Feasibility and Travel Demand Study on Mass Transit Modes

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Contents :

Transportation :

- Transportation is a Derived Demand. Generally people travel for work, education, social and others. Demand defined by the nature and structure of the city.

- Level of urbanisation of India changed from 27.81% in 2001 census to 31.16% in 2011 census. The standard of living is increasing. Also there is increase in privately owned vehicles

- The quality of supply of public transport is inadequate.

- Private modes are used for convenience, comfort and reduced travel cost, which is just a temporary solution.

Peculiar Characteristics of Transportation :

- Common network structure : Wide and inter -linked
- Bulky Capital investments
- Decreasing marginal cost
- Long gestation Period
- Indivisibility
- Transport is a service sector and is not inventory.
- Benefits are not directly chargeable.
- Contingencies factors for uncertainties which involves assumptions

Travel Behavior :

According to Zahavi Hypothesis, a person willingly spends a maximum of **1.1 hour** for travel per day. Time value higher than cost of travel.

The need to provide a good transport system to a city over rides the risk factors associated with it.

Mass Rapid Transit Systems :

Metro Rail System

- Speed : 35 kmph
- Capacity (PPHPD) : 75000
- Approx. Cost : 280-840 Cr/km
- Inter-Station Distance : 800m-1km

Light Rail System

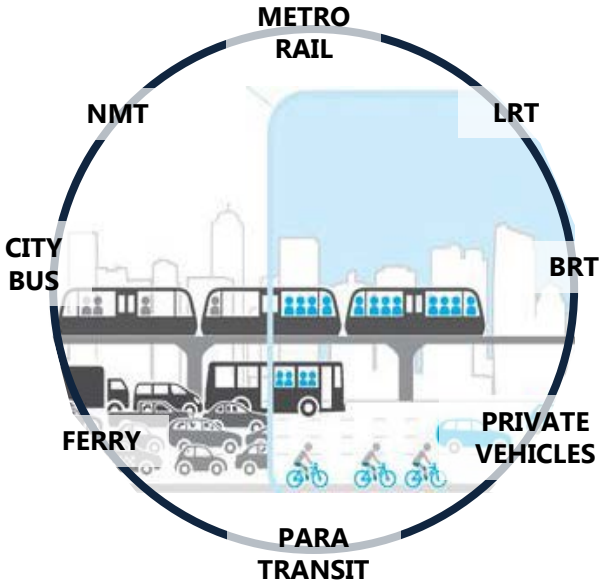
- Speed : 25 kmph
- Capacity (PPHPD) : 10000-25000
- Approx. Cost : 84 Cr/km
- Inter-Station Distance : 600m-800m

Bus Rapid Transit System

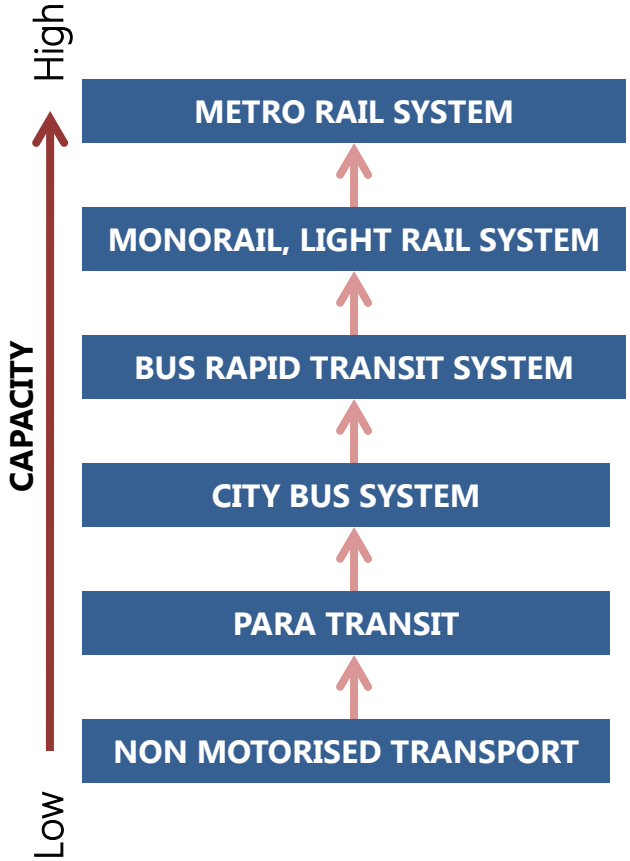
- Speed : 23 kmph
- Capacity (PPHPD) : 12000
- Approx. Cost : 20 Cr/km
- Inter-Station Distance : 500m-800m

Source : http://www.hindustantimes.com/delhi-news/delhi-metro-to-get-platform-screen-doors-to-prevent-suicides/story-8x5xxEGZOTwTwsJ5mtHj5I.html
https://www.connectingsingles.com/blog_54700_1/one_minute_travel_guide_to_enigmatic_pluralism_2.htm
http://itdp.in/cities/ahmedabad/

Integrated & Hierarchy of Systems :



An Integrated Transit System will ensure each public transport system catering its ridership to other and fulfilling the demand of the city



Metro System :
11000 Boarding in one hour
(13.4 km Stretch)

Different modes as feeder:


7333


4583


3666


183

Conventional Planning of a MRTS System for a city :

- Selection of MRTS :

1) Peak Hour Peak Direction Traffic
2) Average Trip Length
3) Population

▪ Density in the catchment of area of the MRTS is an important criteria to be considered for the planning of the type of MRTS. Since a dispersed city may have the population but would not have the required density. Hence the ridership would be less.

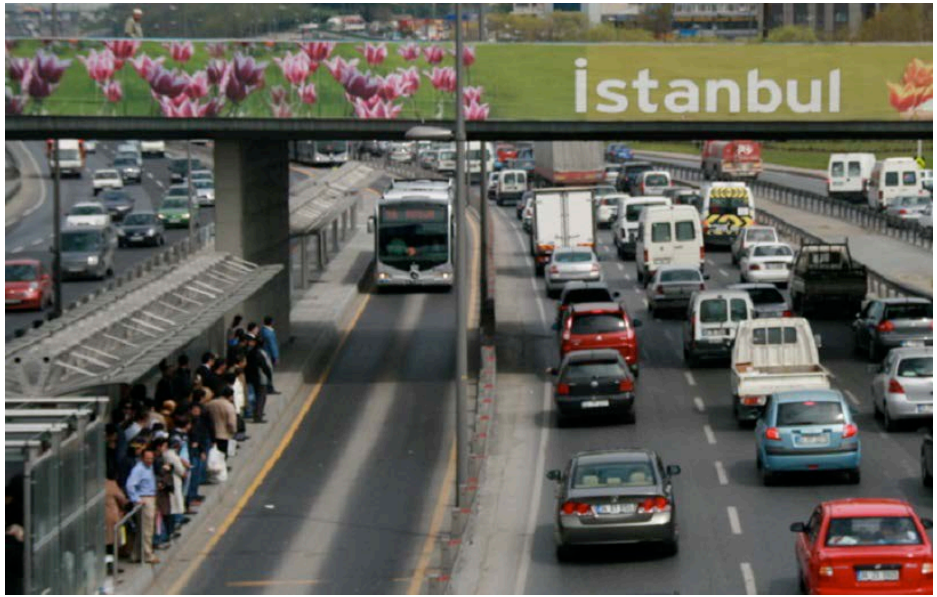
METRO RAIL SYSTEM

- Population : 2 million cities
- PPHPD : >=15000
- Average Trip Length 7-8 km

BUS RAPID TRANSIT SYSTEM

- Population : 1 million cities
- PPHPD : >=4000
- Average Trip Length > 5 km

MRTS around the world that has defied the set thresholds :



ISTANBUL BRT

SPEED : 40 KMPH

BOGOTA BRTS

PPHPD: 45000

Source : http://www.wrirosscities.org/news/can-lessons-learned-advanced-bus-systems-istanbul-apply-mumbai
http://www.lightrailnow.org/myths/m_bog_2009-09a.html

Kochi : Commercial Capital of Kerala

Source : https://postimg.org/image/j3r2rsyo7/

2.1 million
Population

632 sqkm
Area

❑ Travel Demand

2 million passenger trips/day

❑ PT share

2015 : 49 %

❑ Trip Length

NMT : 2.78 km

2 Wheelers : 9.44 km

4 Wheelers : 10.32 km

Public Transport : 9.5 km

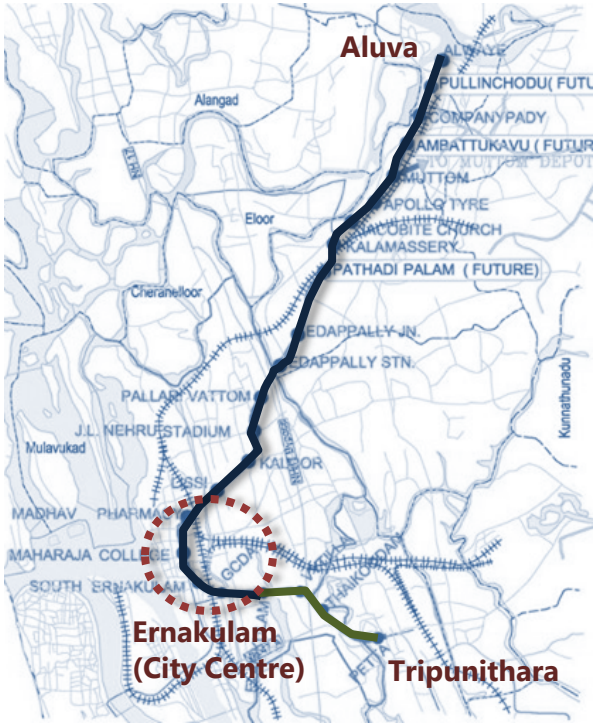
❑ Existing Public Transport Systems :

Metro Rail System, City Bus, Ferries, Para Transit

❑ Planned Public Transport Systems:

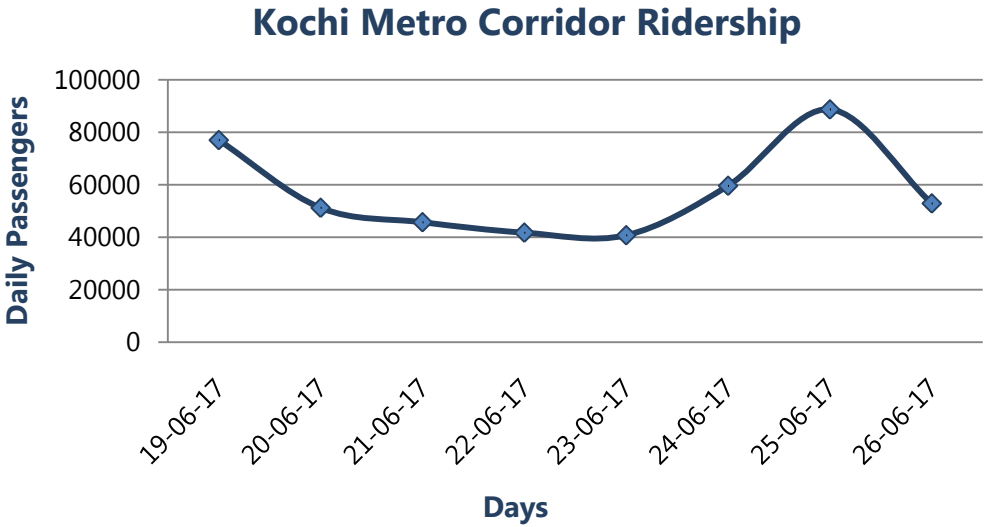
BRTS, LRT

Kochi Metro Rail System :



- Connecting major commercial belts
- Phase 1 : 25 km – Aluva to Petta Corridor
- 13.4 km inaugurated in July 2017 with 11 stations, and now extended to 18.6 km with 16 stations.

Year	Daily Passengers	PHPDT	Trip Length (km)
2015	381868	13681	7.33
2020	468130	17663	8.46
2025	539427	21065	9.55
2030	600526	23621	10.02



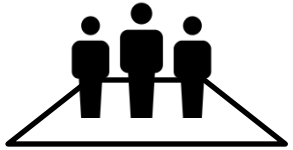
An **13,000 PHPDT** was expected for the Kochi metro system wherein the data shows an **3,600 PPHPD** along the metro corridor.

Perceptions :

CORRIDOR PHPDT

RIGIDITY OF SYSTEM

USER PERSPECTIVE



DENSITY OF MRTS CORRIDOR

Corridor PHPDT :

Corridor PHPDT involves all passengers boarding in corridor over a period of time, greater area reach for commuter population and also a greater mode shift is considered from private motorized vehicles to public transport in the volume calculation.

The Corridor PHPDT is thus expected to cater and desire for a greater population with fleet size and infrastructural systems depending on it.

Route PHPDT :

The Route PHPDT considers the maximum volume of the route using present public transport along the stretch and also considers a shift from the private mode users from the willingness to shift and user perspective surveys.

This allows the mode shift to be calculated along the certain route and with the present public transport ridership; a precise current expected ridership on the system can be predicted

Kochi Bus Rapid Transit System (Bus Express) :

Comprehensive Mobility Plan 2035

Public Transport Improvement Strategy

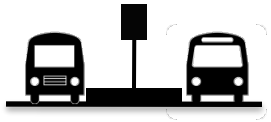
Study on different corridors & Suitability of MRTS

Kodungaloor to Eramallur - BRTS

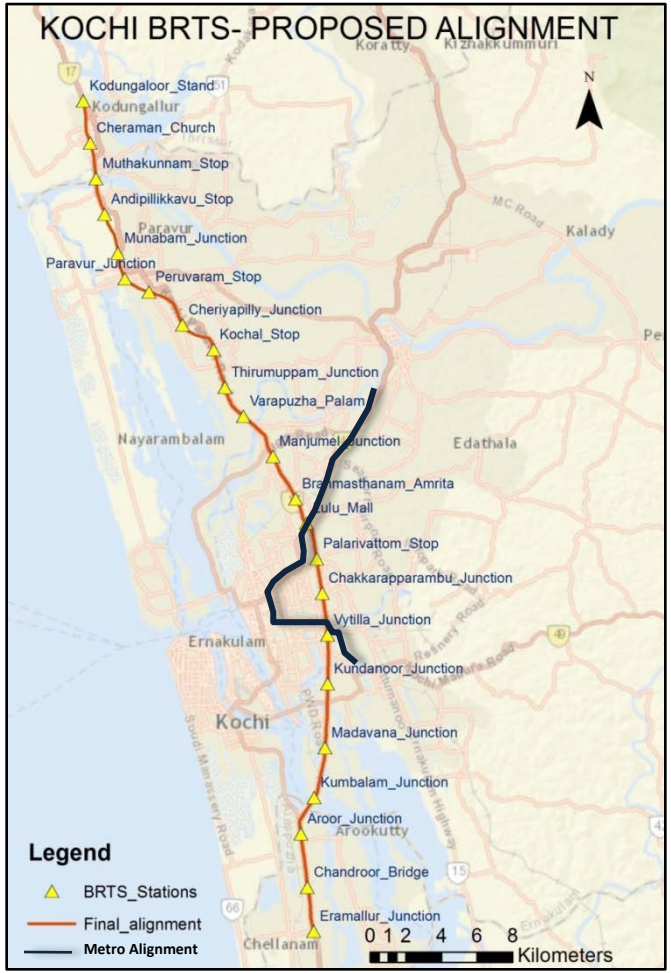
- Kodungaloor to Aroor – 51.6 km
- Providing North-South connectivity
- Intersects Metro Corridor at two locations

92
Existing Stops

23
Bus Express Stations



- BRTS Route passing through 12 Municipalities, Panchayats of aggregate population of **1 million.**



Kochi Bus Rapid Transit System (Bus Express) :

SECTIONAL LOADING (RAW DATA, CMP KOCHI 2017)							
Down Line Ridership				Up Line Ridership			
Stops	Boarding	Alighting	PPHPD	Stops	Boarding	Alighting	PPHPD
Andippillikkavu	841	0	841	Aroor	1677	0	1677
Paravoor	361	25	1177	Kumbalam	827	57	2447
Peruvanam	723	11	1889	Madavana	509	159	2797
Cheriyapalli	263	29	2124	Kundannoor	522	244	3075
Kochal	220	44	2300	Vytila	821	1511	2385
Thirumuppam	372	125	2547	Chakkaraparambu	134	380	2139
Varapuzha	142	256	2433	Palarivattom	582	332	2389
Manjummal	249	110	2573	Lulu	689	1430	1648
Amrita	249	193	2629	Amrita	166	288	1526
Lulu	828	1612	1845	Manjummal	153	352	1327
Palarivattom	375	1062	1158	Varapuzha	144	141	1330
Chakkaraparambu	87	297	949	Thirumuppam	136	421	1045
Vytila	310	1013	246	Kochal	73	339	779
Kundannoor	462	541	167	Cheriyapalli	34	144	669
Madavana	122	124	165	Peruvanam	16	221	464
Kumbalam	21	122	64	Paravoor	37	126	375
Aroor	0	64	0	Andippillikkavu	0	375	0
PHPDT	**5626**			**PHPDT**	**6520**		

- CMP raw data gives **PPHPD of 6520** for the BRTS corridor (without considering the mode shift)
- From the raw data for Up Line, the maximum **PPHPD 3075** for a section (without considering the mode shift).
- Average **PPHPD is 2852** for each directions for base year.

Kochi Bus Rapid Transit System (Bus Express) :

Ridership (Stakeholder survey, 4/7/'17)			
	No.of Buses	**Trips**	**Ridership**
Stretch (Private Buses) (avg. 65 tickets cut per trip)			
Paravur - Vytilla	23	4	5980
Kodungaloor - Paravur	8	4	2080
Paravur - Edapally(to Kaloor)	20	4	5200
Kodungaloor - Vytilla (From Guruvayoor)-Fast Passenger (Considering 45% get down at kodungaloor)	66	4	9438
Vytilla-Eramallur	55	5	17875
			40573
Stretch (KSRTC Buses) (avg. 60 tickets per trip)			
Kodungaloor - Edapally (Container Road)	60	3	10800
Kodungaloor - Vytilla	5	3	900
Through Inter District Buses	12	1	300
Vytilla-Eramallur	305	1	7625
			19625
TOTAL (Route Ridership)_one direction			**60198**
Considering 80% Shift from PT			**42139**
PPHPD (for 16 Hrs)			2634
Total PPHPD (20% mode shift)_one direction		527	**3200**

- Existing Services :
  - Private Buses
  - State Road Transport
- No Direct Service except inter district buses.
- Flexibility of system- Commence with 80% shift from existing , later possibility of upgrading.
- Mode shift based on the Stakeholders perspective

The average PPHPD obtained here in the ridership data almost corresponds to the PPHPD of the sectional loading of the route along the corridor.

Conclusion :

GOVERNING FACTORS FOR ACHIEVING PROJECTED RIDERSHIP ON MRTS THE CITY'S PUBLIC TRANSPORT SHARE	
Sl.No.	**Factors**
1	Extent of MRTS network of adequate capacity in the Mobility Area
2	Access to feeder network of the PT system within 500m at any given point within the notified mobility area
3	Spread & Efficiency of Feeder Network
4	Spread and availability of NMT Network
5	Accessibility / Inclusivity for all class of people
6	Seamless travel, Passenger experience & Informed Transit
7	Affordable, integrated & telescopic fare system

Conclusion :

- Conventional way of selection of MRTS :

1) Peak Hour Peak Direction Traffic
2) Average Trip Length
3) Population

- Additional criteria for selection of MRTS :

1) Route Peak Hour Peak Direction Traffic
2) Average Trip Length
3) Density along the probable MRTS corridors
4) Flexibility of the system

Understanding and Perceptions :

- This study was done for two modes of MRTS (one in operation and one in planning stage) in Kochi : Kochi Metro Rail Ltd and Kochi BRTS (Bus Express)

- The concept of route phpdt was found to be viable for the Kochi . It may or may not apply for other cities.

- This concept can be taken as base for volume calculation. A system should not be designed for volume lesser than route phpdt.

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THANK YOU