



LAND CHARACTERIZED TRANSPORT : CASE OF KOCHI

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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 urbanization 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.



Urban form



Settlements



Employment centers



Transport Demand

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

FACTORS AFFECTING TRANSPORT :

1

External Factors

- Land use
- Population Density
- Employment Density

2

Internal Factors

- Quality and Quantity of the services offered - Trips, Frequency, comfort, reliability, last mile connectivity and marketing

TRANSPORTATION PLANNING IN SYNC WITH THE CHARACTER OF CITY :

- An effective and strategic planning should be carried out considering the character of the city and the nature of commuters.
- Along with this, the system should be enhanced with environmentally efficient rolling stock, smart technology, incentives to passengers with reduced fare for travel, marketing and branding.
- There is no one point solution of public transport for all cities and this indeed is a late realization when our cities are trying to build metros, even at tier three cities like Kochi and Lucknow.
- Metro as a system was so attractive to all cities that it seems like a competition of getting approvals for the system to be built.

DELHI : 16.8 million



JAIPUR : 3.1 million

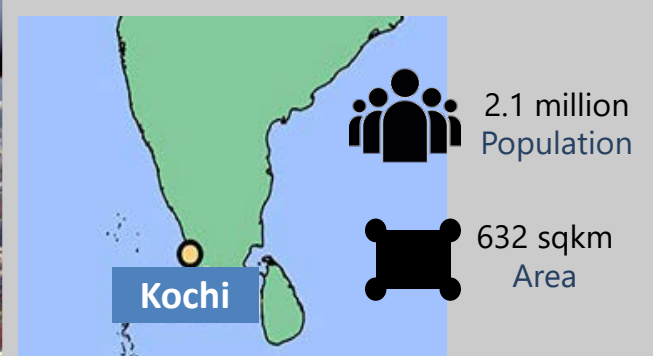


LUCKNOW : 2.8 million



KOCHI : 2.1 million

KOCHI : COMMERCIAL CAPITAL OF KERALA



Travel Demand
2 million passenger
trips/day

PT share
2016 : 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

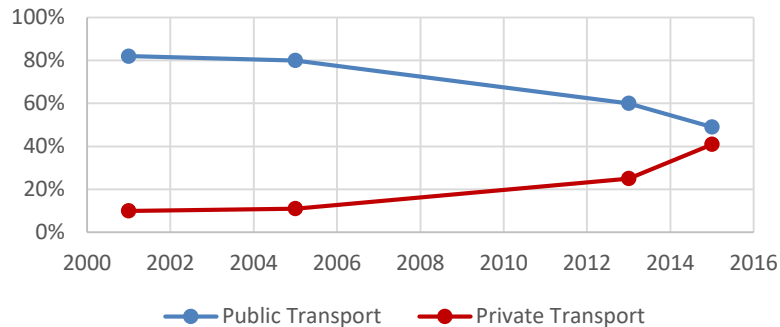
Planned Public Transport Systems:
BRTS, LRT

PUBLIC TRANSPORT DEMAND OF KOCHI:

- Bus system has always been the predominant mode of public transport system for the people of Kochi.
- Bus system caters to an overall boarding's of **12.87 lakh passengers per day** of which 11.5 lakh passengers use the private buses, as per the ticketing data of the respective operators.
- Ferry system connects to the major hinterlands and it is the lifeline mode for the people living in the islands. Ferry system has a daily average ridership of **10,000 passenger boarding** in Ernakulam division and the low ridership is mainly attributed to safety concerns of the poorly maintained ferries.
- The recent addition to the public transport is the Kochi Metro Rail system (18 km as on Aug 2019) which began operations in 2017. At its second year, the system may not have achieved the desired ridership with the present average ridership of **35,000 passenger boarding**. But it has made its presence felt for the people of Kochi, by changing the way the people of Kochi used to travel.

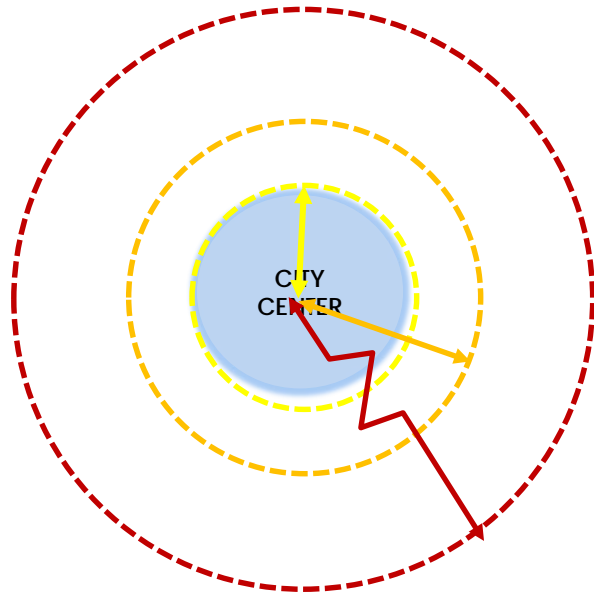
- Given the importance of Kochi and the developments coming up, the city is to grow even further, which would generate higher demand.
- The public transport share over the past years have shown declining trend, signifying the need for quick action.

Trend of PT and PVT in Kochi over years



Source: Kochi CMP, 2017

TRIPLE DISADVANTAGE THEORY:

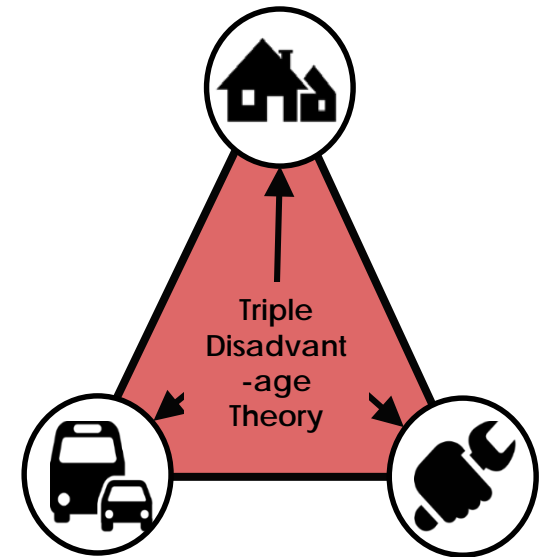


- Land value high at close proximity to city
- Affordable for higher income group
- Shorter trip distances
- Access to private vehicles
- Access to economic opportunities at the city and better infrastructure

- Comparatively lower land prices at distance further from city center
- Affordable for Middle income group
- Good accessibility to public transport meeting demand
- Access to economic opportunities at the city and better infrastructure

- Low income group people live at places far from the city
- Low access to public transport
- Low access to opportunities at the city and settle for work nearby

This disadvantage created by housing, transport and the work place can be defined as **triple disadvantage theory**.

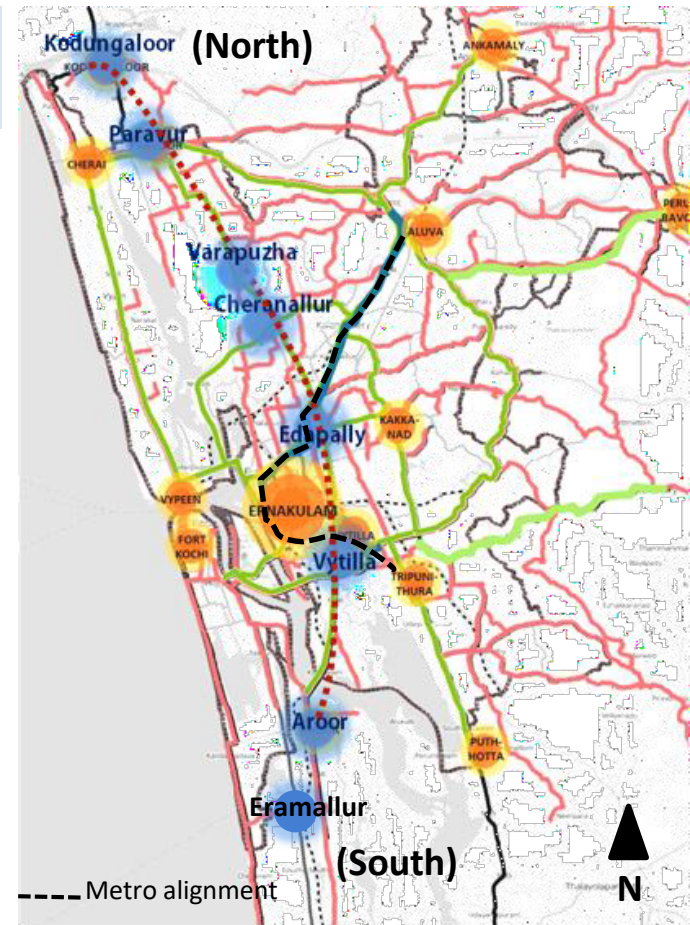


CHARACTER OF SETTLEMENTS :

Ribbon development, along the major corridors with medium density settlements at 2-3 km distance making small towns.

CHARACTERISTICS OF CORRIDOR UNDER STUDY:

- **51.6 km long** connecting Kodungalloor (North) to Eramalloor (South)
- Corridor align **perpendicular to Metro alignment** and intersects with metro at two major interchanges. Passes through 12 major local self- government jurisdictional area summing up to a population of over **1 million**.
- Three major NH and a number of local roads cutting across the proposed alignment, thereby arising a **greater accessibility** and need to cater the **faster movement of people**.
- Apart from serving the towns lying in the alignment, the mass transit system would also cater to the demand of the two districts North and South of Kochi whose commuters travel **daily** such **longer distances** for work.



PRESENT DAY ISSUES IN TRANSPORT:

- Present **Travel Time** over this stretch is a minimum of **2hr and 30mins** in a public transport; this includes the 10 to 15min circulation time the buses take to come through the Paravur and Vyttila bus stands.
- There are **no direct bus services** along the proposed stretch other than the inter district services from North to South
- Accidents are also a huge concern here, which has remained constant over the years with little or no interventions. The **safety, comfort and faster mobility** of people are questioned presently over this stretch.



CORRIDOR AND ROUTE PHPDT :

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

Route PHPDT: This land demand assessment method makes the system design a network approach considering lower possible demand in the corridor rather than high demand projections resulting in metro scenarios across the nation.

DEMAND ASSESSMENT OF CORRIDOR

SECTIONAL LOADING (RAW DATA, CMP KOCHI 2017)							
Down Line Ridership				Up Line Ridership			
Stops	Boarding	Alighting	PPHPD	Stops	Boarding	Alighting	PPHPD
Andipillikkavu	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
Manjummam	249	110	2573	Lulu	689	1430	1648
Amrita	249	193	2629	Amrita	166	288	1526
Lulu	828	1612	1845	Manjummam	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	Andipillikkavu	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.

DEMAND ASSESSMENT OF CORRIDOR

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.

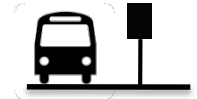
❑ Mode shift based on the Stakeholders perspective

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

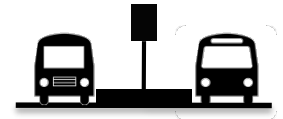
COMBINATION INTER-CITY AND INTRA-CITY CONNECTIVITY

- The recommended system based on the demand is Bus Rapid Transit System.
- At present, there are 92 bus stops in the stretch from Kodungalloor to Eramalloor (51.6 km), which reduces the efficiency of the bus system due to frequent stops. This is unattractive as per the land character for the long distance or town-to-town commuters.
- The 92 stops will be reduced to 23 based on settlement pattern with an average distance of 2.25 km, thereby the overall efficiency of the bus system is improved, the average speed increases and the operational cost reduces.
- The reduced stops would make the long distance mobility much easier, safer and faster, thus attracting a large sub urban population to the main city for employment and allied activities
- The feeder network should be provided on the existing bus routes, limiting the operations onto the trunk corridor.
- The unhindered flow of trunk system with well-connected feeder system will satisfy both intercity and intra-city trips thereby providing the transport justice considering the nature of the corridor.

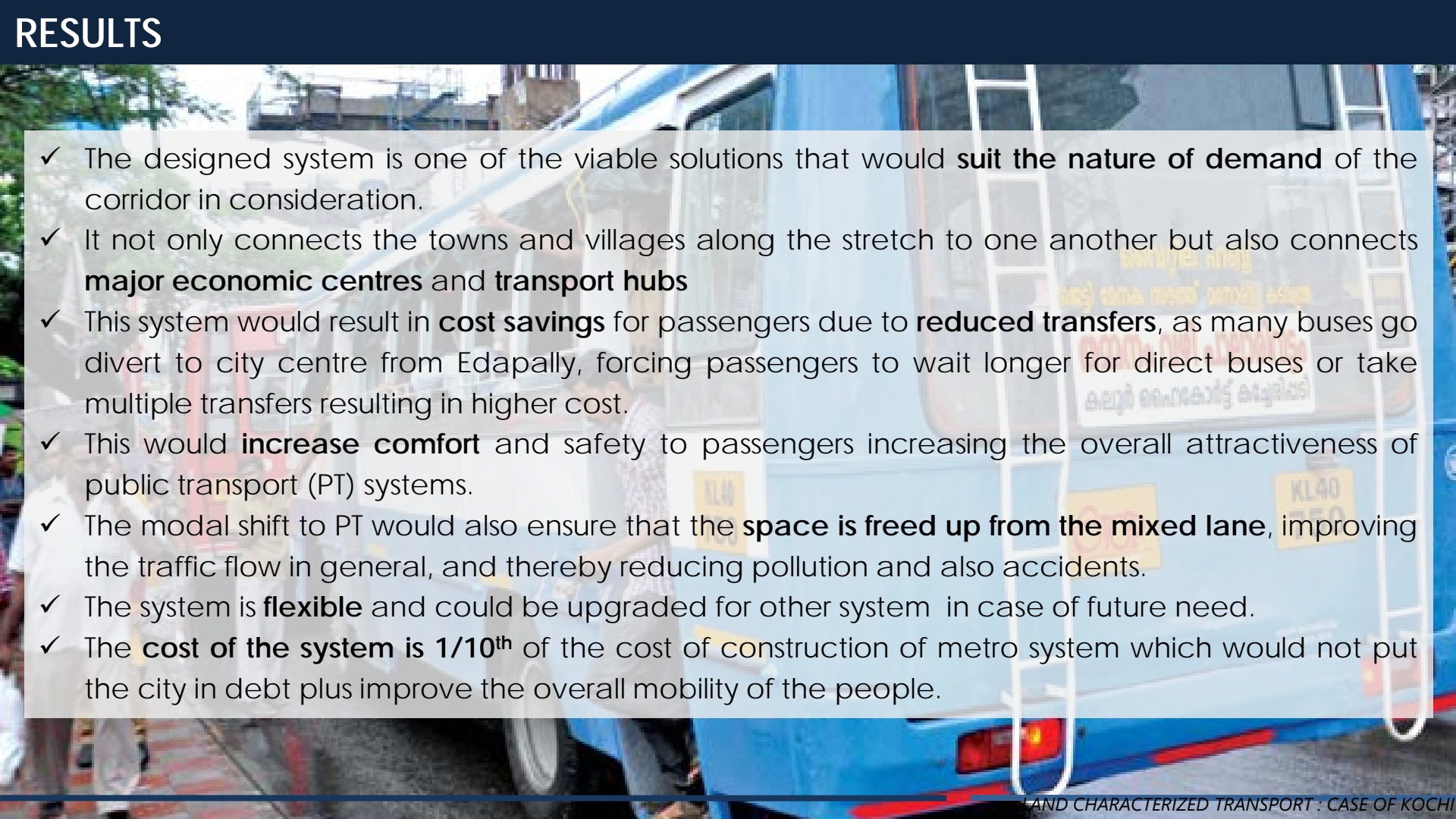
92
Existing Stops



23
Bus Express Stations



RESULTS

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- ✓ The designed system is one of the viable solutions that would **suit the nature of demand** of the corridor in consideration.
 - ✓ It not only connects the towns and villages along the stretch to one another but also connects **major economic centres and transport hubs**
 - ✓ This system would result in **cost savings** for passengers due to **reduced transfers**, as many buses go divert to city centre from Edapally, forcing passengers to wait longer for direct buses or take multiple transfers resulting in higher cost.
 - ✓ This would **increase comfort** and safety to passengers increasing the overall attractiveness of public transport (PT) systems.
 - ✓ The modal shift to PT would also ensure that the **space is freed up from the mixed lane**, improving the traffic flow in general, and thereby reducing pollution and also accidents.
 - ✓ The system is **flexible** and could be upgraded for other system in case of future need.
 - ✓ The **cost of the system is 1/10th** of the cost of construction of metro system which would not put the city in debt plus improve the overall mobility of the people.

CONCLUSION

- **Internal and External factors affect the public transport system and land** and its use acts as an important factor deciding whereby the demand is **generated, distributed and attracted**.
- It is imperative to design a public transport system in coherence with the **urban character** and in the case of Kochi it is ideal to have a bus rapid transit system in the considered corridor.
- The land demand assessment involved the concept of route PHPDT whereby the **network approach** was taken into consideration for the corridor concerned.
- The proposed closed type bus rapid transit system with reduced stops based on the **land character of 2-3Km settlement pattern** will create faster mobility, safety with the dedicated corridor, accessible with feeder system, comfort and reliable public transport system. This system will indeed provide transport justice as discussed creating an efficient public transport system.



THANK YOU