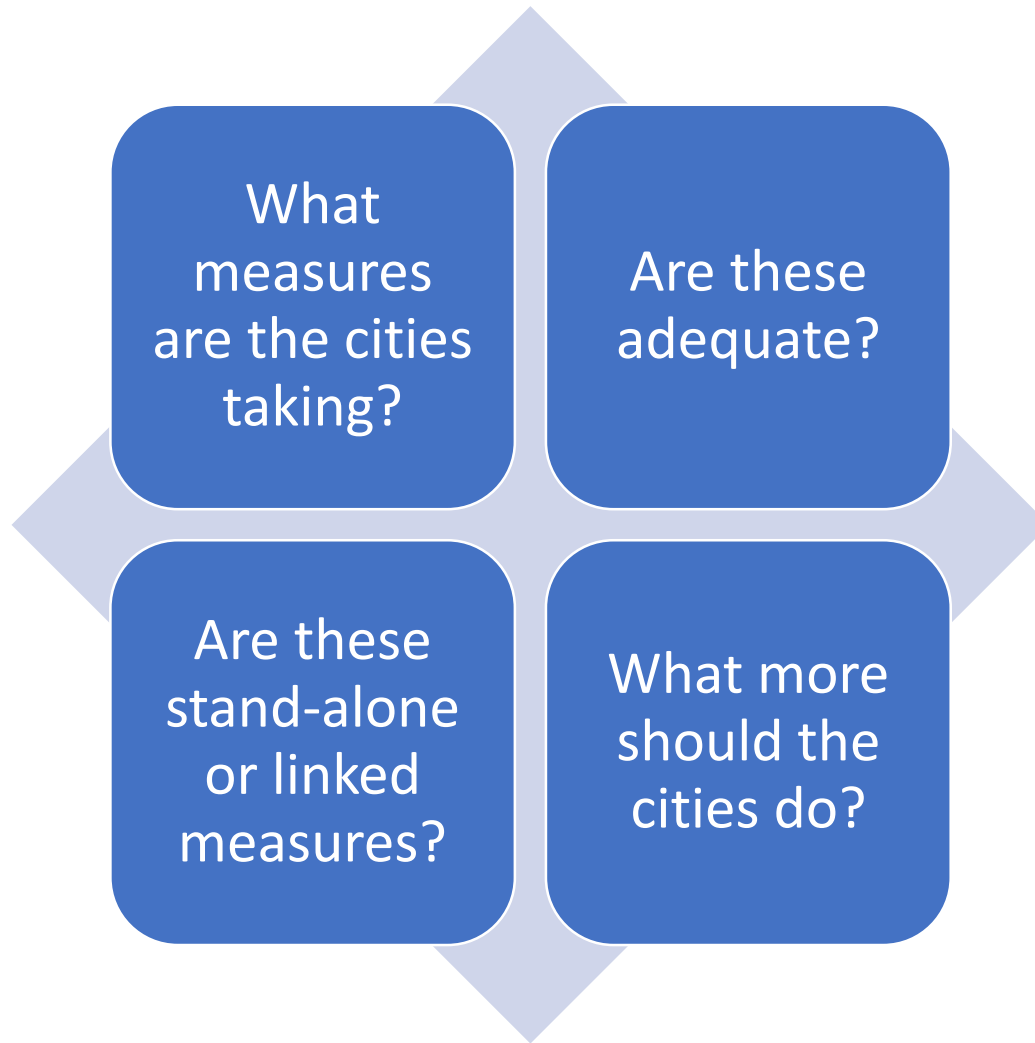


<https://www.asiaone.com/singapore/why-number-covid-19-clusters-bus-interchanges-growing>

5. Institutional Integration

- Coordinated working of agencies to plan and deliver integrated transport systems
- Draws out strategic plans and plans to ensure continuous cooperation and coordination between institutions at different stages
- Key for achieving integration across other core areas

Transportation components	Planning	Plan Implementation / Maintenance	Operation	Control/ Regulation/ enforcement
Road network	Urban Dev Authority (UDA), Municipal Authority (MA), NHAI, PWD	Urban Dev Authority, Municipal Authority, NHAI, PWD	na	na
Public Transport – Buses / BRTS	MA / SPV/State Road Transport Corp.	Transport service provider	Transport service provider, Private operators	RTO-licensing, permits, vehicle registration; Traffic Police
Regional Rail	Indian Railways			
PT- Metro	State Government	State level SPV		
NMV facility	MA, UDA	MA, UDA	na	
Traffic Mgmt	MA, UDA	Traffic Police		Traffic Police
Parking	Municipal Authority	Municipal Authority		Traffic Police
Freight			Private freight companies	Traffic Police



Are our cities working towards an integrated transport system?

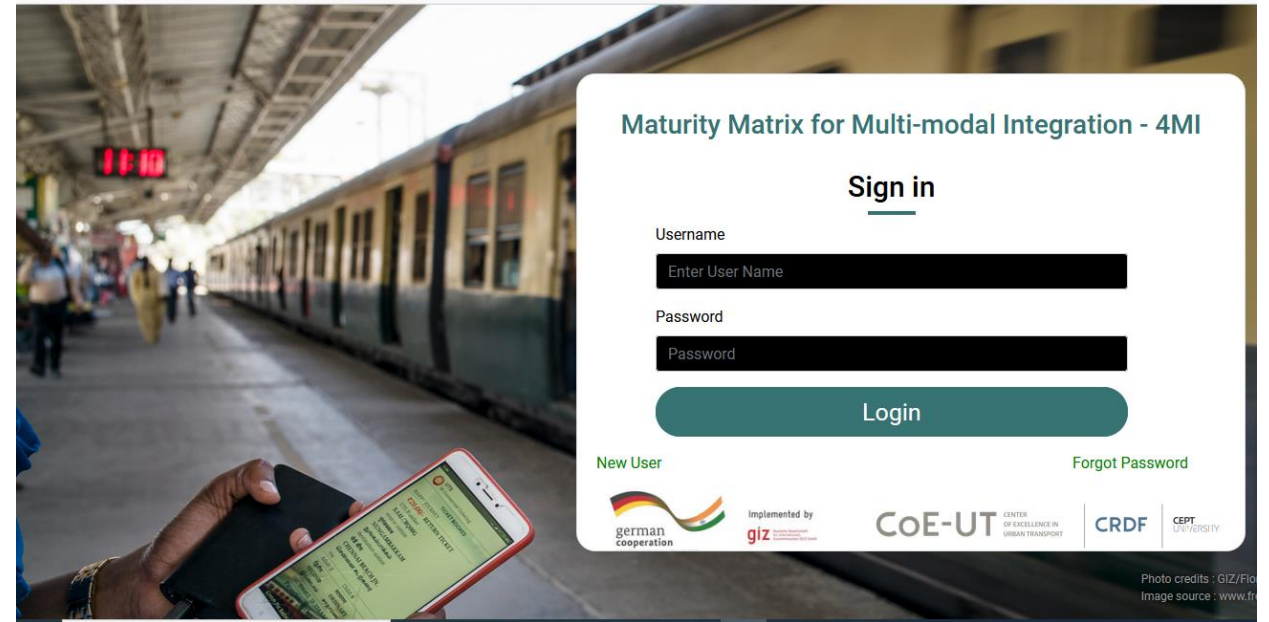
Where are we in terms of Multi-modal integration?

Input indicators to assess measures adopted and their comprehensiveness

Outcome indicators to assess efficacy levels

MATURITY MATRIX FOR MULTI-MODAL INTEGRATION (4MI) TOOL

- Developed by COE-UT, CRDF CEPT University as part of SMART-SUT project jointly implemented by MoHUA and GIZ under the Indo-German Green Urban Mobility Partnership
- Web-based tool, available at <https://4mitool.crdf.org.in/>



MATURITY MATRIX FOR MULTI-MODAL INTEGRATION (4MI) TOOL

- Assessment tool for Indian cities to assess maturity levels of integrated transport systems;
- Objective is to evaluate progress towards MMI and identify barriers/action areas
- Determine the extent of integration achieved across the five core areas of MMI and its sub-categories
- Can be used by the city authorities – to align with city objectives & enable realistic targets.

ELEMENTS CONSIDERED IN 4MI TOOL

NETWORK & SERVICE INTEGRATION



- E1. Planning of routes and services
- E2. Service headways and schedule coordination
- E3. Accessibility

PHYSICAL INTEGRATION



- E4. Proximity of transit stops
- E5. Accessibility within the interchange zone
- E6. Last mile connectivity to the interchange zone

FARE INTEGRATION



- E7. Fare policy/ structure
- E8. Fare technology

INFORMATION INTEGRATION



- E9. Information availability for commuters
- E10. Wayfinding
- E11. Customer care

INSTITUTIONAL INTEGRATION



- E12. Decision making processes
- E13. Data sharing and integration

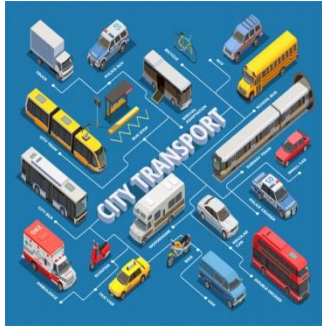
**5 CORE MMI
AREAS**

**13 MMI
ELEMENTS**

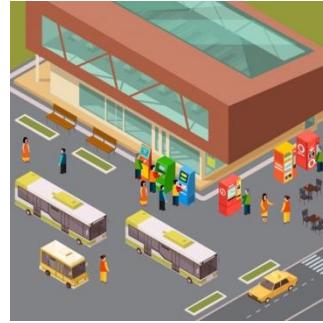
**5 LEVELS OF
INTEGRATION**

**13 X 5 MATURITY
MATRIX**

**NETWORK &
SERVICE
INTEGRATION**



**PHYSICAL
INTEGRATION**



**FARE
INTEGRATION**



**INFORMATION
INTEGRATION**



**INSTITUTIONAL
INTEGRATION**



LEVELS OF MATURITY



**Independent
Systems**

LEVEL 1

Nothing,
marginalized
or ad-hoc efforts/
planning

LEVEL 2

Baseline, informal
efforts, not
mainstreamed

LEVEL 3

Getting started, basic
applications and
processes being
adopted



LEVEL 4

Improving,
partially
integrated,
standardized and
managed
applications

**Integrated
Systems**

LEVEL 5

Advanced,
integrated,
continuous
improvement

Core Areas of Multimodal Integration	Elements	Levels of integration				
		Independent systems				Integrated systems
		Level 1	Level 2	Level 3	Level 4	Level 5
Network & Service integration	E1. Planning of routes and services					
	E2. Service headways and schedule coordination					
	E3. Accessibility					
Physical integration	E4. Proximity of transit stops					
	E5. Accessibility within the interchange zone					
	E6. Accessibility within the interchange zone					
Fare integration	E7. Fare policy/ structure					
	E8. Fare technology					
Information Integration	E9. Information availability for commuters					
	E10. Wayfinding					
	E11. Customer care					
Institutional integration	E12. Decision making processes					
	E13. Data Sharing and Integration					

Detailed descriptions of each maturity level for the 13 elements are specified based on which users can choose the level of maturity


Source: 4MI Tool developed by CoE-UT, CRDF as a part of SMART-SUT project jointly implemented by MoHUA and GIZ under the Indo-German Green Urban Mobility Partnership

Selection of levels for different MMI elements

← → ↺ 4mitool.crdf.org.in/MaturityMatrix/MaturityMatrix ☆ ⚙ S

Multimodal PT System – Maturity Matrix Select City ▼ New Scenario ▼ Save City MMI Score : 0 Admin ▼

Elements	Level 1	Level 2	Level 3	Level 4	Level 5	Select Level
8. Fare technology	<ul style="list-style-type: none"> No use of technology Manual ticketing – paper tickets issued 	<ul style="list-style-type: none"> Use of Electronic Ticketing Machines (ETM) for issuing tickets QR code tickets enabled for some of the modes 	<ul style="list-style-type: none"> Use of ETM for issuing tickets with QR codes on buses Automatic fare collection systems (AFCS) enabled with smart cards in case of rapid transit modes 	<ul style="list-style-type: none"> Interoperable smart cards across all transit modes – a single card can be used to pay fares for rapid transit modes Use of ETM for issuing tickets with QR codes on buses may continue 	<ul style="list-style-type: none"> Interoperable smart cards across all PT modes – a single card can be used to pay fares for all the modes including last mile modes - auto rickshaws, taxis, PBS, etc Mobile ticketing option also enabled 	Select Level
▼ Information Integration						
9. Provision of service information	<ul style="list-style-type: none"> No pre-trip information available online Information available at bus stops/ rapid transit 	<ul style="list-style-type: none"> Pre-trip information available on rapid transit mode agency's website Information available at bus 	<ul style="list-style-type: none"> Pre-trip information available on respective PT agency's website; in some cases, static information available on Google 	<ul style="list-style-type: none"> Pre-trip data available independently for each mode through respective websites or Google Maps 	<ul style="list-style-type: none"> Integrated trip planners available for all modes to help plan journeys Maps, service details and real-time 	Select Level

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		Independent systems					Integrated systems
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	E2. Service headways and schedule coordination			<div></div>	<div></div>	<div></div>	
	E3. Accessibility		<div></div>	<div></div>			<div></div>
Physical integration	E4. Proximity of transit stops		<div></div>	<div></div>			<div></div>
	E5. Accessibility within the interchange zone	<div></div>	<div></div>			<div></div>	
	E6. Accessibility within the interchange zone		<div></div>	<div></div>		<div></div>	
Fare integration	E7. Fare policy/ structure		<div></div>	<div></div>	<div></div>		
	E8. Fare technology		<div></div>	<div></div>	<div></div>		
Information Integration	E9. Information availability for commuters		<div></div>	<div></div>	<div></div>		
	E10. Wayfinding	<div></div>	<div></div>		<div></div>		
	E11. Customer care	<div></div>	<div></div>		<div></div>		
Institutional integration	E12. Decision making processes		<div></div>	<div></div>	<div></div>		
	E13. Data Sharing and Integration		<div></div>	<div></div>	<div></div>		

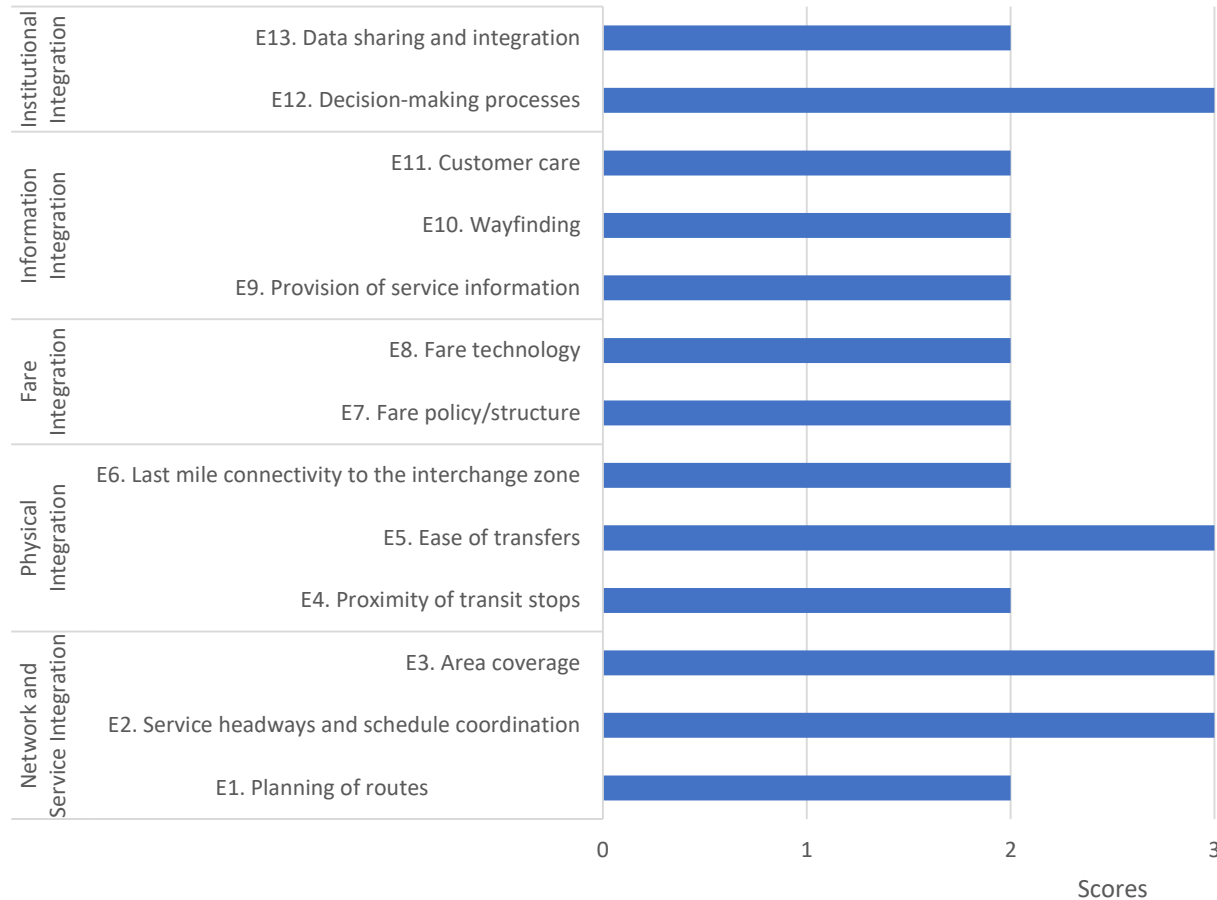
Source: 4MI Tool developed by CoE-UT, CRDF as a part of SMART-SUT project jointly implemented by MoHUA and GIZ under the Indo-German Green Urban Mobility Partnership

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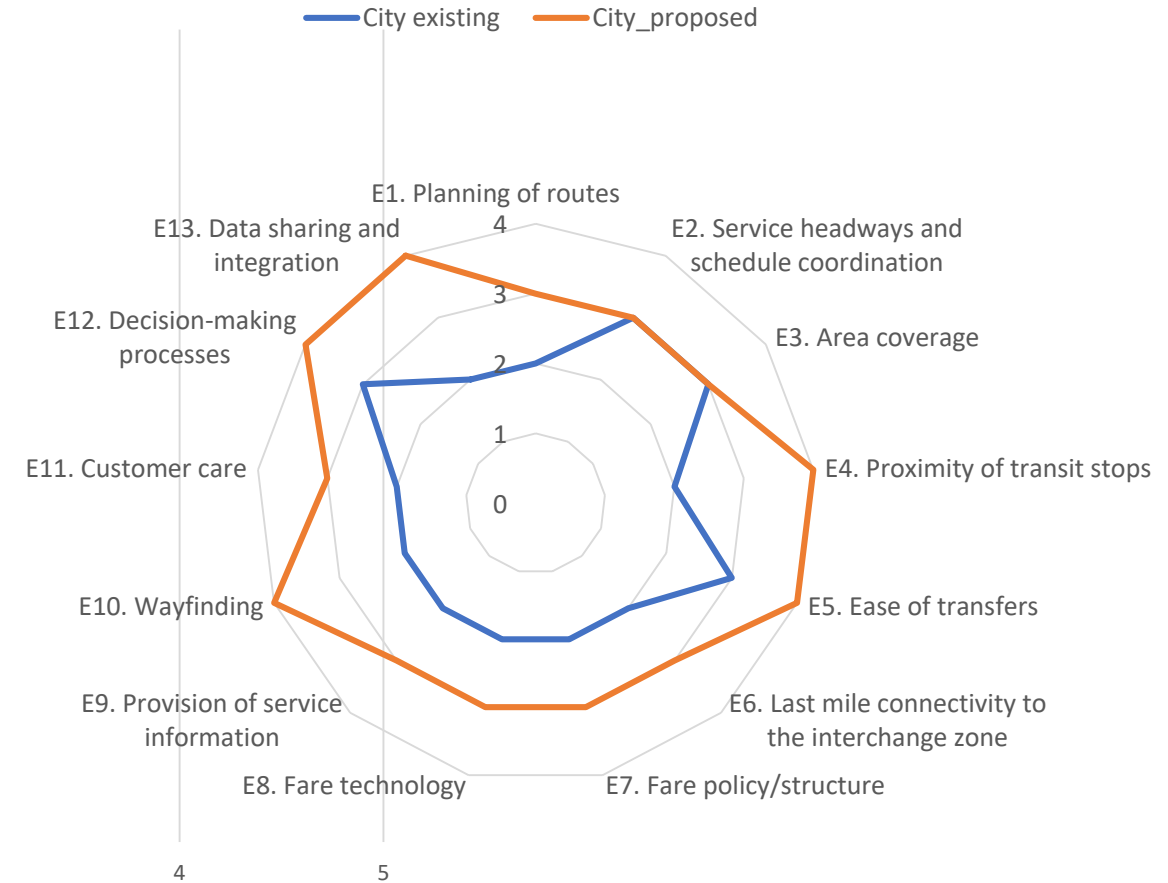
Source: 4MI Tool developed by CoE-UT, CRDF as a part of SMART-SUT project jointly implemented by MoHUA and GIZ under the Indo-German Green Urban Mobility Partnership

4MI TOOL OUTPUTS

City existing



MMI Scores comparison



OUTCOME INDICATORS FOR MMI

Multi-modal outcome indicators	Unit of measurement
1. Mode share of PT and NMT	Percentage
2. PT patronage	Percentage increase in ridership
3. Multi-modal integrated PT journeys (with transfers)* *Data regarding multi-modal integrated PT journeys will be available once integrated smart card ticketing is implemented across all PT modes	Proportion of total trips
4. Average PT journey time reductions (Transfer time & Waiting times separately)	Minutes
5. Smart card usage	Proportion of total trips
6. Customer satisfaction level	Percentage of PT commuters satisfied with the service levels of PT system

SUMMARY

- Integrated transportation system key for seamless passenger journeys and facilitating mode shift
- Cities undertaking several initiatives towards integration
- Need for a self-assessment framework for analysing the initiatives towards MMI and identifying future action areas

4MI tool features



Consists of five different maturity levels and five core areas of MMI



Enables future scenario creations and comparisons



Adopts a simple scoring system



Acts as a road map - outlines MMI strategies for achieving higher level of integration



Identifies current levels of maturity and helps track progress of MMI over time



Allows city authorities to identify areas of interventions achieved across the five core areas of MMI

Thank you

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Tool link: <https://4mitool.crdf.org.in/>