

Introduction

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Objectives

- To evaluate the circulation patterns of public transport users in interchanges
- To explore and recommend suggestions to improve the public realm of the area
- To recommend interventions that can make the transit transfer a seamless experience

Aim

“To ensure seamless mobility in intermodal transportation in-order to make the travel experience as a single journey experience”

Scope

- Focuses only on the accessibility to the interchange zone
- Inputs are captured from the perspective of the users and the community around and not the operators
- Out of the three stations considered as part of the interchange zone in the study area, only the ferry and bus services were functioning and the metro was just proposed

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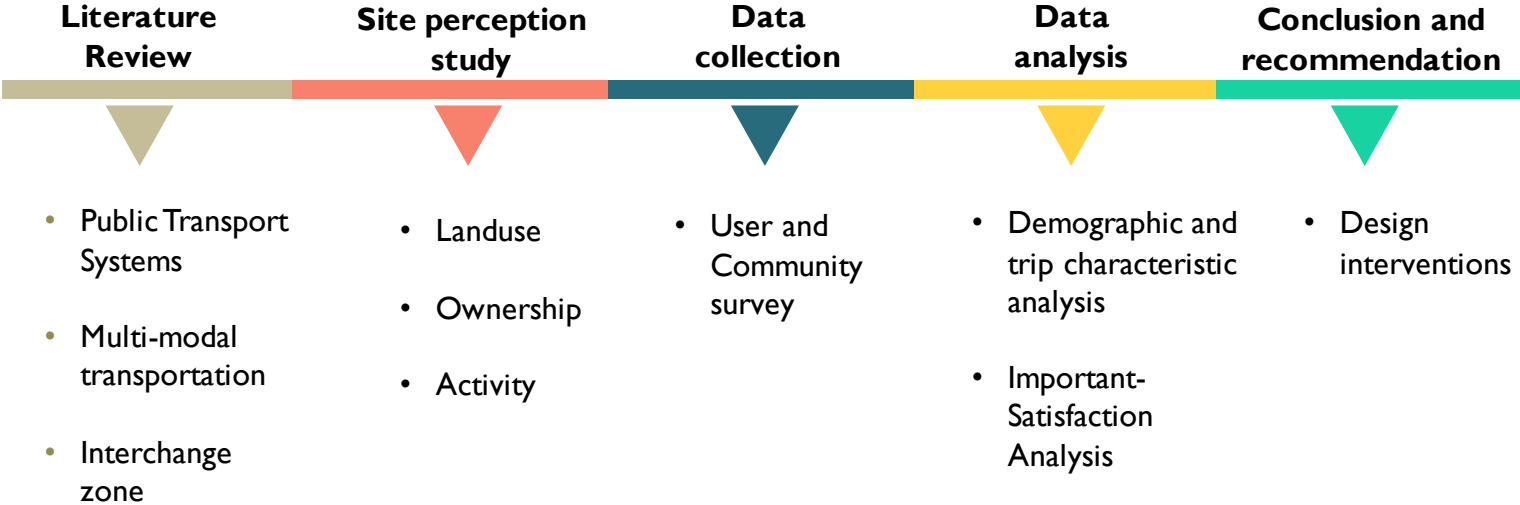
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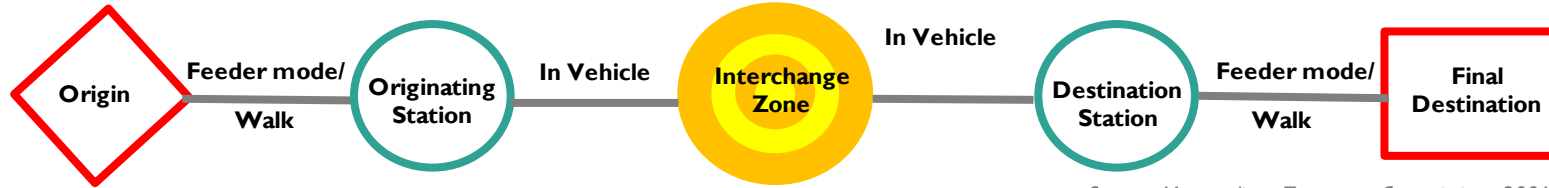
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MULTI-MODAL TRANSPORTATION

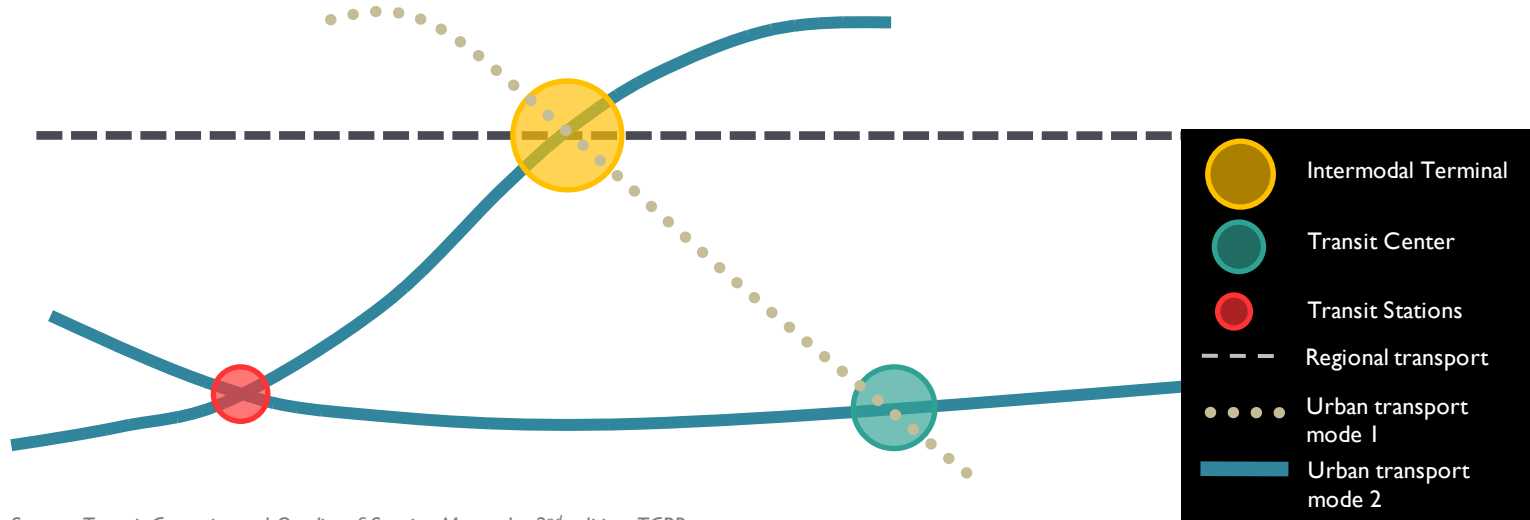
Multi-modal transportation is when a journey requires the use of multiple modes of transportation, either government or privately owned, to travel from origin to destination



Source: Metropolitan Transport Commission., 2006

Transfers

While commuting through means of multi-modal transportation, one needs to transfer from one type of mode to another. An efficiently integrated and planned transfer zone will decrease the travel time to an extent



Source: Transit Capacity and Quality of Service Manual – 2nd edition TCRP

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INTERCHANGE ZONE

A wide space where inter-modal transfer happens, which includes the surrounding community and economy and enhances the public realm of the area



Movement spaces

Spaces that link the decision spaces. (corridors and paths)

- Clear unobstructed routes
- Fixed items such as street furniture, plantings, advertisements, etc. can be located adjacent



Decision spaces

Areas where passengers take a decision regarding their journey. (Entrance, ticket office or corridor junctions)

- Clear signing or good sight lines
- Information such as time schedule, platform number, etc.



Opportunity spaces

Areas of the interchange zone that exists outside the core corridors of movement or decisions

- Can accommodate cafés, retail entrances, retail display, seating or landscaping.

Source: *Interchange Best Practice Guidelines 2009.*
Transport for London & Design for movement-Case studies

ABOUT KOCHI

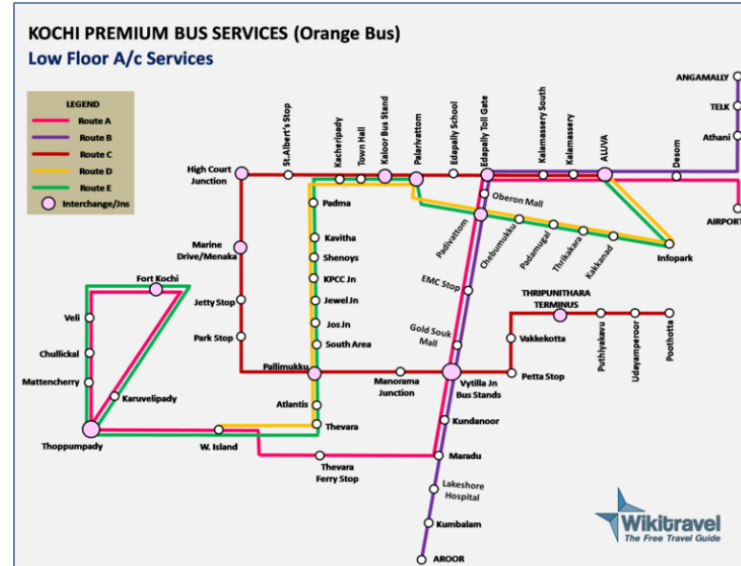
- Port city with a population of **2.118 million** and an area of **94.88 Sq.Km** (2011 Census)
- **Commercial and industrial capital** of Kerala
- **Increase in population** which in turn contributes immensely to the city's traffic
- **Traffic congestion** has been a major concern to its people
- Kochi mainly includes **bus and ferry services** in its public transport system
- A **Metro rail** is now being operated, which is expected to reduce the traffic issues in the city



- 630 intra-buses
- 2100 long-distance private buses (466 are inter-city state buses)
 - 160 official authorized routes

Green Bus

- Operators – KSRTC under JNNURM
- Low floor non AC Volvo



Source: Retrieved from Kerala State Road Transportation Corporation

Ferry Service

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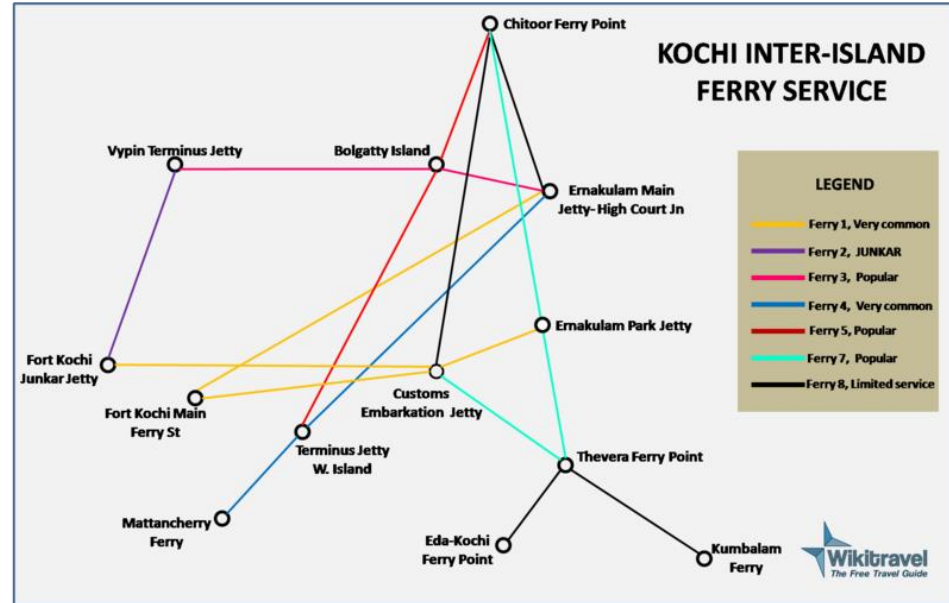
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Intra-ferry service operated by - Kerala Shipping and Inland Navigation Corporation (KSINC), the state Water Transport Authority

Two main boat jetties in Kochi: High Court Jetty and the Ernakulam Central jetty

Ernakulam boat jetty:

- 9 boats - 3 inter-service, 6 intra-service
- No. of people: 75-100 people.
- Ticket fare – Depends on destination
- User group – 1/3 tourists, rest are daily commuters.
- Frequently travelled destination - Fort Kochi



Metro Service

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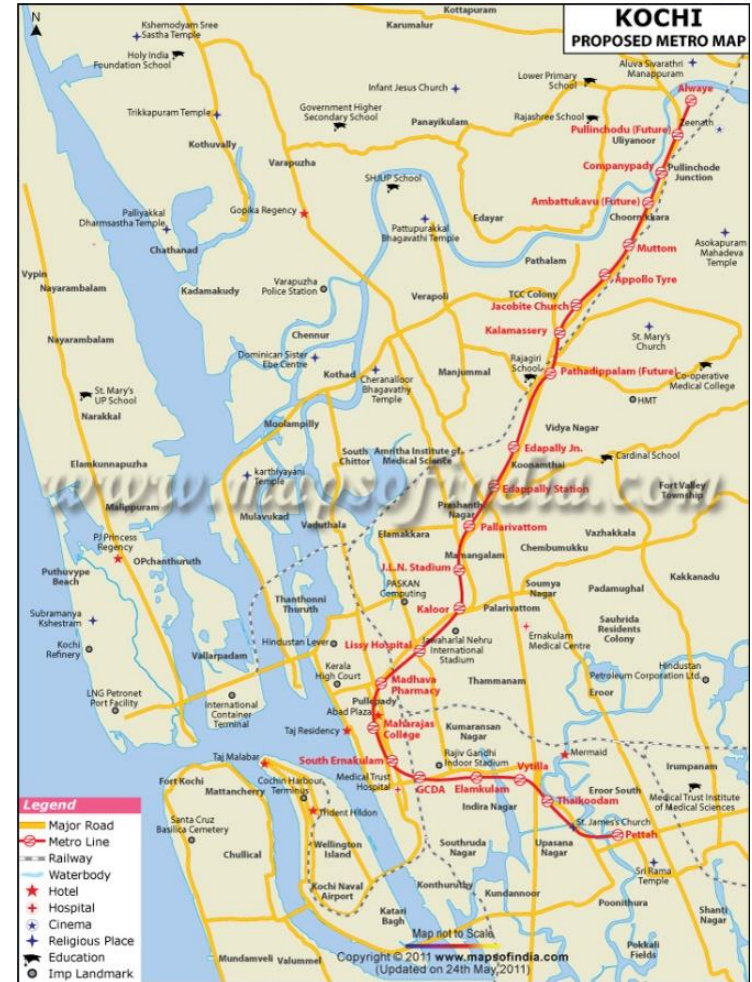
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- Construction by: DMRC (Delhi Metro Rail Corporation)
- Operation date: June 2017
- Estimated completion cost: Rs 5181.79 Cr .
- First phase origin and destination: Aluva to Petta
- Fare system: Automatic fare collection system with combination of smart card & computerized paper tickets.
- Fare amount: Rs 15/- to Rs 30/-
- Capacity of the train: 975 passengers (8 Standee passengers/sq.mtr; seating 140)
- Phase-II origin and destination: Jawaharlal Nehru Stadium at Kaloor to Infopark via Kakkanad.



Marine Drive

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- Major commercial spine
- Existence of existing bus and ferry station and proposed metro station at approx. 800m
- Acts as a landmark to the city and is a tourist destination :
Promenade (140 m walkway), two parks contemporary bridges, shopping centre and cafes.
- An area of 0.75 sq.km was taken as the study area surrounding the stations for detailed analysis and survey purpose

STUDY AREA



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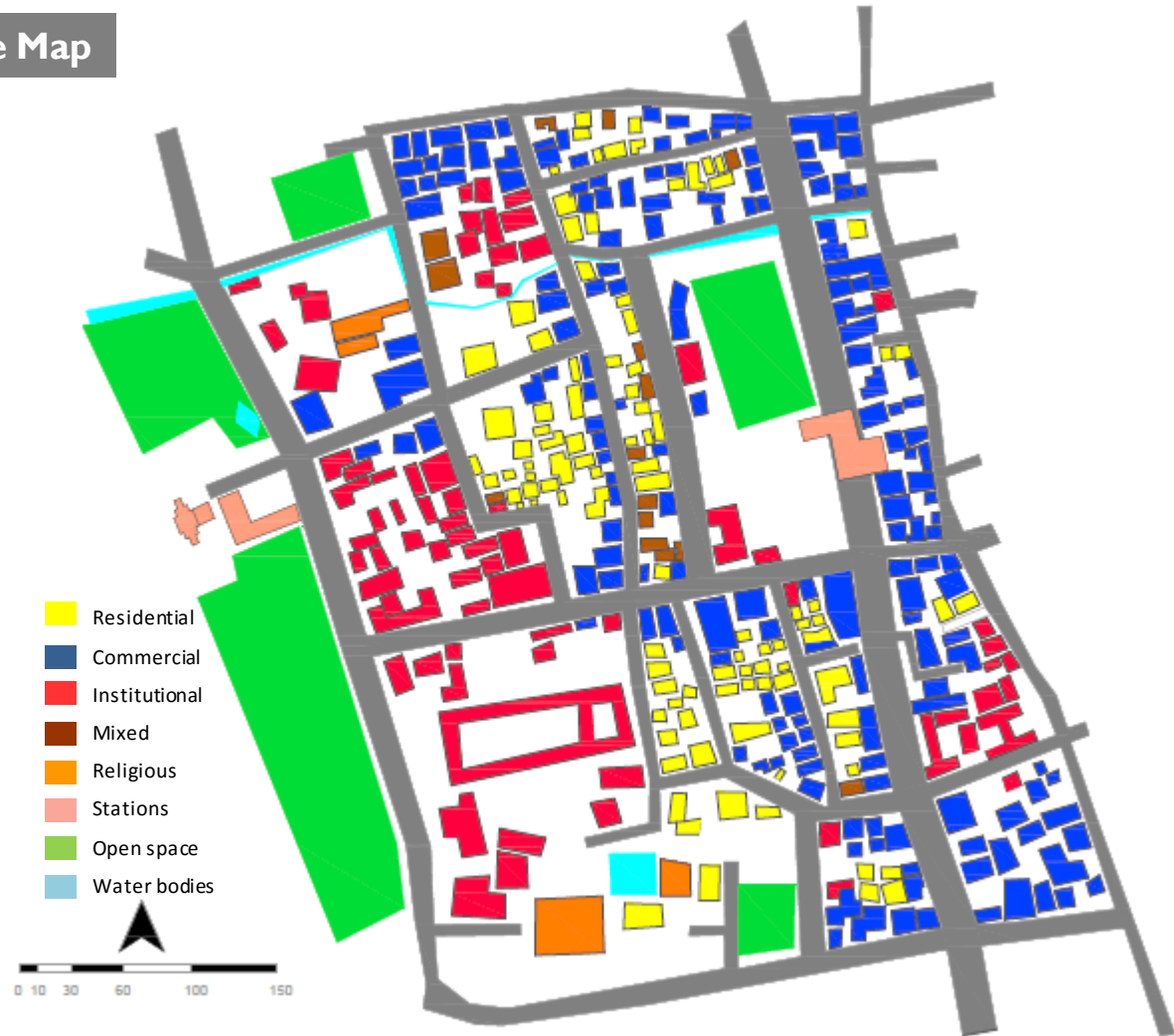
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Land use Map



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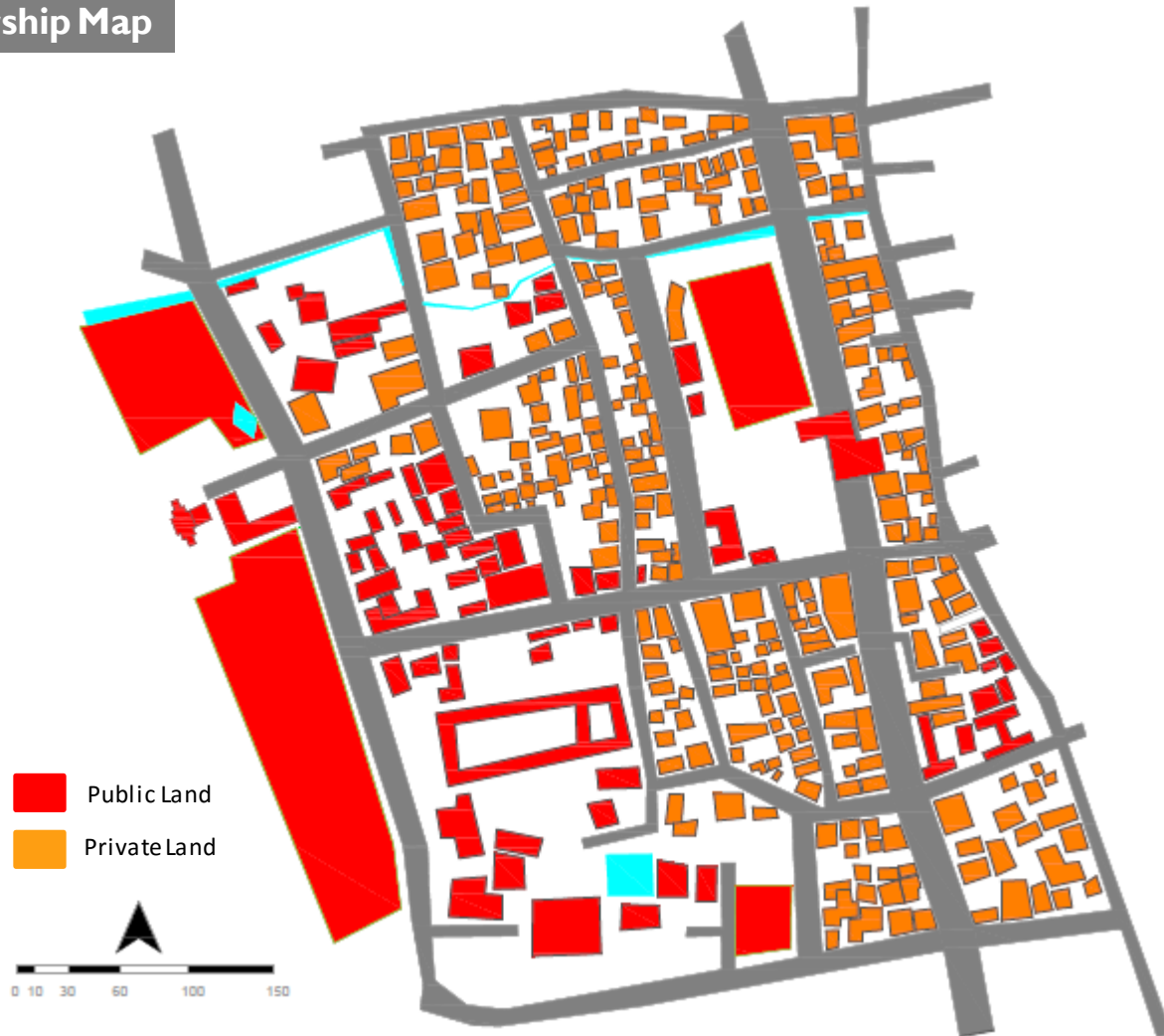
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Ownership Map

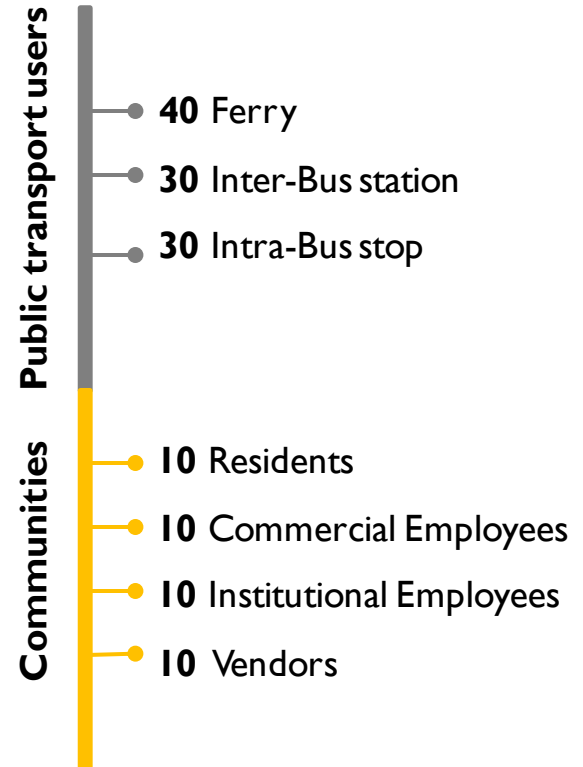


Survey Framework

Survey Method

- Questionnaire
- Approx.5 mins per sample
- **140 samples**
- Survey time:
Morning slot (9:00 am to 11:00 am)
Evening slot (1:00pm to 3:00 pm)

Sample Size Distribution



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Factors affecting travel behavior

Personal Factors

- Age
- Gender
- Occupation
- Individual income
- Vehicle Ownership
- Year of establishment
- Time slot of work

Trip Factors

- Frequency of using PT
- Trip purpose
- Origin of trip
- Mode used to access
- Time taken to access
- Destination
- Waiting time
- Activities involved in while waiting

Station Factors

- Walkability
- Availability of information
- Safety and Cleanliness
- Information availability
- Reliability on services
- Adequate comfort
- Fare Affordability
- Efficient infrastructure

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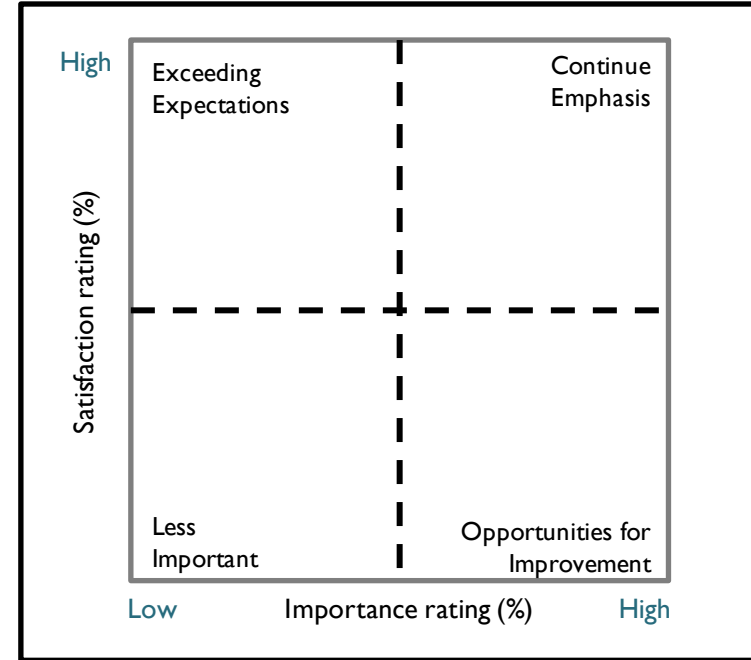
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Method of Assessment

Importance - Satisfaction Analysis:

- Two-dimensional grid split into four quadrants
- Allows for the identification of the relative urgency of the improvements required for each element of the service.
- **Importance rating** - Proportion of survey respondents who rated the level of importance on an element among the total number of respondents
- **Satisfaction rating** - Proportion of survey respondents who rated the level of satisfaction on an element among the total number of respondents.



The Importance-Satisfaction (IS) rating is computed for each element by multiplying the importance rating by 1 minus the satisfaction rating.

$$\begin{aligned} \text{IS} &= [\text{Importance} \times (1 - \text{Satisfaction})] \\ &= [\text{Importance} \times \text{Dissatisfaction}] \end{aligned}$$

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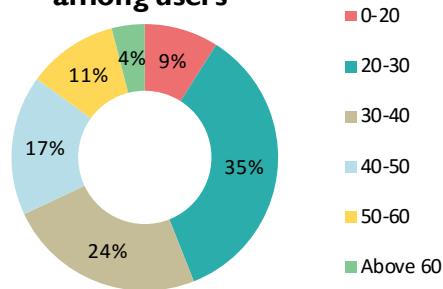
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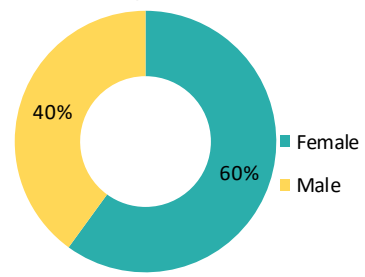
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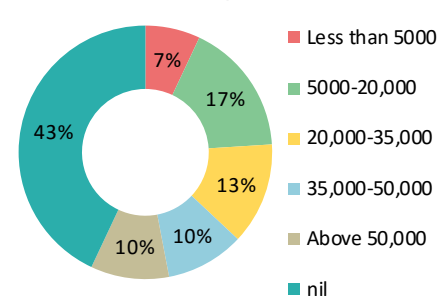
Age distribution
among users



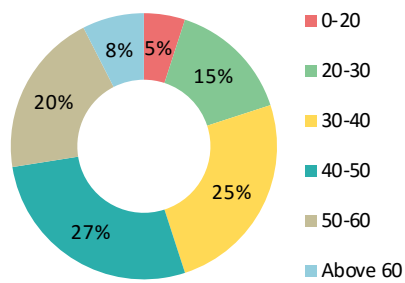
Gender distribution
among users



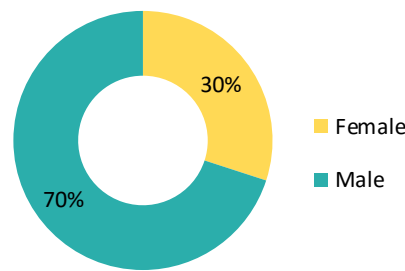
Individual Income
distribution among users



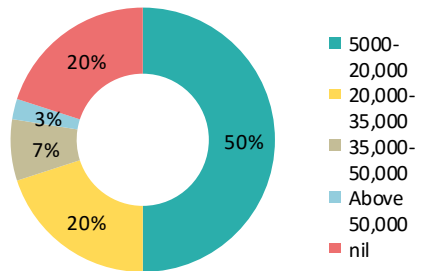
Age distribution
among communities



Gender distribution
among communities



Individual Income
distribution among communities

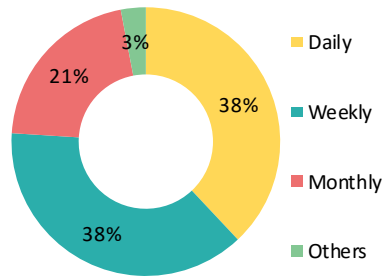


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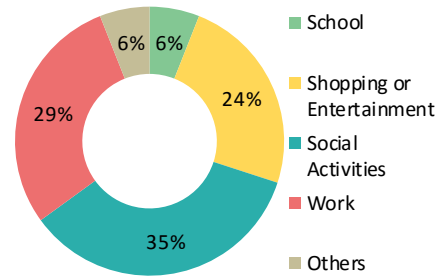
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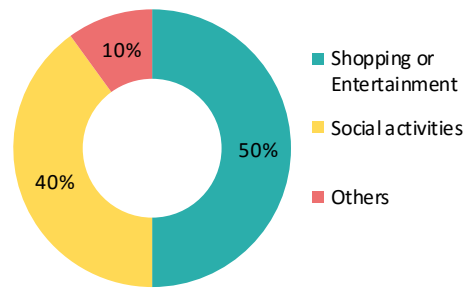
Frequency of using public transport among users



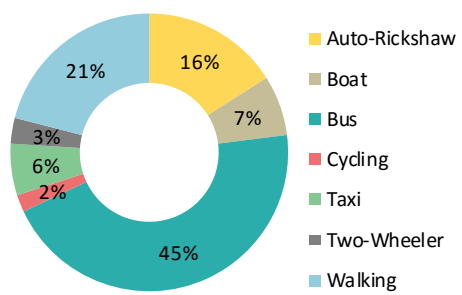
Purpose of the trip among users



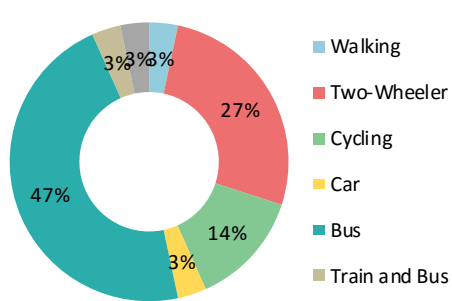
Purpose of trip among residents



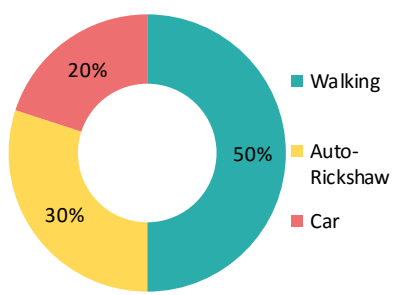
Mode used to access the station among users



Mode used to access the station among employees and vendors

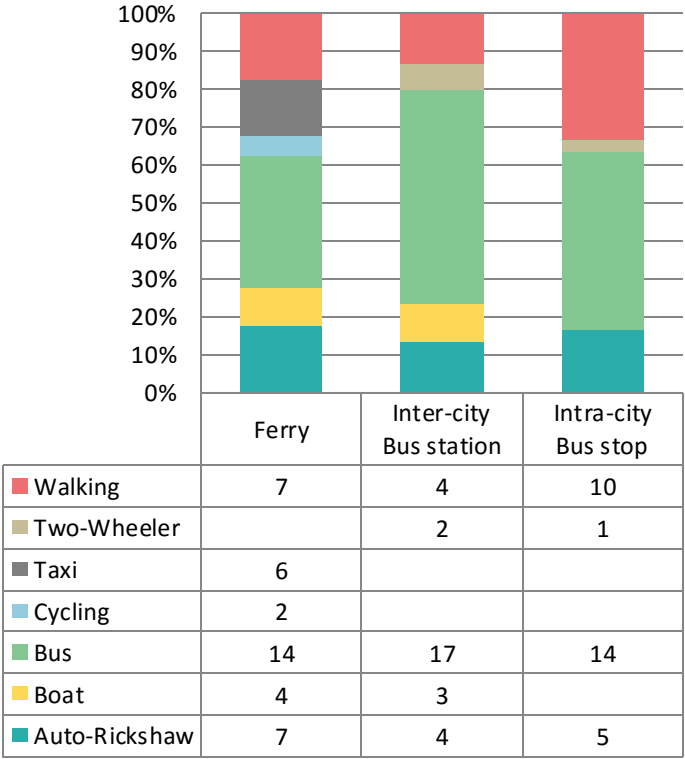


Mode used to access the station among users

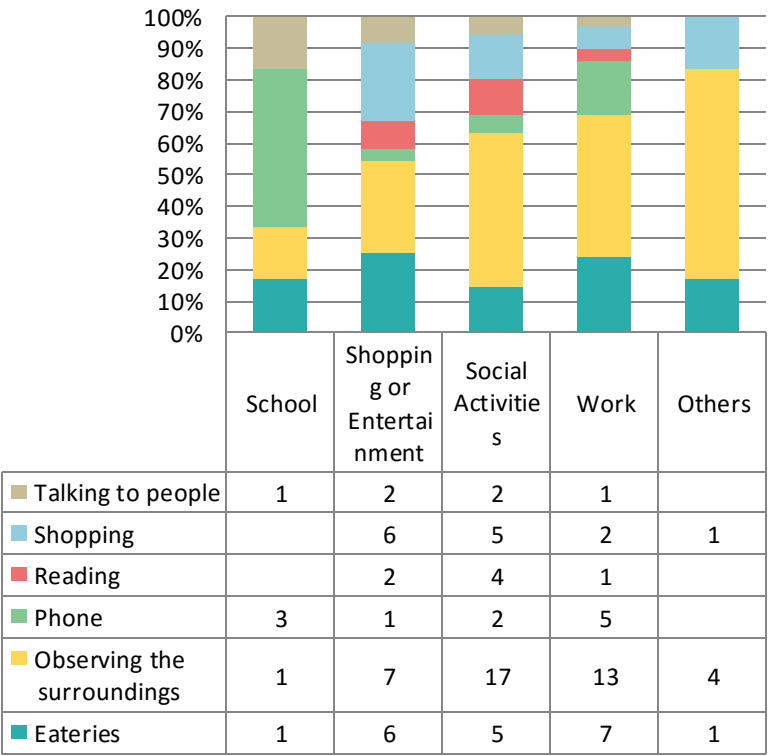


Survey Analysis

Mode used to access station vs mode used from station



Purpose of the trip vs Waiting time activities



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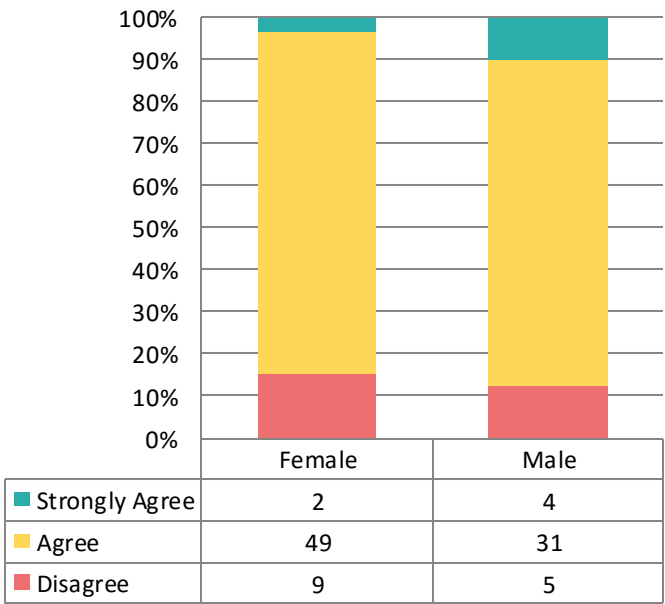
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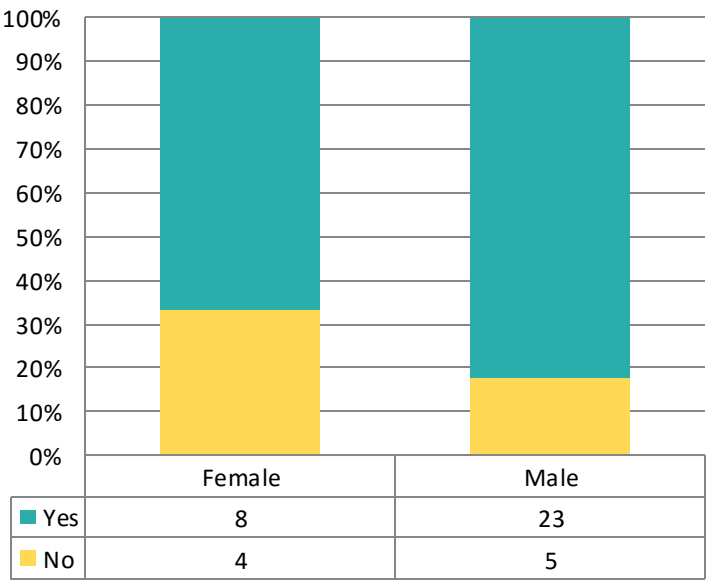
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Gender vs Safety among users



Gender vs Safety among communities



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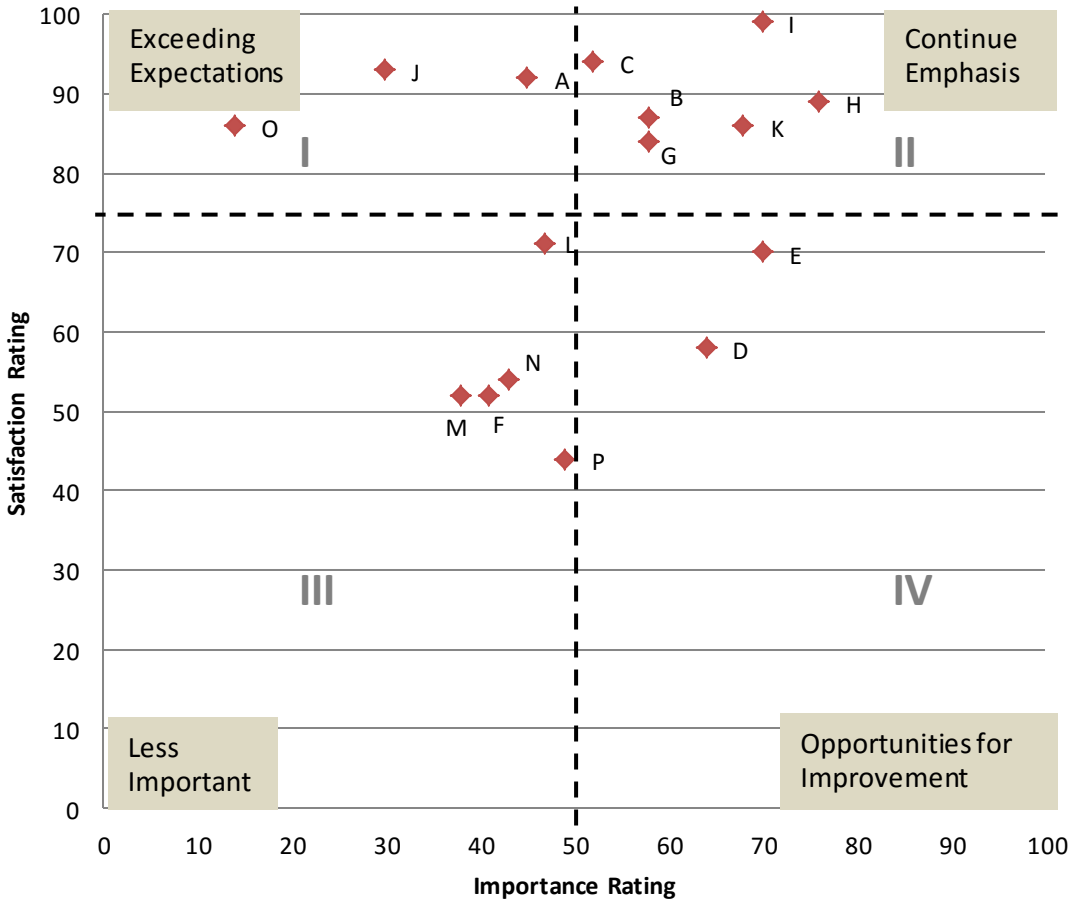
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Important Satisfaction Analysis



Priority

High Low

A	Easy to get around the station
B	Good pedestrian connection
C	Convenience to reach other mode of transports
D	Efficient Sign boards
E	Ease to get schedule and route information
F	Good Air quality
G	Short Waiting time
H	On-time transport service
I	Affordable Fare
J	Well-lit station
K	Safe Station
L	Ease to get help
M	Clean Station
N	Efficient Seating
O	Place to buy food
P	Availability of usable toilets

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Factors considered for intervention

Efficient information and signboards

- Efficient Sign boards
- Ease to get schedule and route information

Efficiency and utilization of amenities and leisure space

- Efficient Seating
- Place to buy food
- Availability of usable toilets

Ease to get around the station

- Ease to get around the station

Easy access to all modes of transport

- Convenience to reach other mode of transports
- Good pedestrian connection

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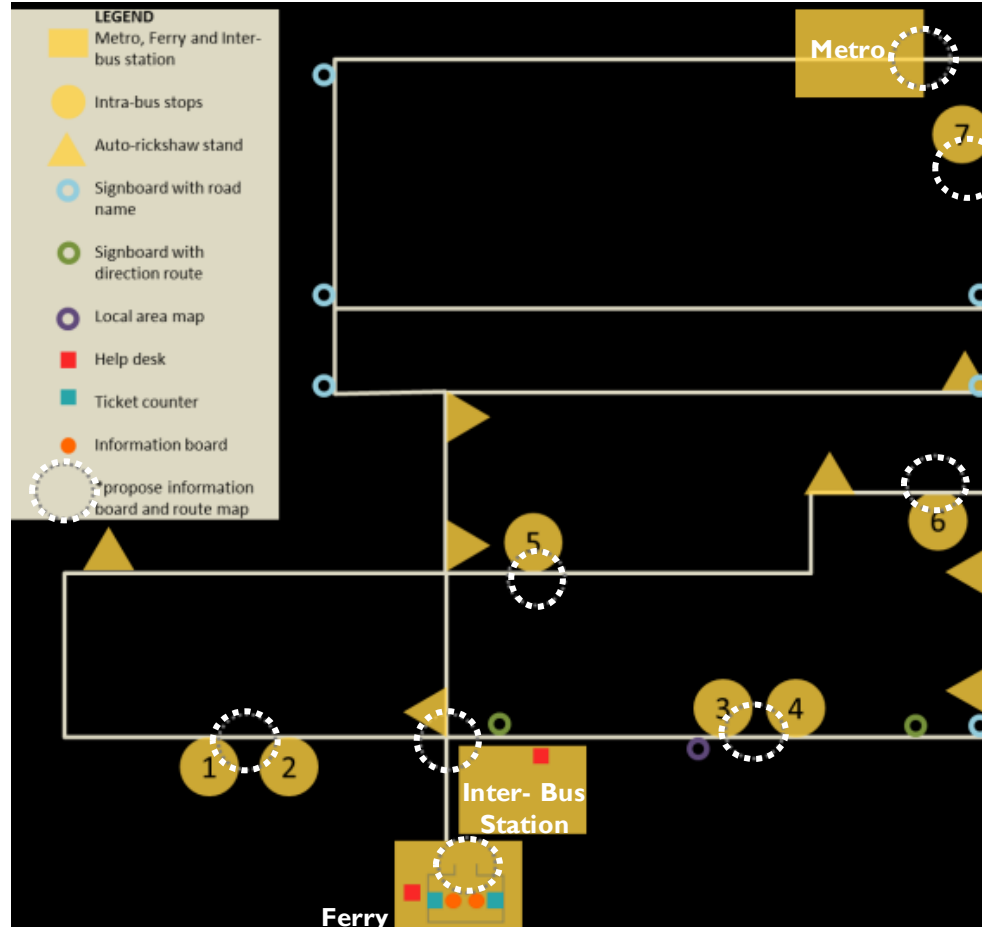
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Efficient information and signboards



Survey output

- 58% users agreed - efficient signboards
- 70% users agreed - easy to get route and time information

On- site observation

- Few signboards with names of each road and information board for the ferry are present
- No other signboards which help with any kind of information regarding the route, the availability of facilities, the distance or direction to a certain place etc.

Design input

- Implementation of signboards with road names, direction boards and route and time information at appropriate places

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Efficient information and signboards

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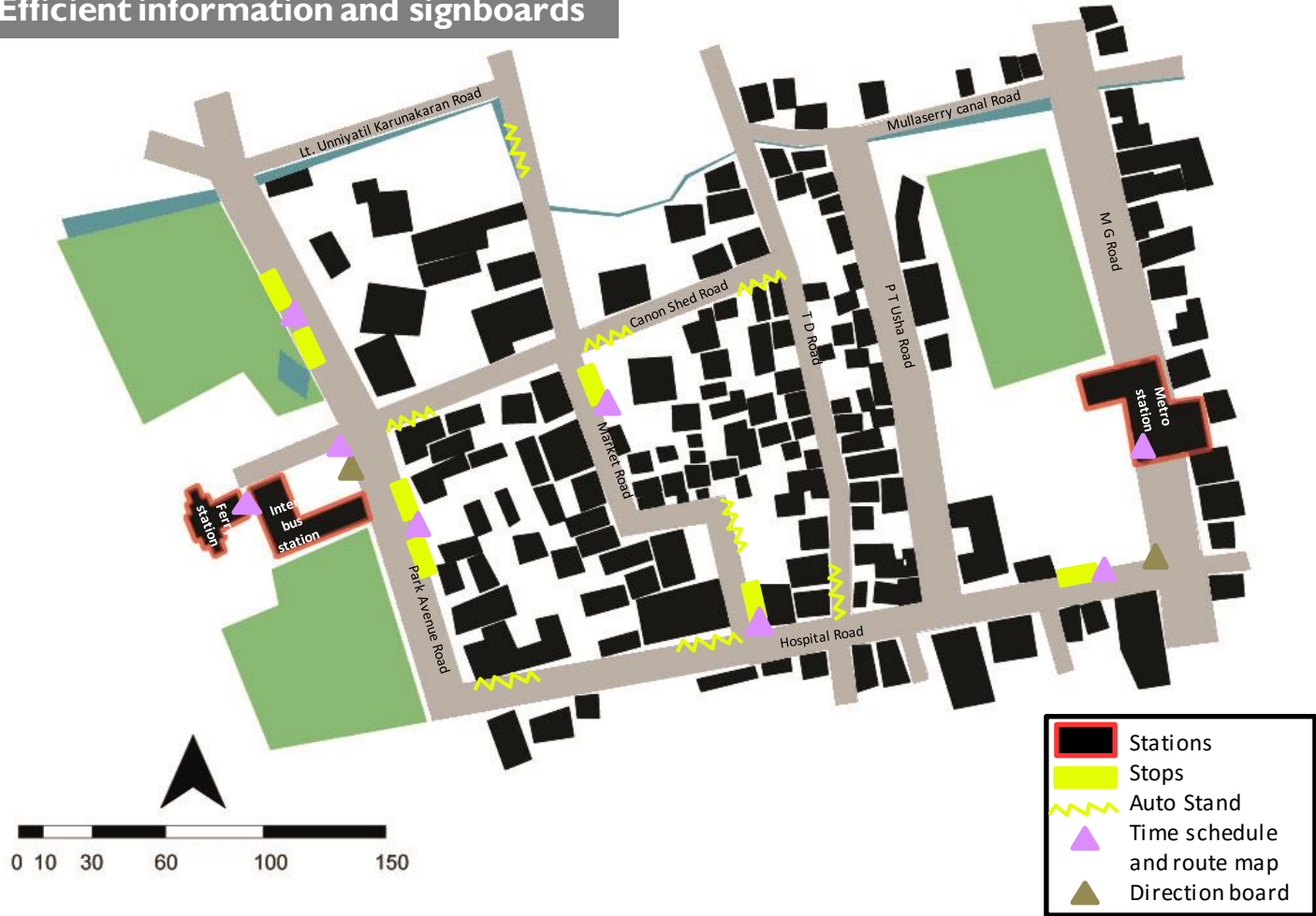
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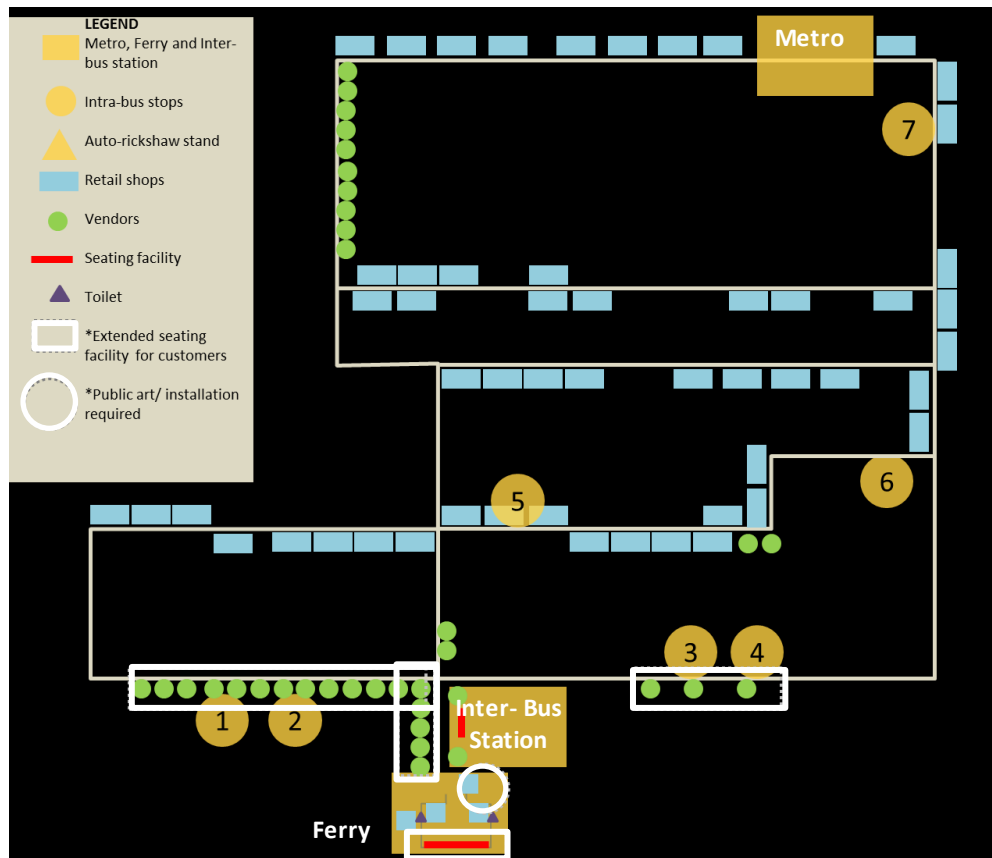
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Efficiency and utilization of amenities and leisure space



Survey output

- 54% users agreed - efficient seating facilities
- 86% users agreed - places nearby to buy food and drinks
- 44% users agreed - availability of usable toilets

On-site observation

- Ferry - insufficient seating during peak hours; well-shaded.
- Inter-bus station - seating facilities which are partially shaded
- Presence of vendors and food kiosks near all the stations at a walkable distance
- Availability of toilet facilities at the ferry station; not maintained well

Design input

- Ensuring efficient seating facilities for the users/customers that are well shaded with an attractive public realm

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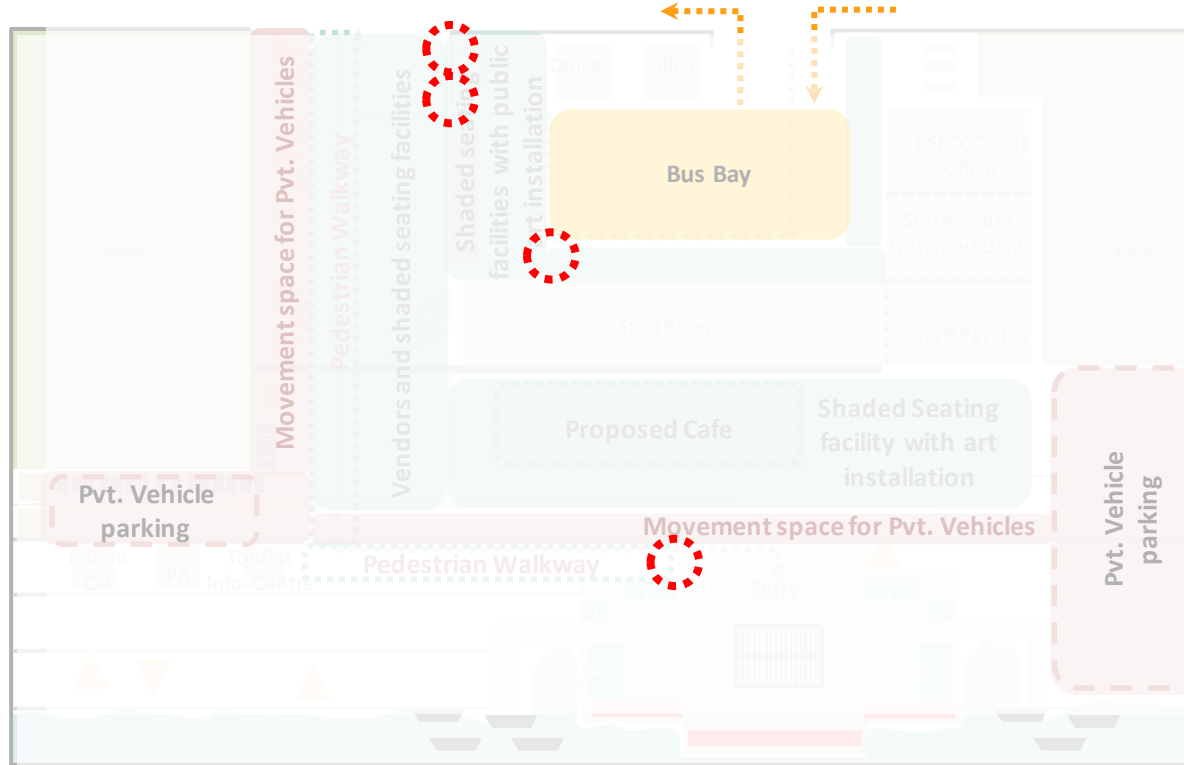
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Ease to get around the station



Survey output

92% users agreed that it is easy to get around the station

On-site observation

Ferry: Well planned station building with proper movement spaces
Inter-bus station: Wide area where buses are parked. People have to move around and see which bus goes where. No designated movement space



Vendors



Ticket counter



Toilet



Café



Seating



Stairs



Buildings



Pedestrian movement



Bus movement



Pvt. Vehicle



Bus



Boat

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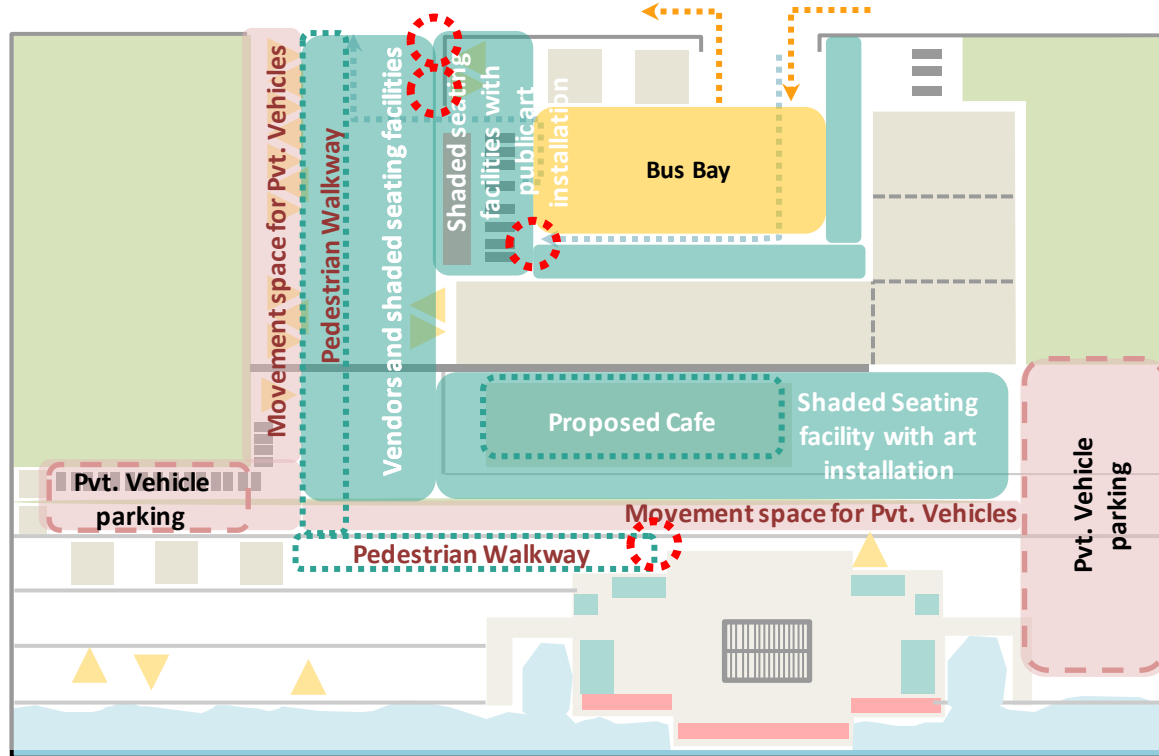
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Ease to get around the station

 Route map and time schedule information

Design input

Implementation of shaded walkway along the stations, designated spaces for vendors with adequate seating facilities, designated parking facilities for users who access the station with their private vehicle, and improved public realm with shaded efficient seating facilities and public art installation

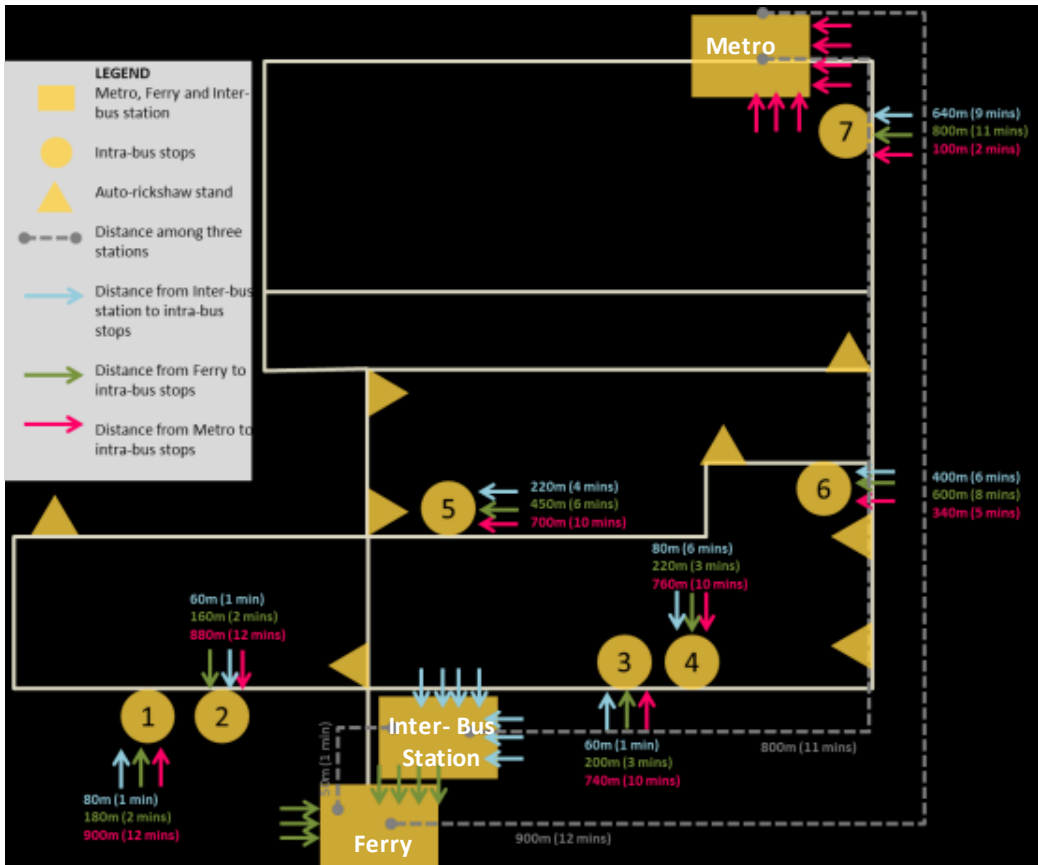
Survey output

92% users agreed that it is easy to get around the station

On-site observation

- Ferry: Well planned station building with proper movement spaces
- Inter-bus station: Wide area where buses are parked. People have to move around and see which bus goes where. No designated movement space

Easy access to all modes of transport



Survey output

On-site observation

Design input

- 94% users agreed - convenient to reach other modes of transport
- All three stations have city bus stops and auto-rickshaw stand at a walkable distance.
- The distance from Ferry to Inter bus station is 50m, Ferry to Metro is 900 m and Inter bus station to Metro is 800 m
- Skywalk for commuting easier and conveniently to access other modes of transport

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Easy access to all modes of transport

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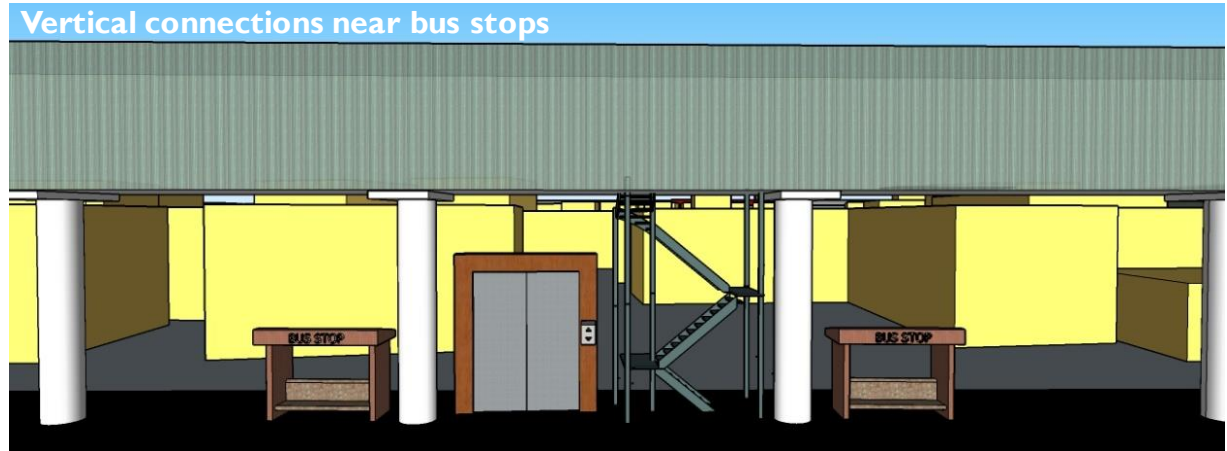
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Easy access to all modes of transport



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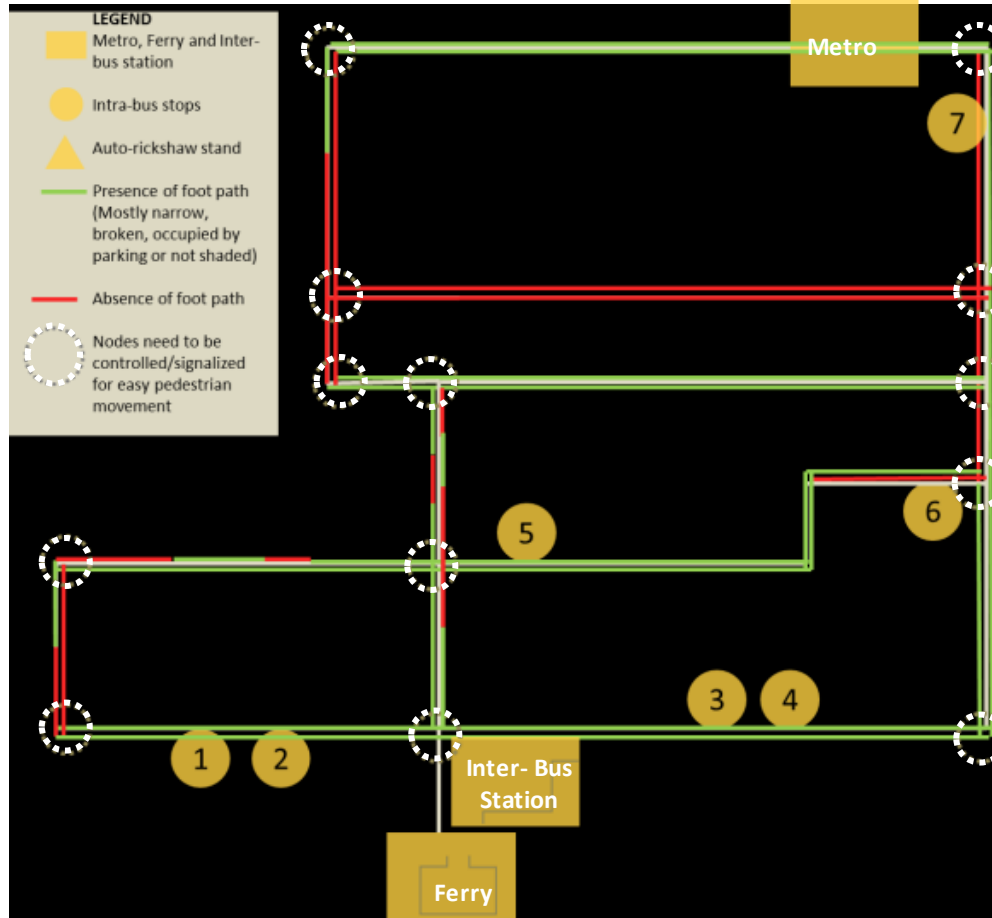
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Easy access to all modes of transport



Survey output

On-site observation

Design input

85% users agreed - good pedestrian connection to access the stations

Park Avenue Road - proper shaded walkable footpath that are maintained.

All the other roads - incomplete footpaths which are broken, too narrow, hindered by obstacles or occupied by parking

Segregated footpath with designated building frontage, walkway and furniture zone;

Signalized/Controlled nodes with pedestrian crossing wherever required

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Proposed street sections

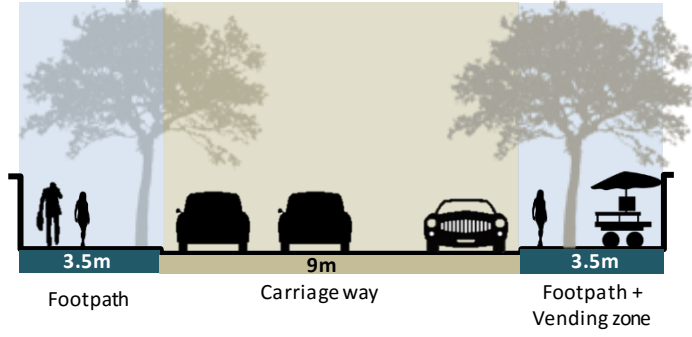




Proposed street sections

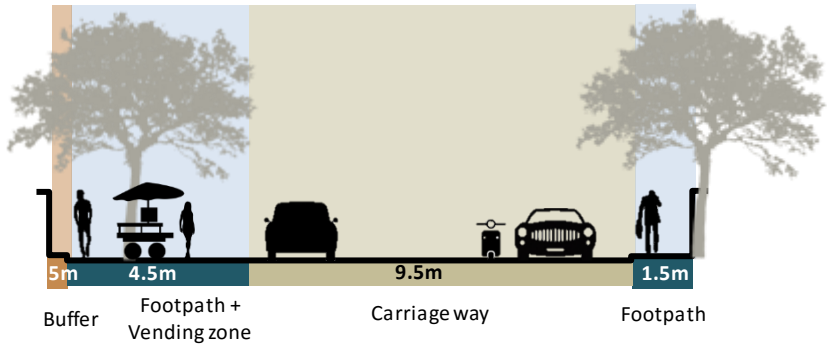
Existing (A)

A-A' (Park Avenue Road: 16m)



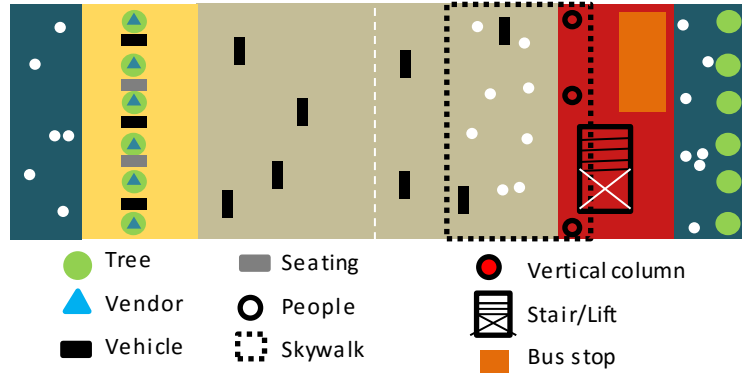
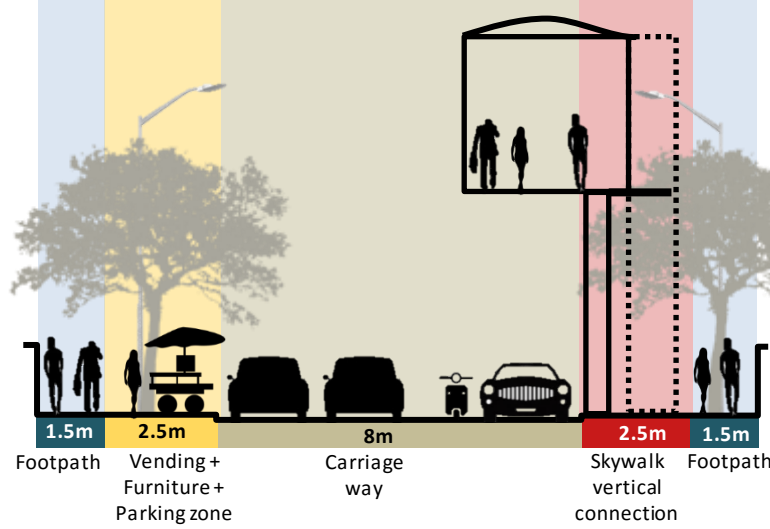
Existing (B)

B-B' (Park Avenue Road: 16m)



Proposed (AB)

Park Avenue Road: 16m

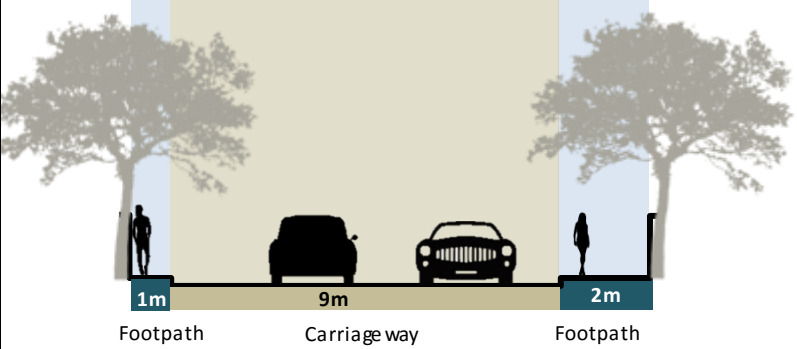


Proposed street sections



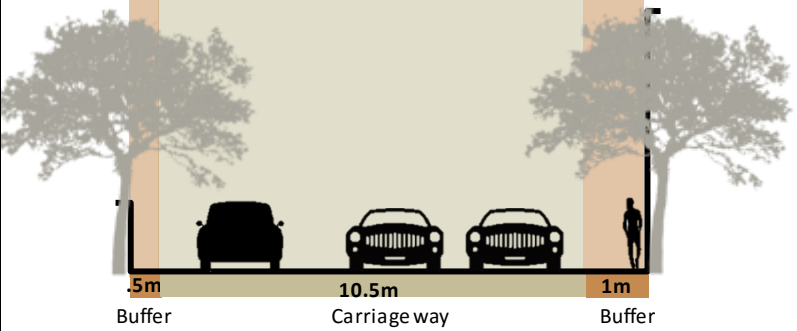
Existing (C)

C-C' (Hospital Road: 12m)



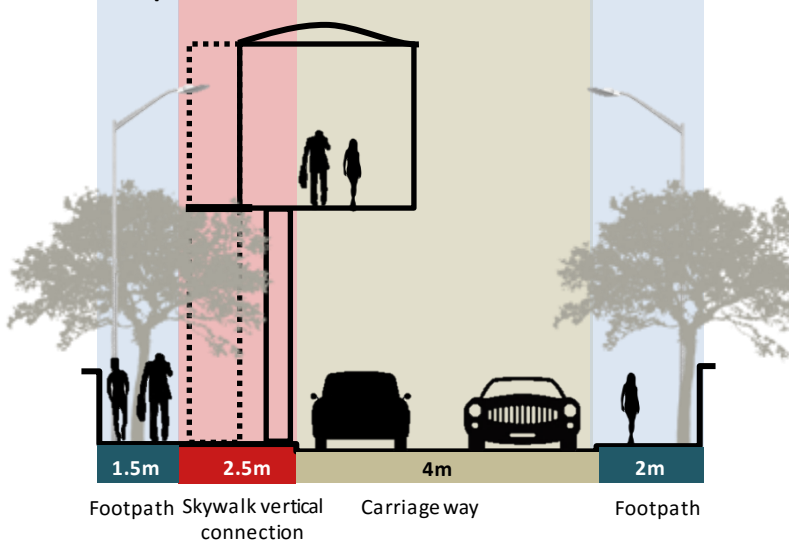
Existing (D)

D-D' (Hospital Road: 12m)



Proposed (CD)

Hospital Road: 12m



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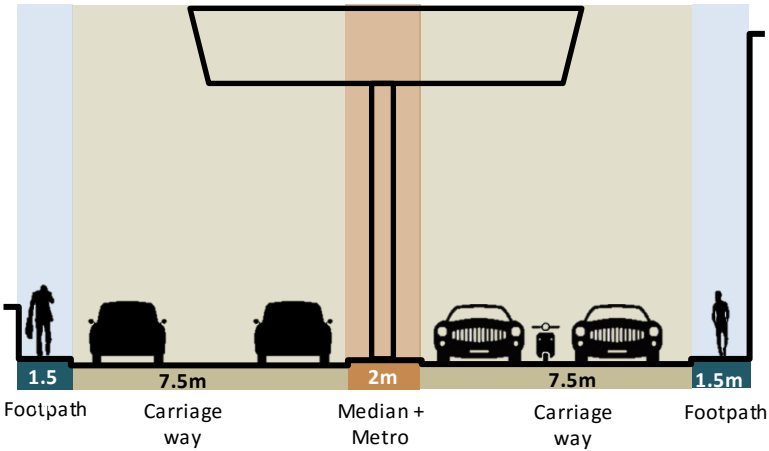
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Proposed street sections



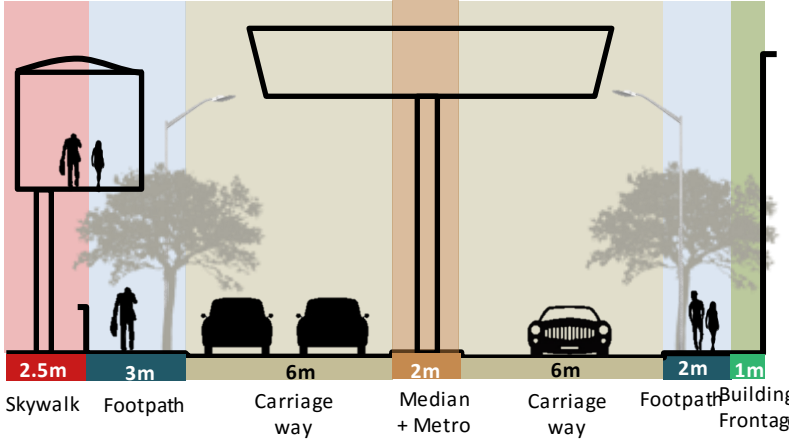
Existing (E)

E-E' (MG Road: 20m)



Proposed (E)

MG Road: 20m



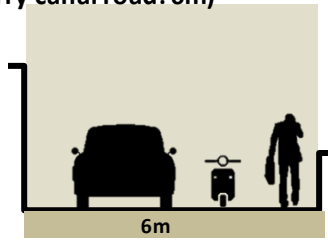
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Proposed street sections

Existing (F)

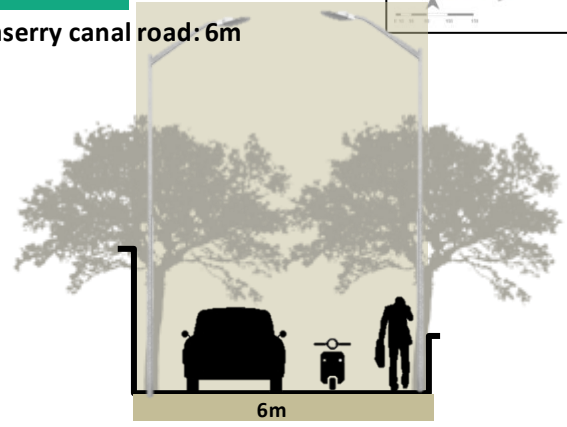
F-F' (Mullaserry canal road: 6m)



Carriage way

Proposed (F)

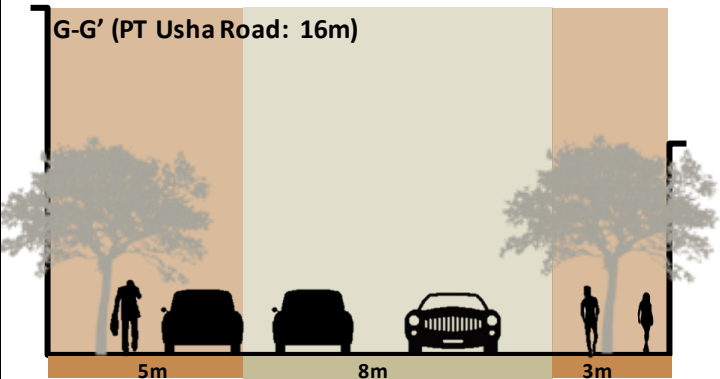
Mullaserry canal road: 6m



Carriage way

Existing (G)

G-G' (PT Usha Road: 16m)



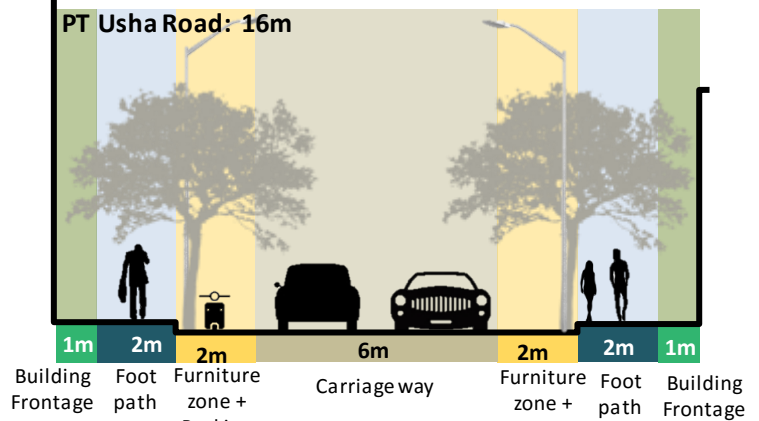
Buffer + Parking

Carriage way

Buffer

Proposed (G)

PT Usha Road: 16m



Building Frontage

Foot path

Furniture zone +

Carriage way

Furniture zone +

Foot path

Building Frontage



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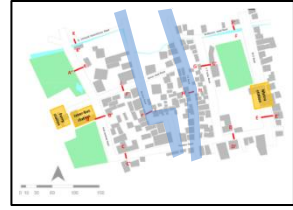
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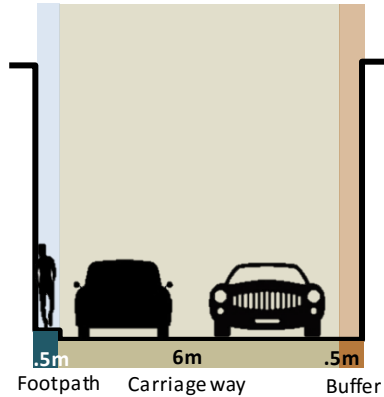
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Proposed street sections

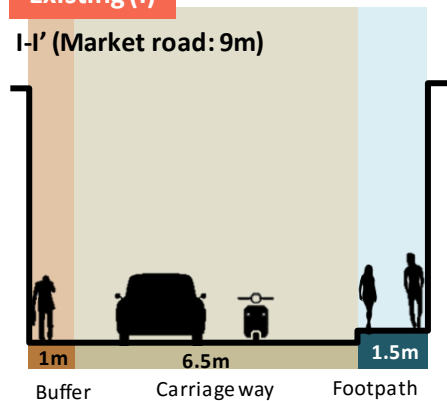
Existing (H)

H-H' (TD Road: 7m)



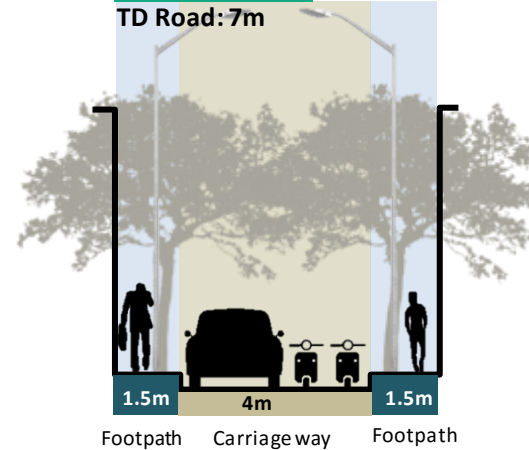
Existing (I)

I-I' (Market road: 9m)



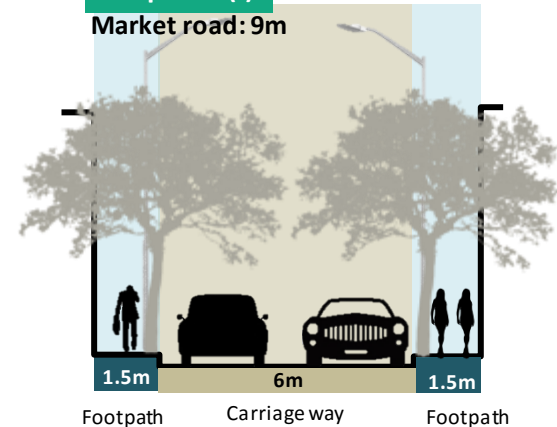
Proposed (H)

TD Road: 7m



Proposed (I)

Market road: 9m



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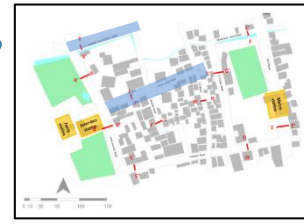
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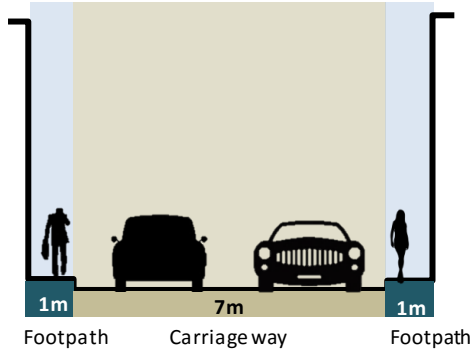
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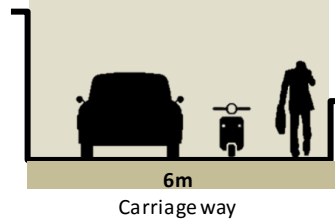
Existing (J)

J-J' (Canon shed road: 9m)



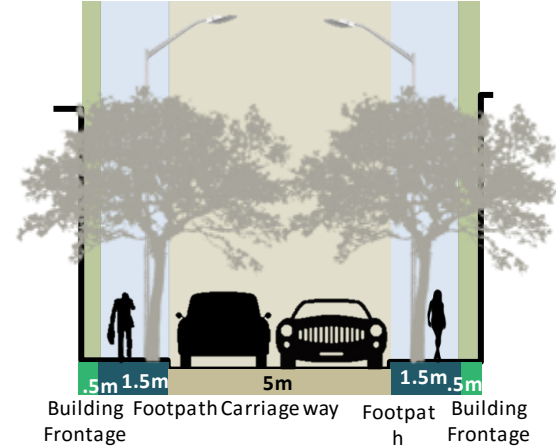
Existing (K)

K-K' (Lt. Unniyatil Karunakaran road: 6m)



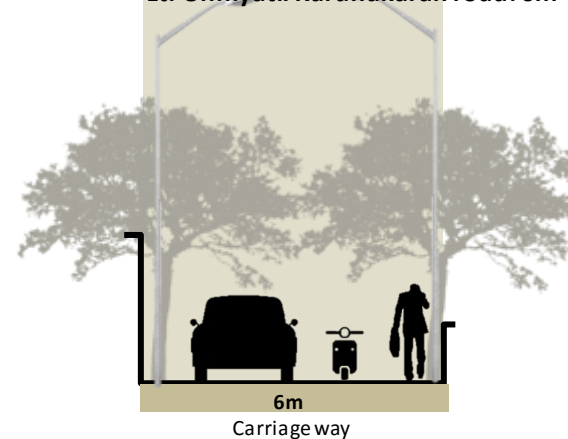
Proposed (J)

Canon shed road: 9m



Proposed (K)

Lt. Unniyatil Karunakaran road: 6m



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Easy access to all modes of transport

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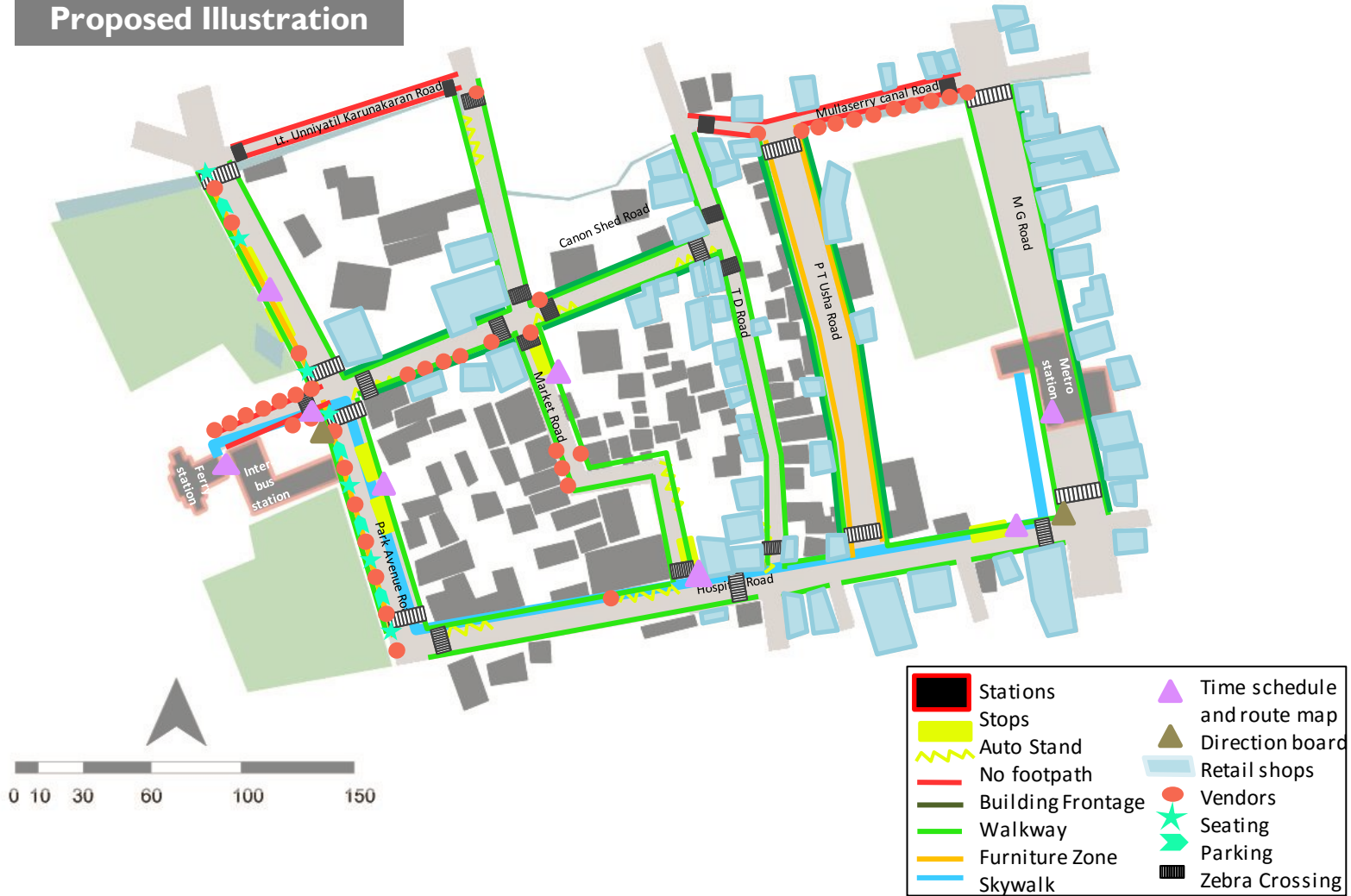
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CONCLUSION

Proposed Illustration



Proposed Illustration



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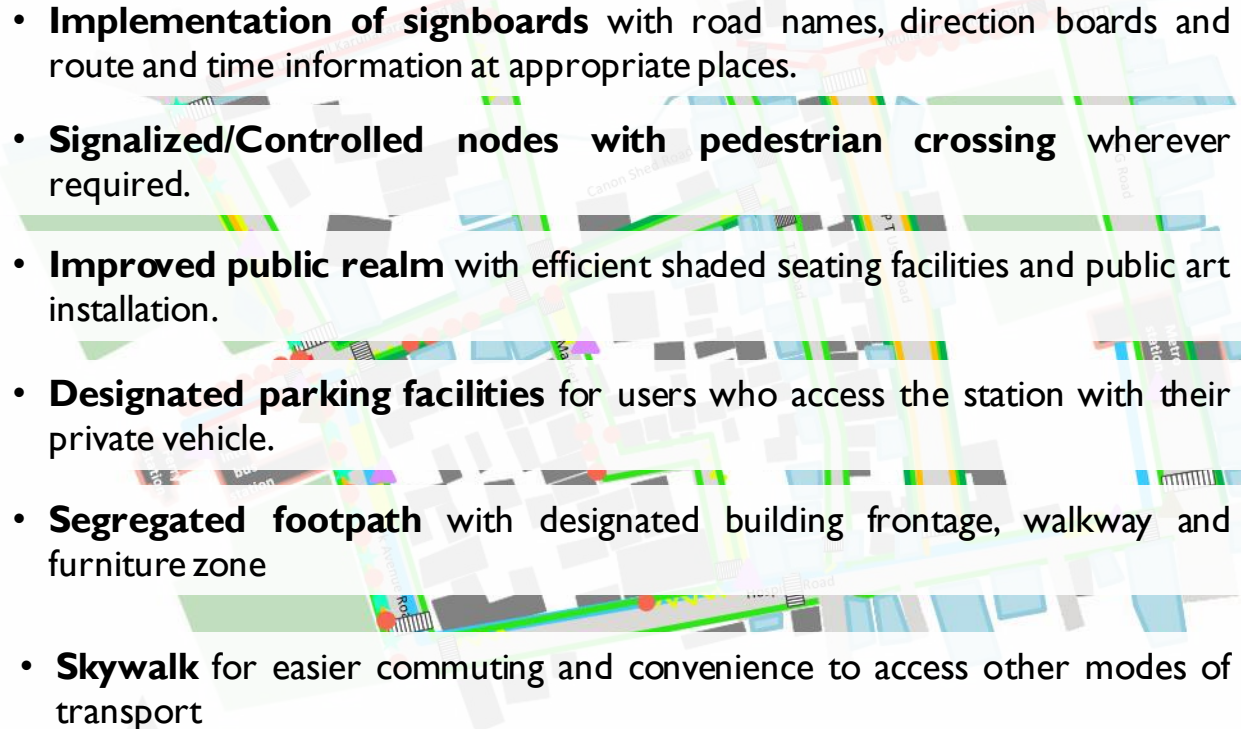
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- 
- **Implementation of signboards** with road names, direction boards and route and time information at appropriate places.
 - **Signalized/Controlled nodes with pedestrian crossing** wherever required.
 - **Improved public realm** with efficient shaded seating facilities and public art installation.
 - **Designated parking facilities** for users who access the station with their private vehicle.
 - **Segregated footpath** with designated building frontage, walkway and furniture zone
 - **Skywalk** for easier commuting and convenience to access other modes of transport



THANK YOU