

# Bus Rapid Transit System Surat & Ahmedabad

Projects under *JnNURM*  
Ministry of Urban Development, Government of India

Surat Municipal Corporation  
Ahmedabad Municipal Corporation

Presentation by:  
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Ahmedabad Municipal Corporation and Surat Municipal Corporation : Government of Gujarat  
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# Surat today

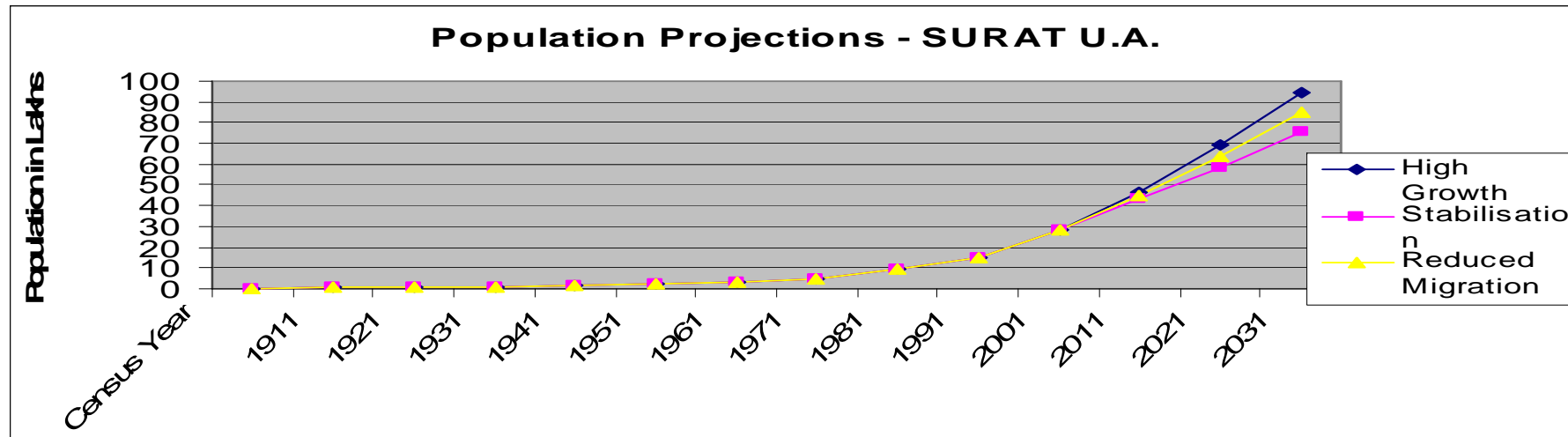
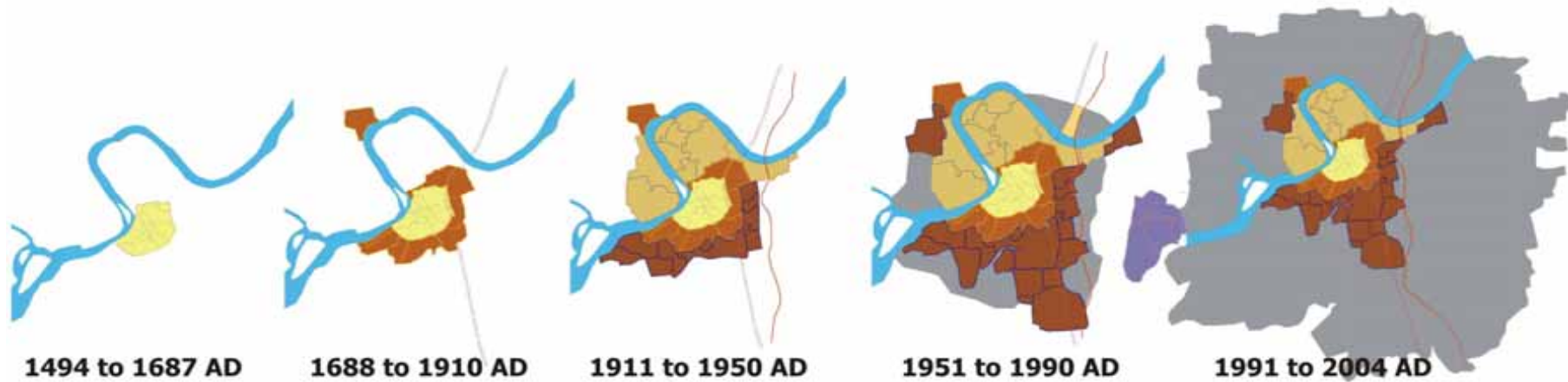
- **Population - 4.6 Million (2011)**
- **Municipal Area – 326 sqkm**
- **High Density – 12750/sq.km**
- **9th largest city in India**
- **Large Migrant Population**
  - **56 % of the city's population**



## • **Manufacturing City: (Diamond & Textiles)**

- **42 % of the world's total rough diamond cutting and polishing**
- **40 % of the nation's total diamond exports**
- **40 % of the nation's total man made fabric production**
- **18 % of the nation's total man made fibre export**

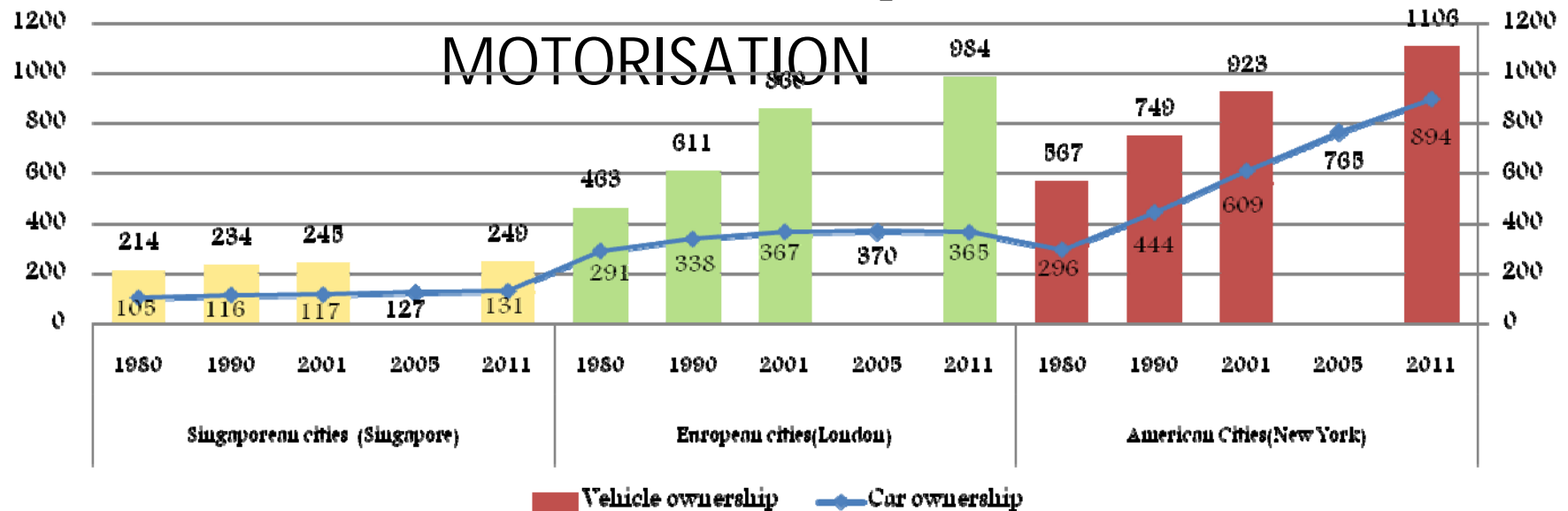
# SURAT – City Growth



**Recorded 60%+ decadal growth over 5 decades**

# SURAT – Motorisation

Trends in Vehicle and Car ownership in different countries



## INDIA - LOW CAR OWNERSHIP

50-75 cars per 1000 people

Two wheelers – 200 per 1000 people

- Will they move to Car?

- Will they move to Bus?

Bicycles – 100 per 1000 people – What are we doing for them?



# City Public Transport



45000 Autos operating like Public Transport!

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# SURAT – With some Public Transport



**Challenge for Surat  
To create Sustainable High Quality Public Transport**

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# SURAT – With BRTS



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# SURAT – Public Transport System

## Existing Situation Analysis

### Overview

- » 4.6 Million People
- » City Buses
  - » Bus routes – 41 routes
  - » Fleet size – 111 buses
  - » Ridership - approx 50,000 passengers/day
- » Auto-rickshaws functioning as shared autos
  - » Auto Routes – 37 major routes
  - » No. of autos - around 45,000 nos.
  - » Ridership - approx 1.6 million passengers/day

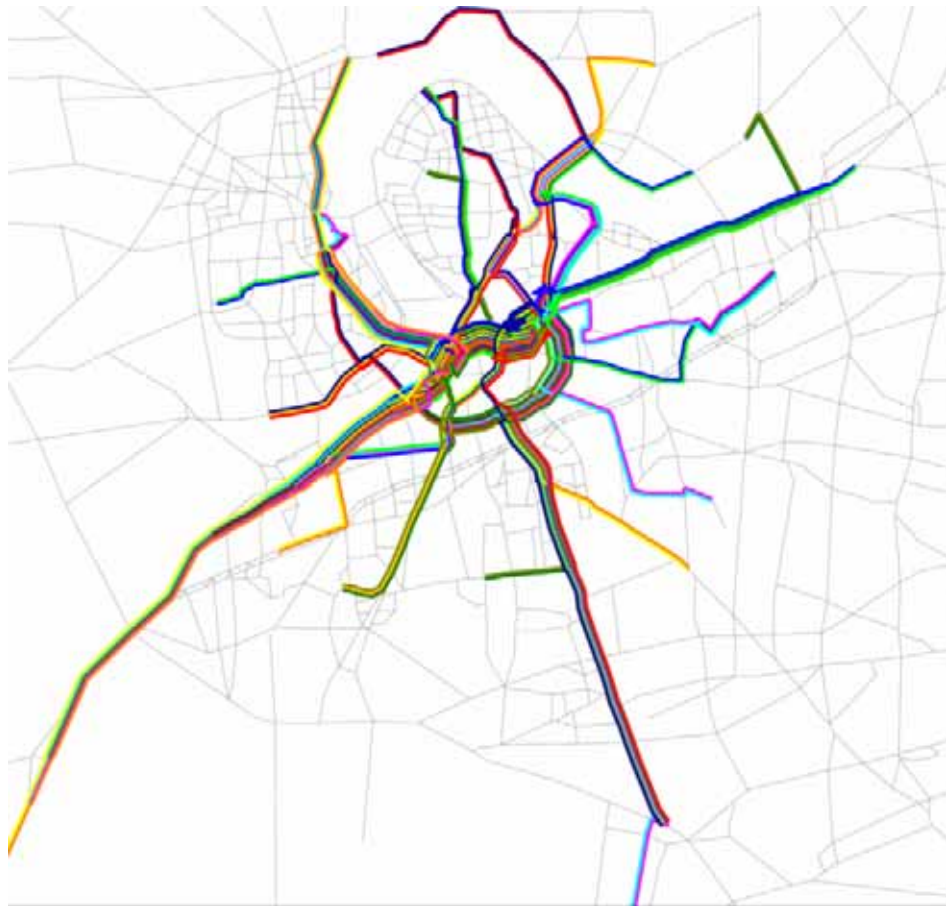




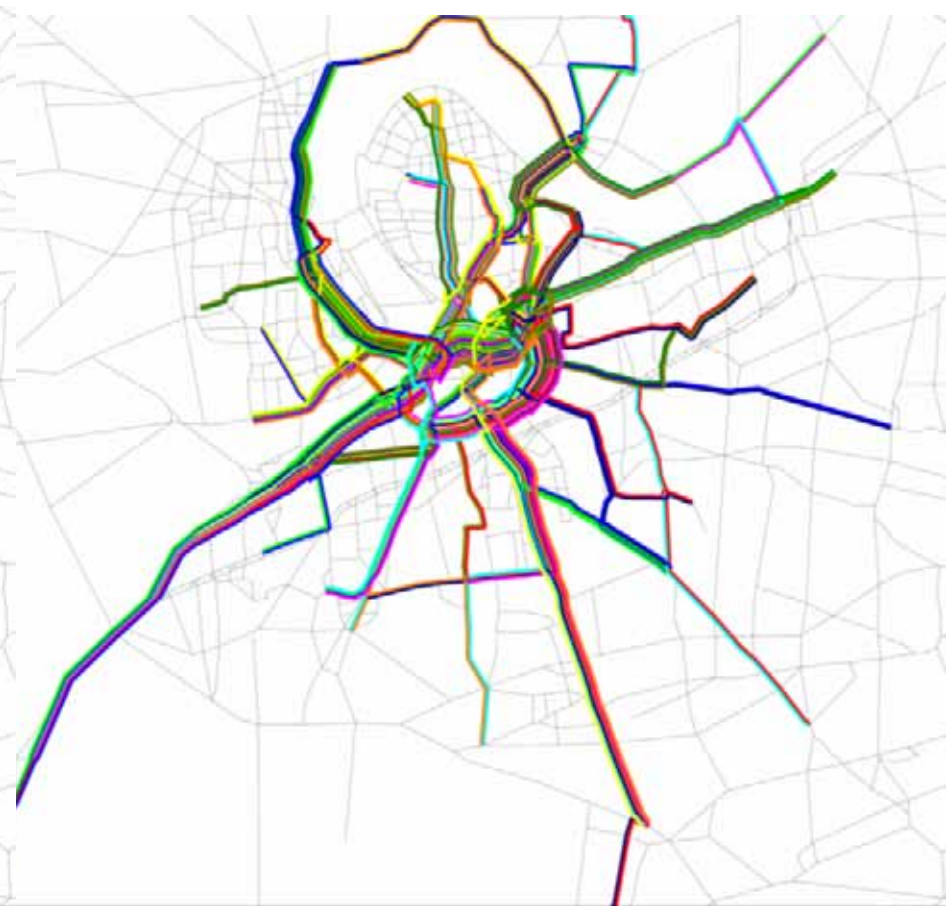
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## Routes

Bus



Autos

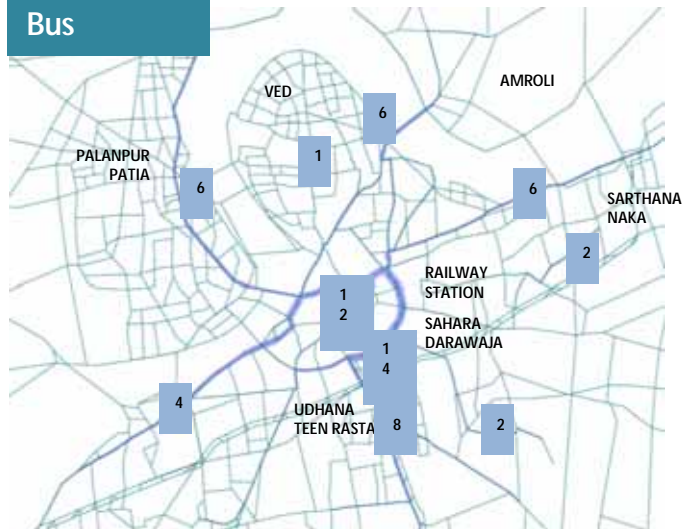


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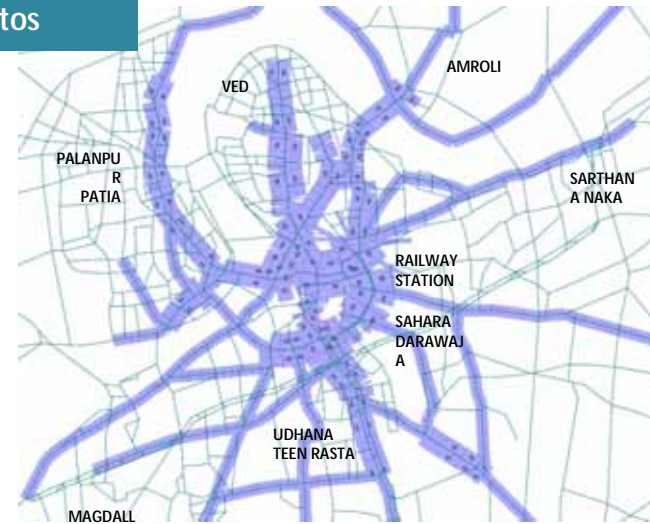
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Bus



Autos



Bus headways 30-160 mins, easy availability of shared autos

Transit Ridership (no. of passenger boardings)



50000 trips/day on buses in comparison to 1.65 million on autos

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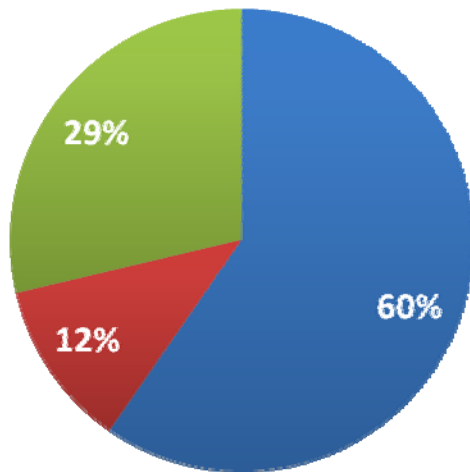
# SURAT

## Auto Passenger Survey - Analysis

Total shared auto trips (16 hrs/day): 16,30,232

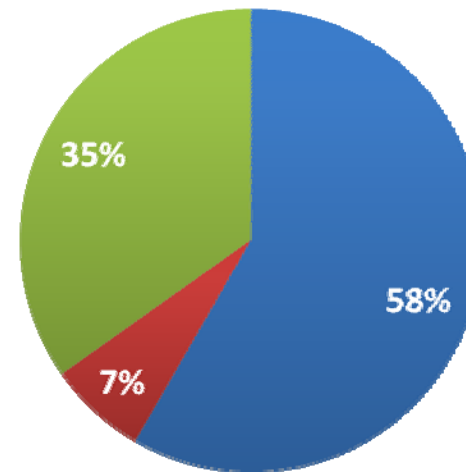
Average Trip Length: 6.9 Km

### Morning trips



■ Work ■ Education ■ Social

### Evening trips

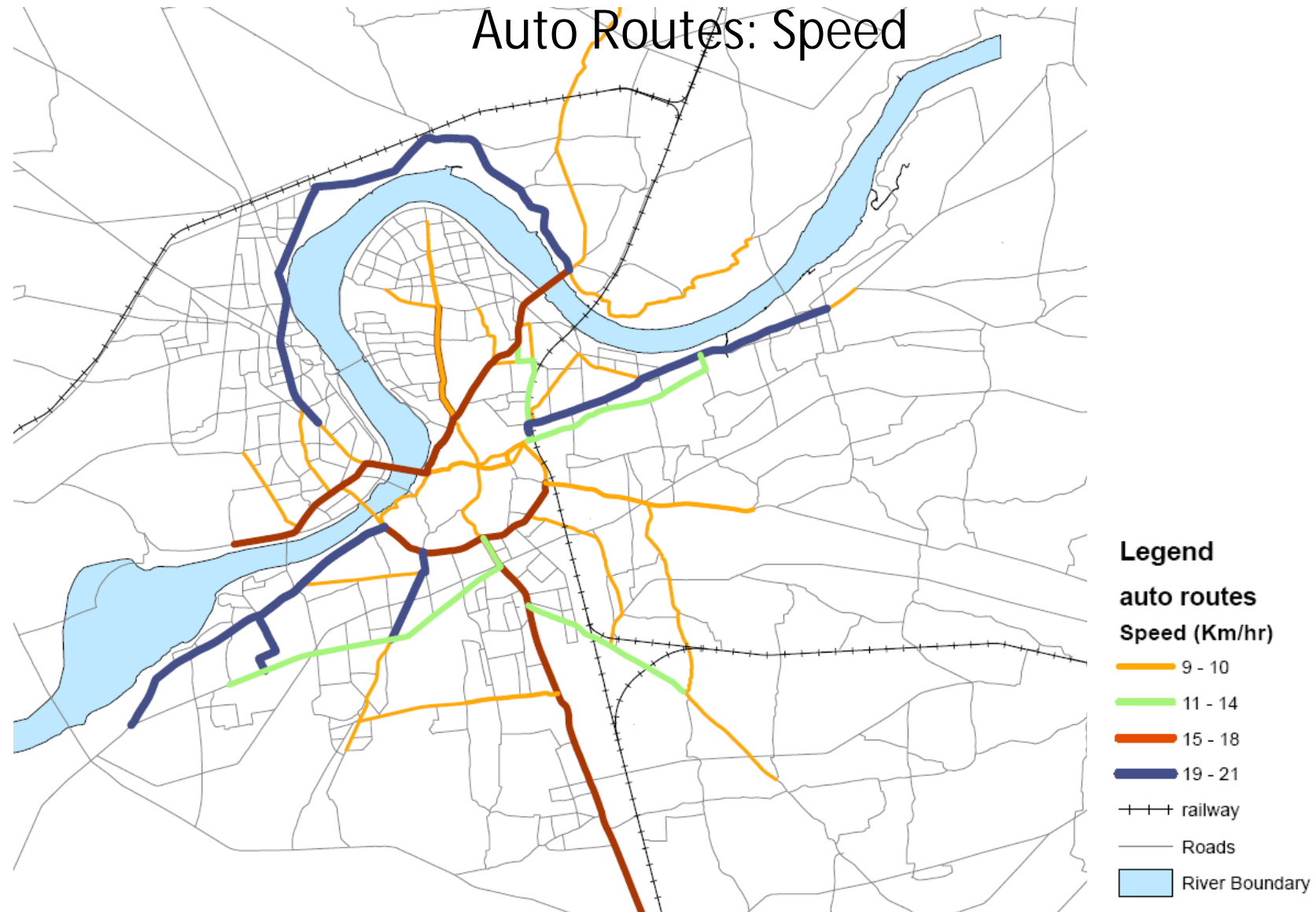


■ Work ■ Education ■ Social

Source: Primary Survey, 2009



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## Willingness to Shift Survey

- » Results indicate around 6 lakh trips would use the proposed PT system

Journey Time Ranges (mins)	Total trips (in lakh)	Willingness to Shift	Proportional Trips (in lakh)
<b>0 – 10</b>	2.9	17 %	0.5
<b>10 – 20</b>	3.5	40 %	1.4
<b>&gt; 20</b>	9.9	43 %	4.2
<b>Total</b>	16.3		6.1

*Source: Primary Survey, 2009*

# SURAT - PROPOSED STRATEGIES

- BRTS Development
- Feeder System Development
  - Bus based
  - Small Vehicle Option – TATA Magic (GOG)
- Auto Rickshaw Strategy
  - Stop issue of licenses for new auto
  - Old auto replacement – with small vehicle – TATA Magic
- Integration
  - Single ticket /Smart card, token



# SURAT

## BUS to BRTS PLAN



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## BRTS - COMMON APPREHENSIONS

- Takes away road space!
- Roads will be congested!
- Very few buses given priority over large mixed traffic vehicles!
- Movement will be inefficient!
- Too much Investment – Too little a benefit

# Existing Scenario (Ahmedabad) November 2012

## MORE BUSES MEAN LESS TRAFFIC

Janmarg

People moved : 150

Area occupied – 84 sq. m

Queue length – 24 m.

Mixed traffic



Janmarg – Focus on Moving People..



# MORE CARS MEANS LESS PEOPLE

*MORE CARS – Constant queue Length- Reduction in people moved*

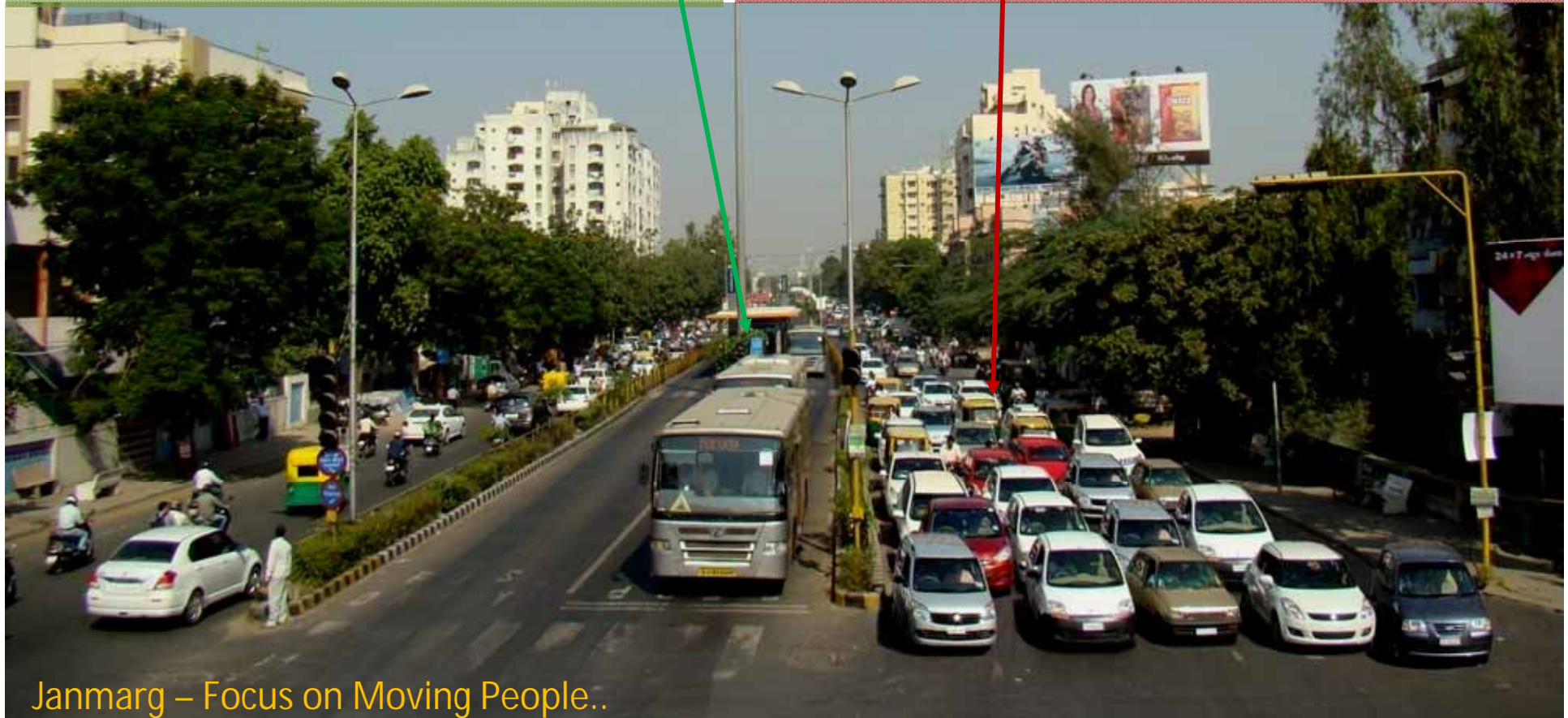
Janmarg

People moved – 150

Area occupied – 84 sq. m

Queue length – 24 m.

Mixed traffic



Janmarg – Focus on Moving People..



# MORE CARS MEANS LONGER QUES

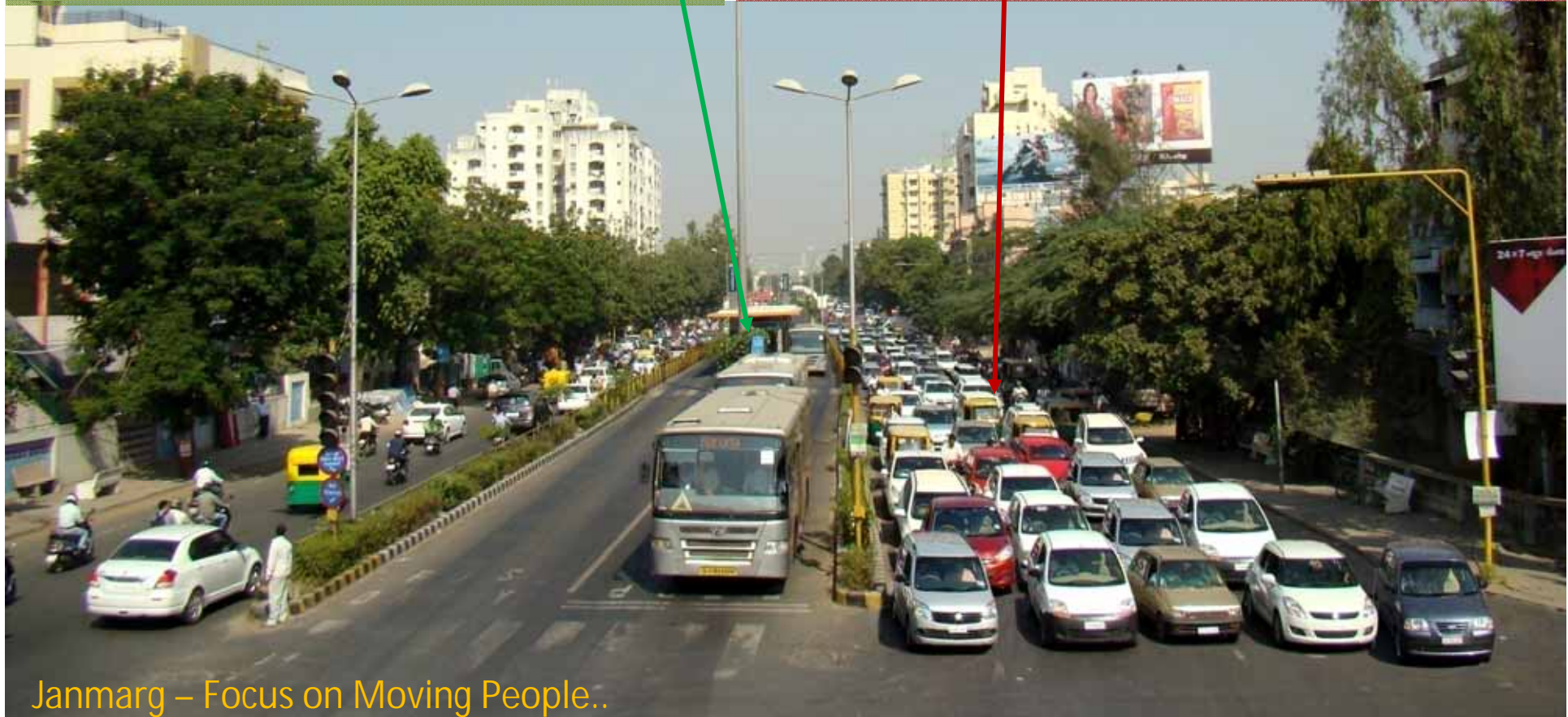
*MORE CARS – Same No of people – Longer Queue*

Janmarg

People moved – 150  
Area occupied – **84 sq. m**  
Queue length – **24 m.**

Mixed traffic

People moved -77  
Queue length - **183 m.**  
(Increase from 54 meters)  
Phase time – 70 Seconds  
Cycle Length – 180 Seconds



Janmarg – Focus on Moving People..

# Future Scenario: If the Traffic is Doubled



# MORE CARS MEANS LONGER QUES

***MORE CARS – Same No of people – Longer Queue***

Janmarg

People moved – 280

Area occupied – **135 sq. m**

Queue length – **37 m.**

18 M ARTICULATED BUS

CAPACITY- 140

Mixed traffic


People moved -155

Queue length – **210 m.**

Phase time – 70 Seconds

Cycle Length – 180 Seconds





# Future scenario: if the traffic is tripled



# MORE CARS MEANS LONGER QUES

*MORE CARS – Same No of people – Longer Queue*

Janmarg

People moved – 380

Area occupied – 179 sq. m

Queue length – 49 m.

24 M ARTICULATED BUS

CAPACITY- 190

Mixed traffic People moved -230

Queue length - **315 m.**

(Increase from 54 meters)

Phase time – 100 Seconds

Cycle Length > 180 Seconds (Not Desirable)



Janmarg – Focus on Moving People..

# If BRTS did not exist



# MORE CARS MEANS LONGER QUES

## *Present scenario- without BRTS*

Mixed traffic

People moved -240

Queue length - **165 m.**

(Increase from 54 meters)

Phase time – 100 Seconds

Cycle Length > 180 Seconds (Not Desirable)



Janmarg – Focus on Moving People..



# MORE CARS MEANS LONGER QUES

## *Future Scenario- (double traffic) without BRTS*

Mixed traffic

People moved -240

Queue length - **463 m.**

(Increase from 210 meters)

Phase Time – 200 Seconds+ (Not possible to operate with At-grade junction)



Janmarg – Focus on Moving People..



# MORE CARS MEANS LONGER QUES

## *Future Scenario- (double traffic) without BRTS*

Mixed traffic People moved -610  
Queue length - **630 m.**  
(Increase from 210 meters)  
Phase time – 200 + Seconds  
(At-grade operation impossible)

Total -Section  
length –537m



Janmarg – Focus on Moving People..

# RESULT



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# SIMULATION RESULTS FROM VISSIM

## -- FROM HELMET TO SHIVARAJANI INTERSECTION

Origin - Destination		Length (Km)	With BRT		Savings (s)	Without BRT	Saving
From	To		Average Delay (s) BRT	Average Delay (s) Mix Traffic		Average Delay (s)	Average Delays w/o BRT over with BRT
Helmet	Keshavbaug	2.1	103.5	338.605	235	394.49	3.8 times
Helmet	Shivaranajani	2.6	138	368	230	430.88	3.1 times

- The evaluation results indicate the average speed of 27.2 and 22-24 kmph for BRT and mixed traffic respectively.
- The evaluation results indicate the average speed under mixed traffic situation is 16-19 KMPH

# How do we use our roads?

# How do we use our roads?

Element	Planned		On site situation	
	Width	% covered	Width	% covered
Footpath	2.25m	15 %	2.25m	15 %
Carriageway	9.25m	50%	7m	22%
BRT lane	3.65m	25 %	3.65m	25 %
BRT Stop	1.9m		1.9m	
Parking	2.25	8 %	6m	36%



# How much does BRTS costs?



# DIFFERENCE – TWO MEDIANS VS ONE MEDIAN



Janmarg – Focus on Moving People..

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# HOW MUCH DOES BRTS COSTS?

1. PROJECT COSTS – US \$ 3 Million/km (Rs 15 Crores)
2. DECOMPOSITION - PROPORTIONAL COST  
ALLOCATION - US \$ 0.45 Million/km (Rs 2.2 Crores)
3. INCRIMENTAL COSTS - US \$ 0.05 Million/km (Rs 25 Lakhs)

# SURAT

## PRINCIPLES

1. Network & Not Corridors
2. Connect busy places – Avoid Busy Roads
3. We are a growing city. Hence add capacity – take part of capacity created for BRTS
4. Develop full scale BRTS with all elements
5. Affordable fare – Comparable with Auto Fare
6. Integrated system (Trunk-Complementary-Feeder)
7. TOD – Hub & Increase FSI Along the corridor
8. Value Capture – Sale of FSI
9. TDM (Pay & Park)



# SURAT BRTS NETWORK

## PHASE 1 - JnNURM

Part Complete – Part Under Constn

- Year of Sanction 2008
- Start Year of implementation – 2009
- Phase 1 Corridors – 30 km
- Corridor 1 (10 km) Completion date – 2013
- Corridor 2 (20 km) Completion date – 2014

## PHASE 2 – SMC/STATE

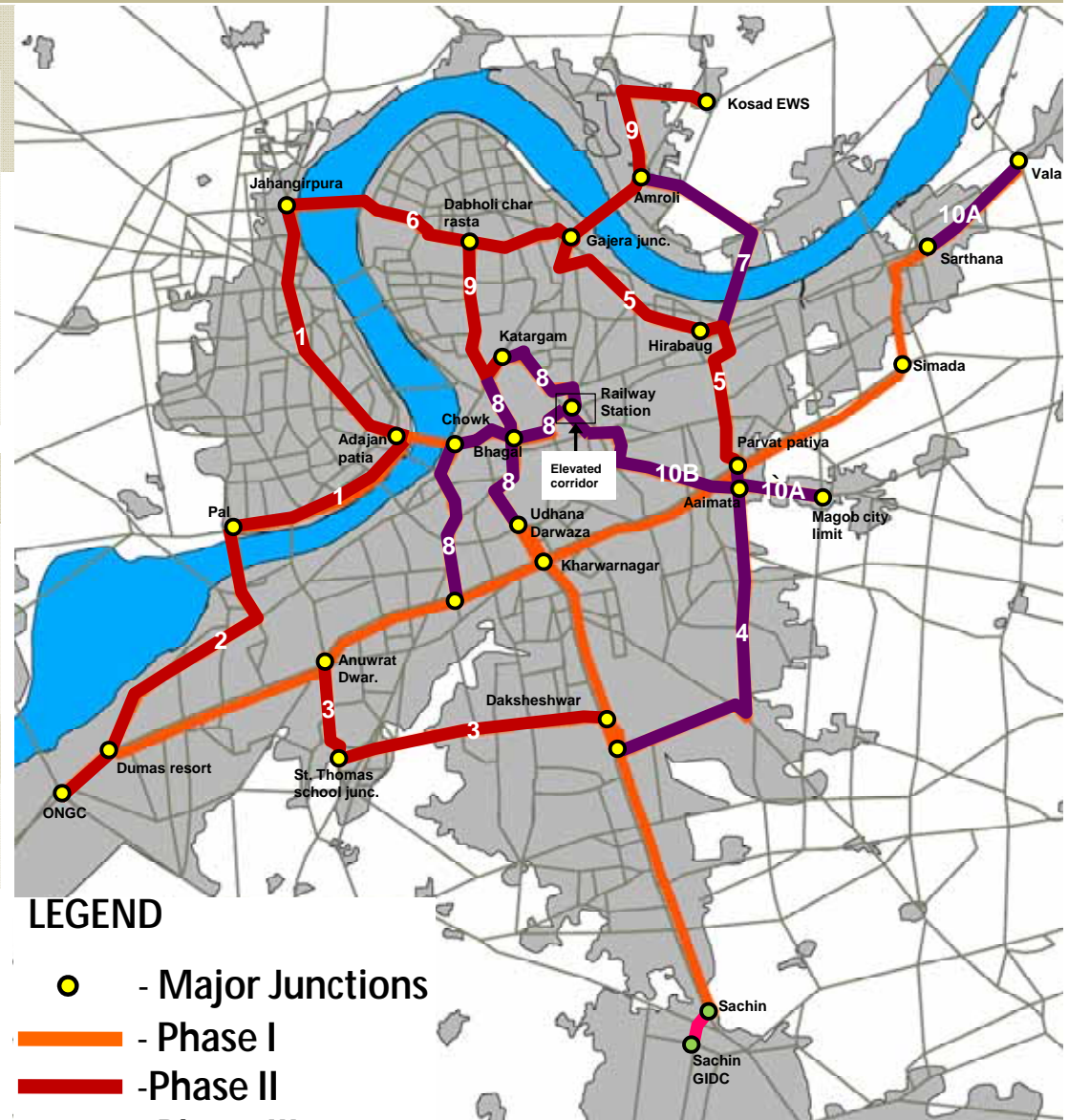
- Network length - 42 kms
- Under Construction

## PHASE 3-JnNURM (Proposed)

- Network length - 30 kms

## PHASE 4 - Proposed

- 3.5 km long elevated corridor connecting railway stn & city center



### LEGEND

- - Major Junctions
- - Phase I
- - Phase II

Surat Municipal Corporation - Government of Gujarat

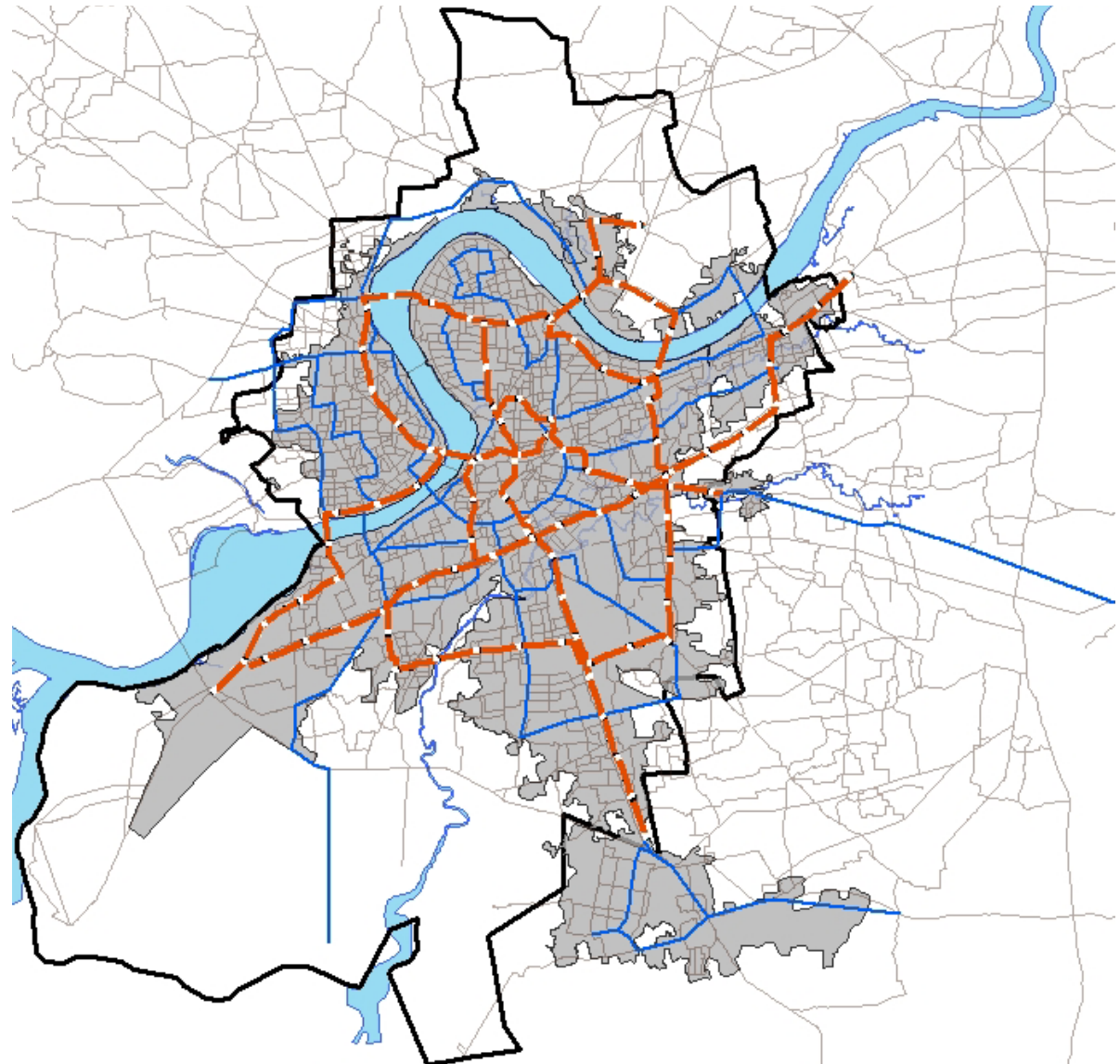
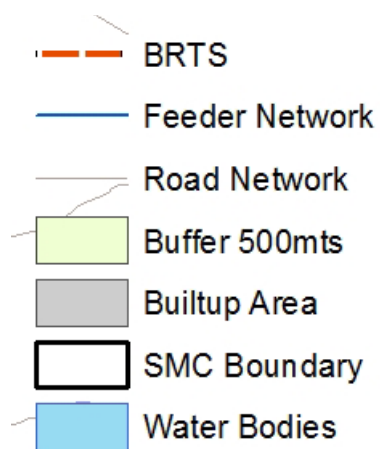
# SURAT BRTS NETWORK

## Public Transport Coverage

BRT Network Length: 102 km.

Feeder Network Length: 157 km.

Total PT Network Length: 250 km.



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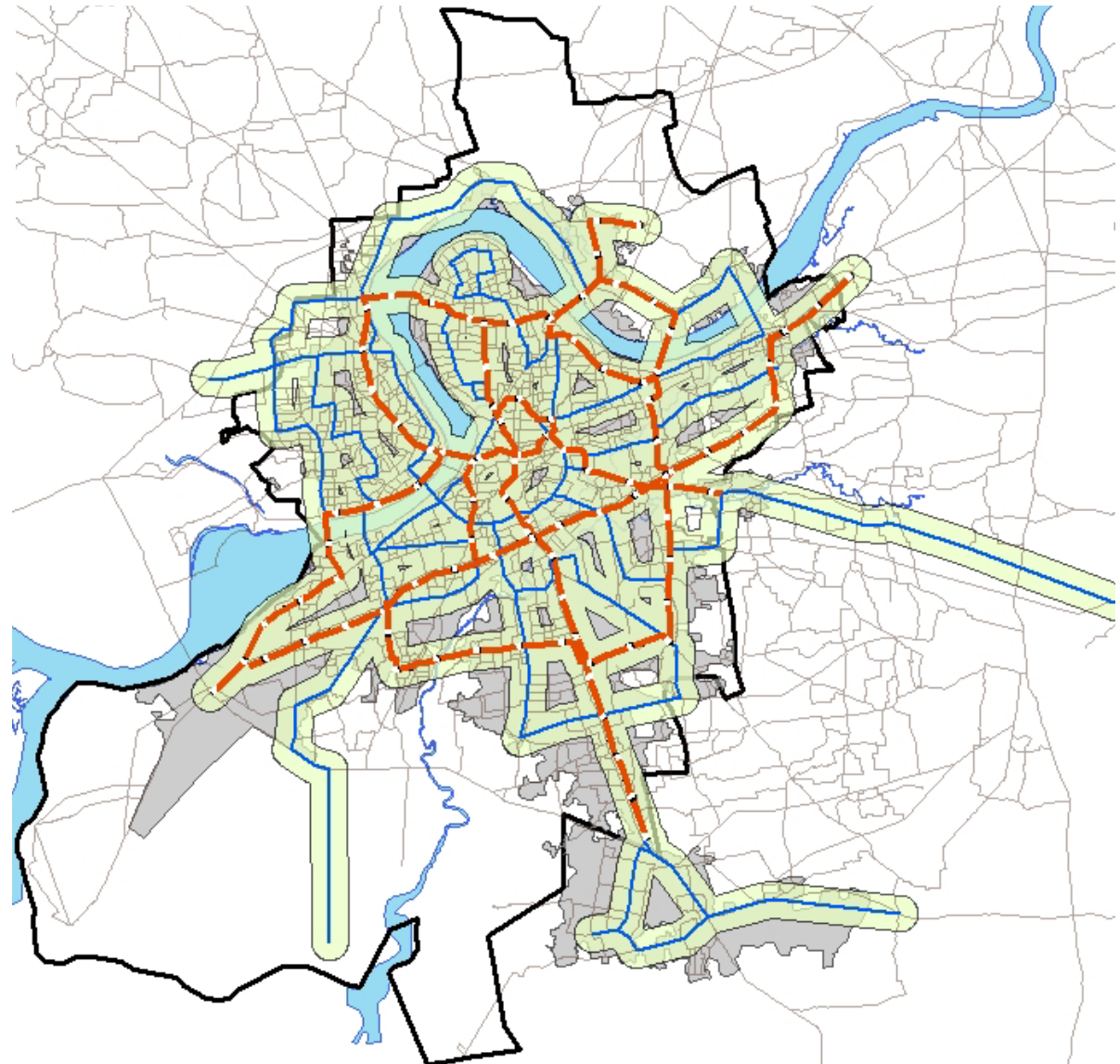
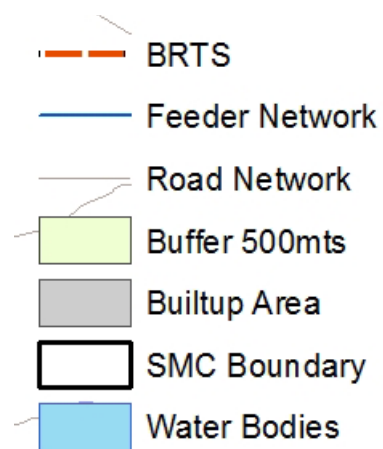


# SURAT BRTS NETWORK

BRT Network Length: 102 km.  
Feeder Network Length: 157 km.  
Total PT Network Length: 250 km.

**Built up coverage: 80%**

Total Built up area: 166 sqkm.  
Built up covered: 133 sqkm



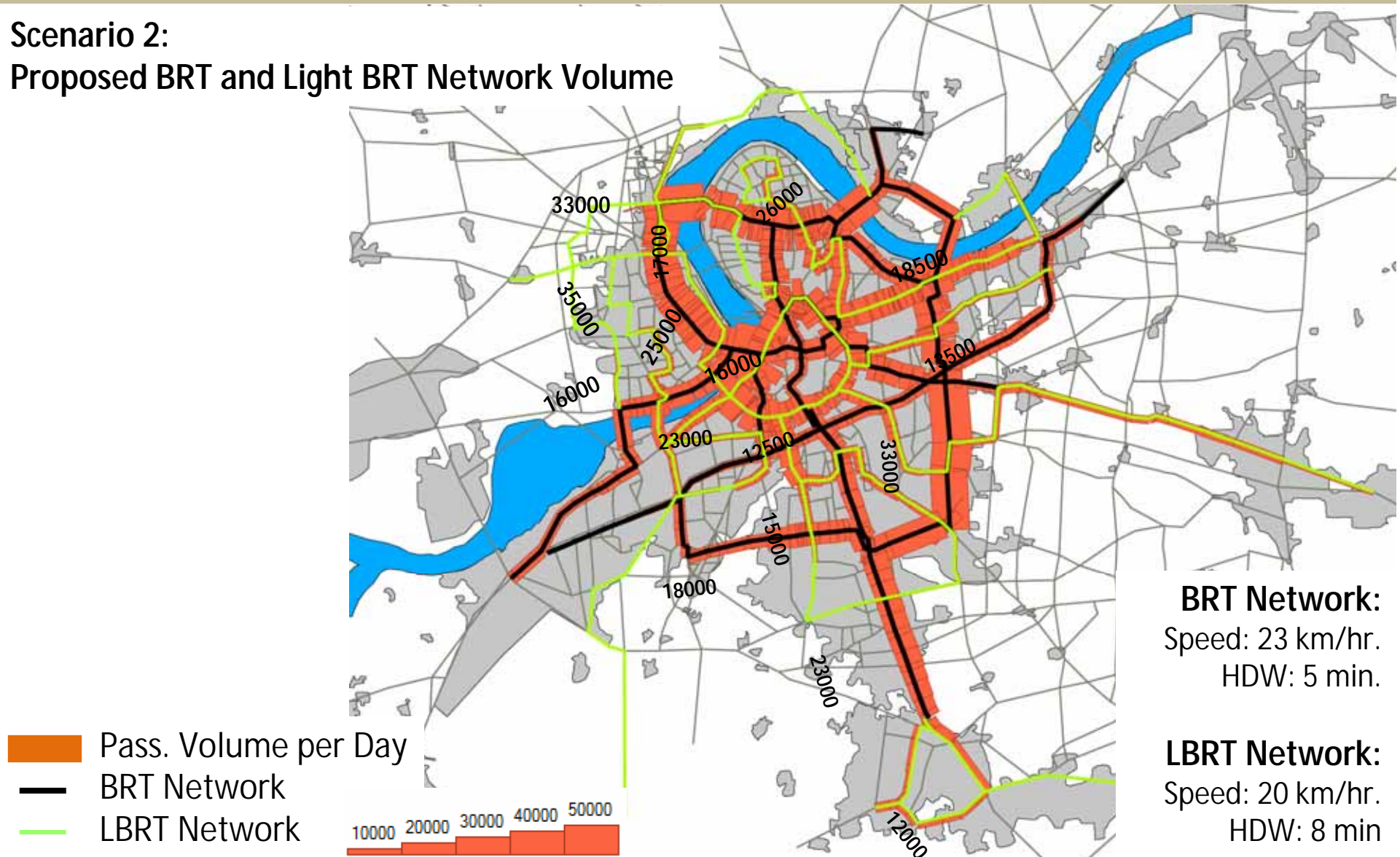
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# SURAT BRTS

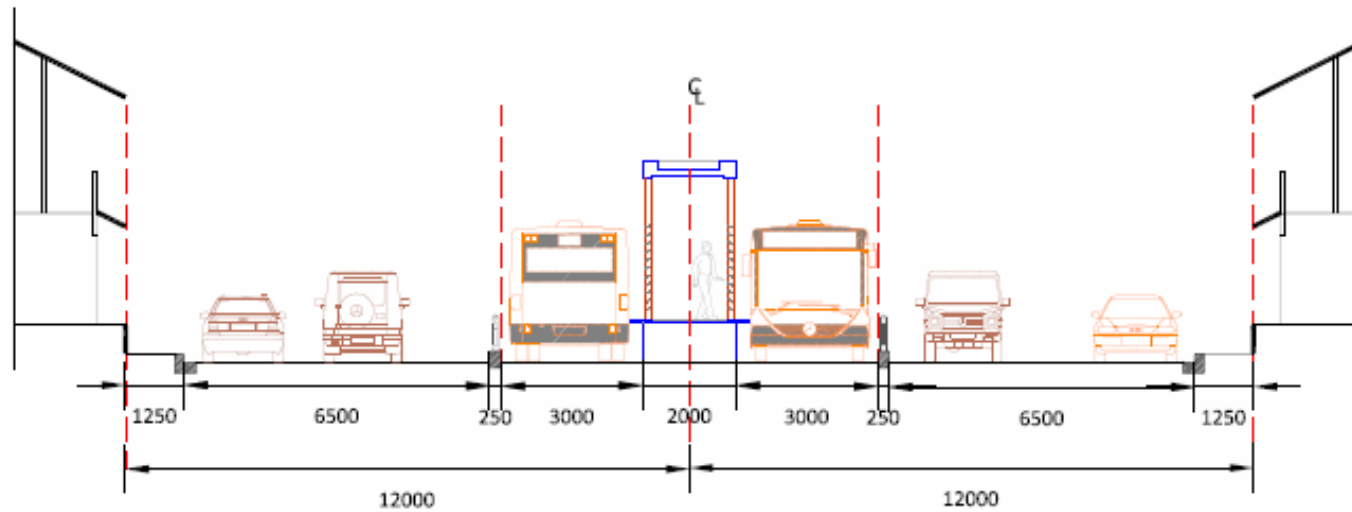
Scenario 2:  
Proposed BRT and Light BRT Network Volume



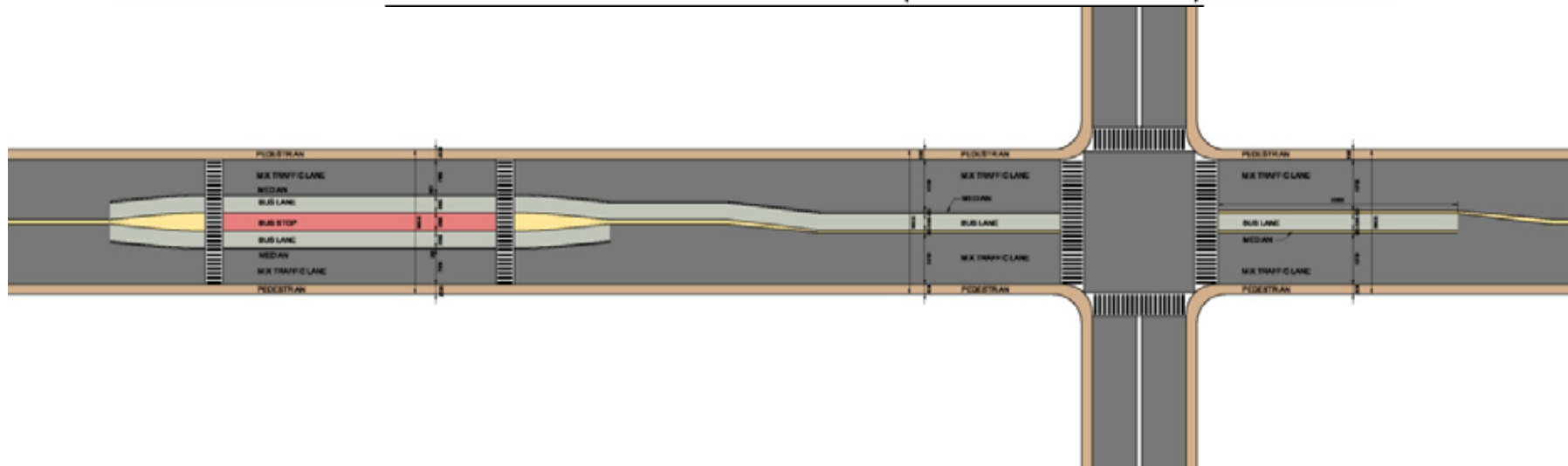
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# INNER CITY ACCESS - Design Interventions



TYPICAL CROSS SECTION FOR OLD CITY (24 m NEAR BUS STOP)



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# SURAT



Prototype Bus Station Completed



Prototype Bus Station Completed



Activity Area



Trees retained along Footpath



# Phase 1 - Ongoing Work at Udhana Sachin corridor



# Phase 1 - Ongoing Work at Canal Road



Canal edge work in progress

Working days 7-10 days in a Month – due to flow of water by Irrigation dept.



# SURAT

## Glimpse from Surat BRTS



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# SURAT

## Anuwart Dwar to Kharwarnagar



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## Before & After – Canal Road



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# Ahmedabad

## Before & After - Anjali



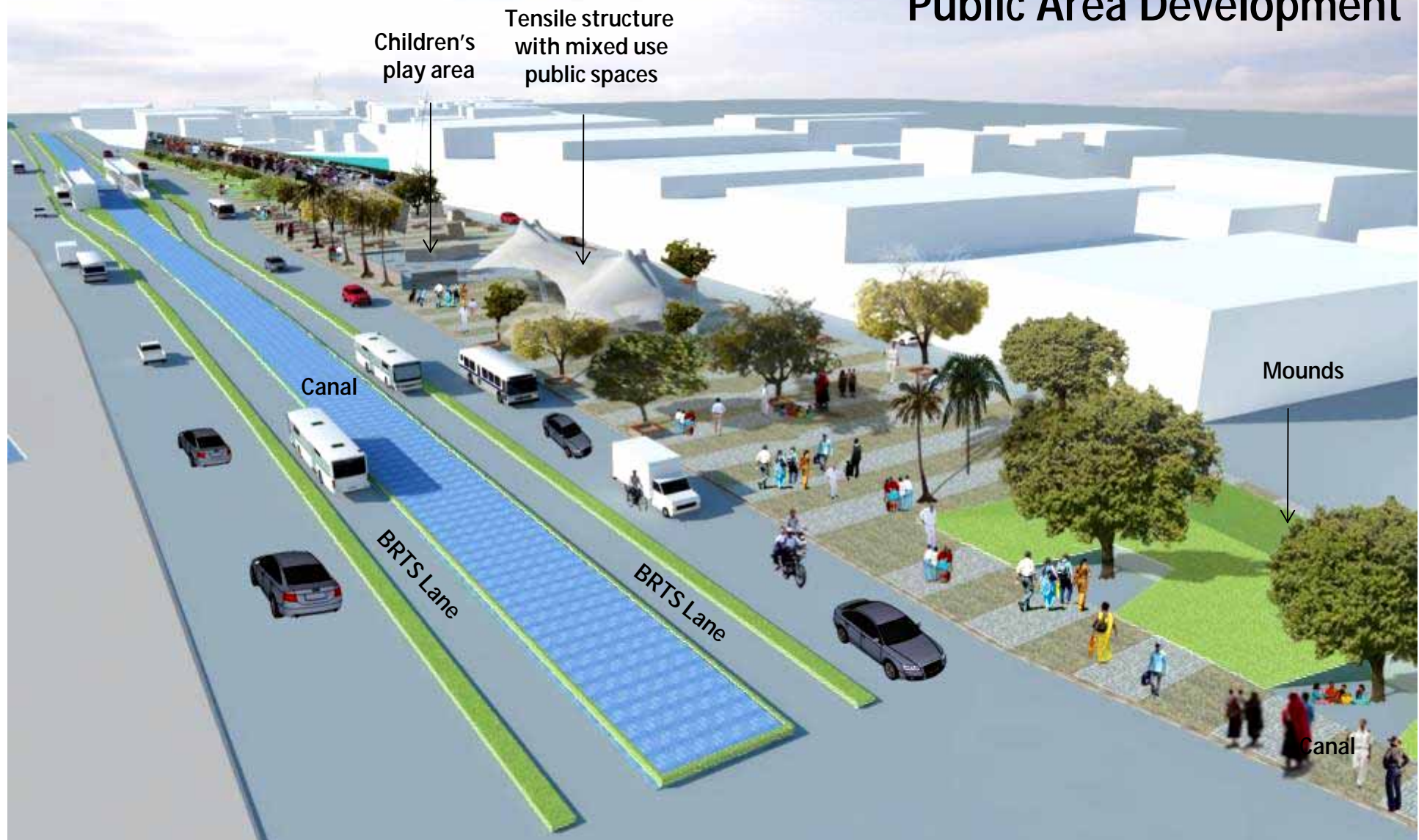
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# Surat

## Public Area Development



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# Surat

## Public Area Development



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# **SURAT BRTS**

## **ITS applications**

**Operations Control**

**Electronic Fare Collection**

**Passenger Information System**

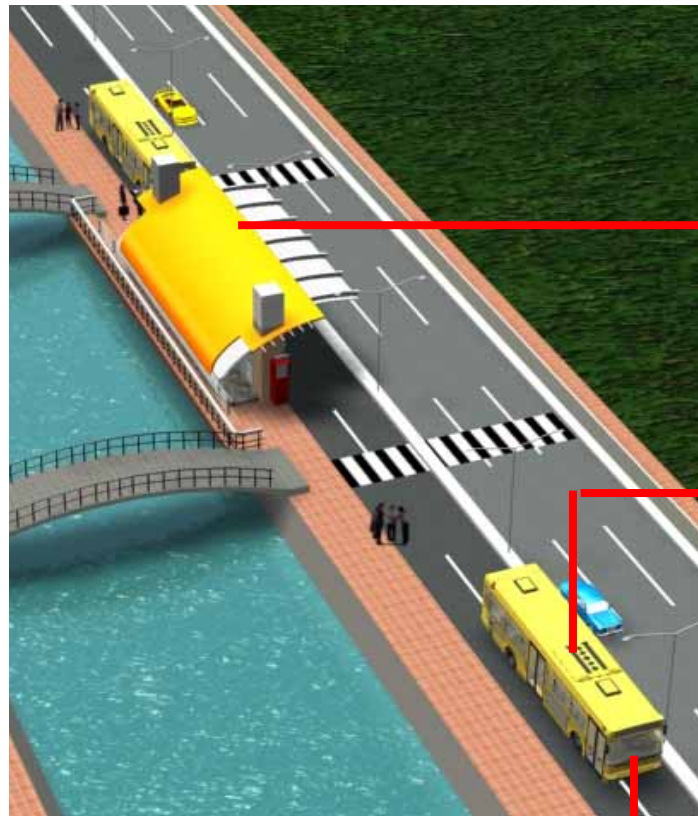
**Traffic Signaling / ATC**

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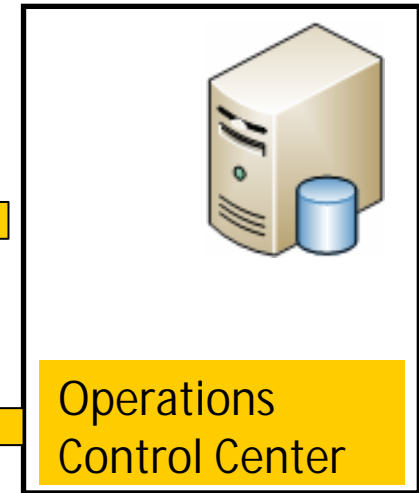
# Operations control & Passenger Information system



## PASSENGER INFORMATION SYSTEM

Passenger Information System in BRT Stops and terminals

Passenger Information System in Bus



## AUTOMATIC VEHICLE TRACKING & OPERATIONS CONTROL

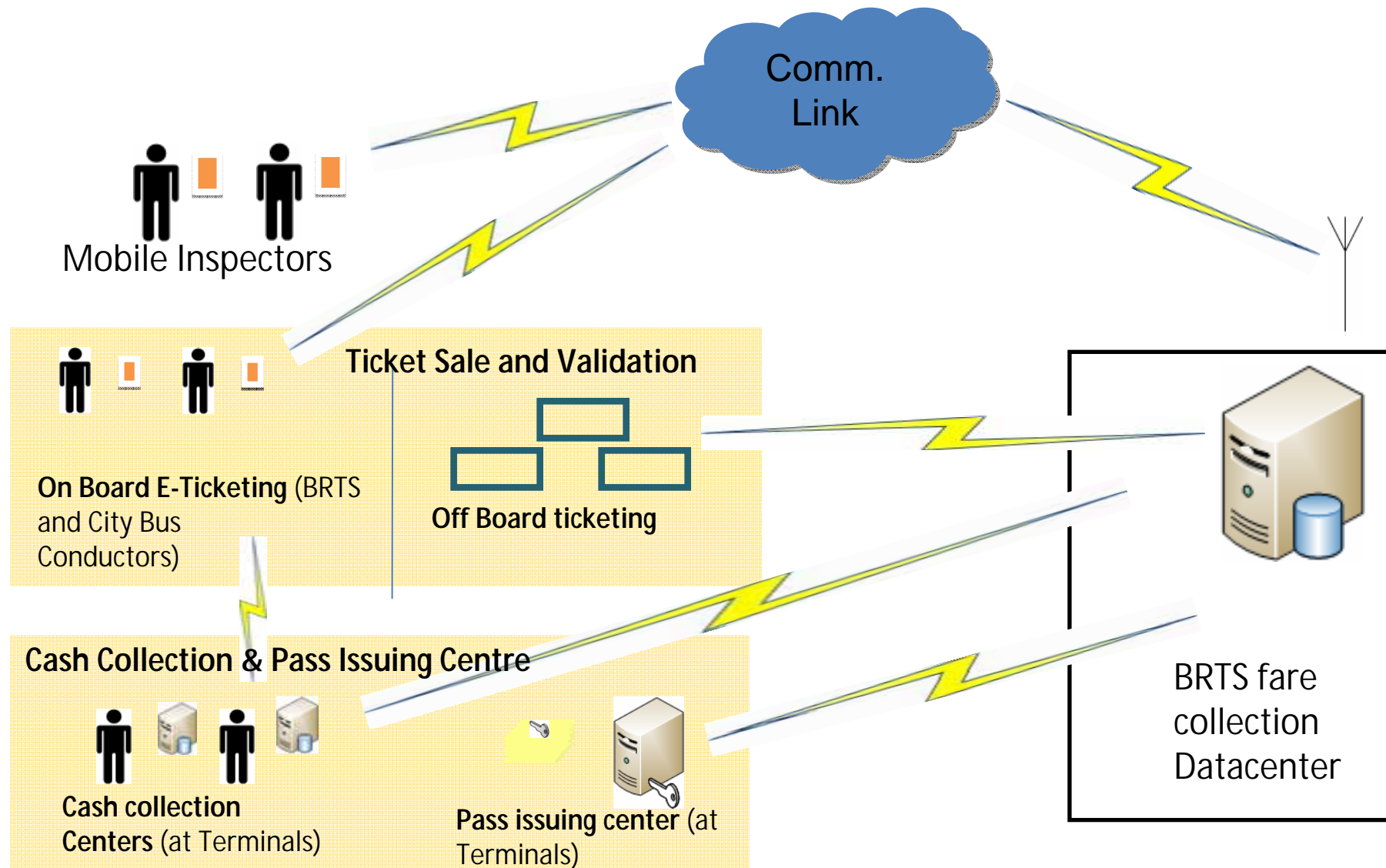
GPS/ GPRS module with two way voice and data communication

## BUS OPERATOR DEPOT

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# Electronic fare collection system

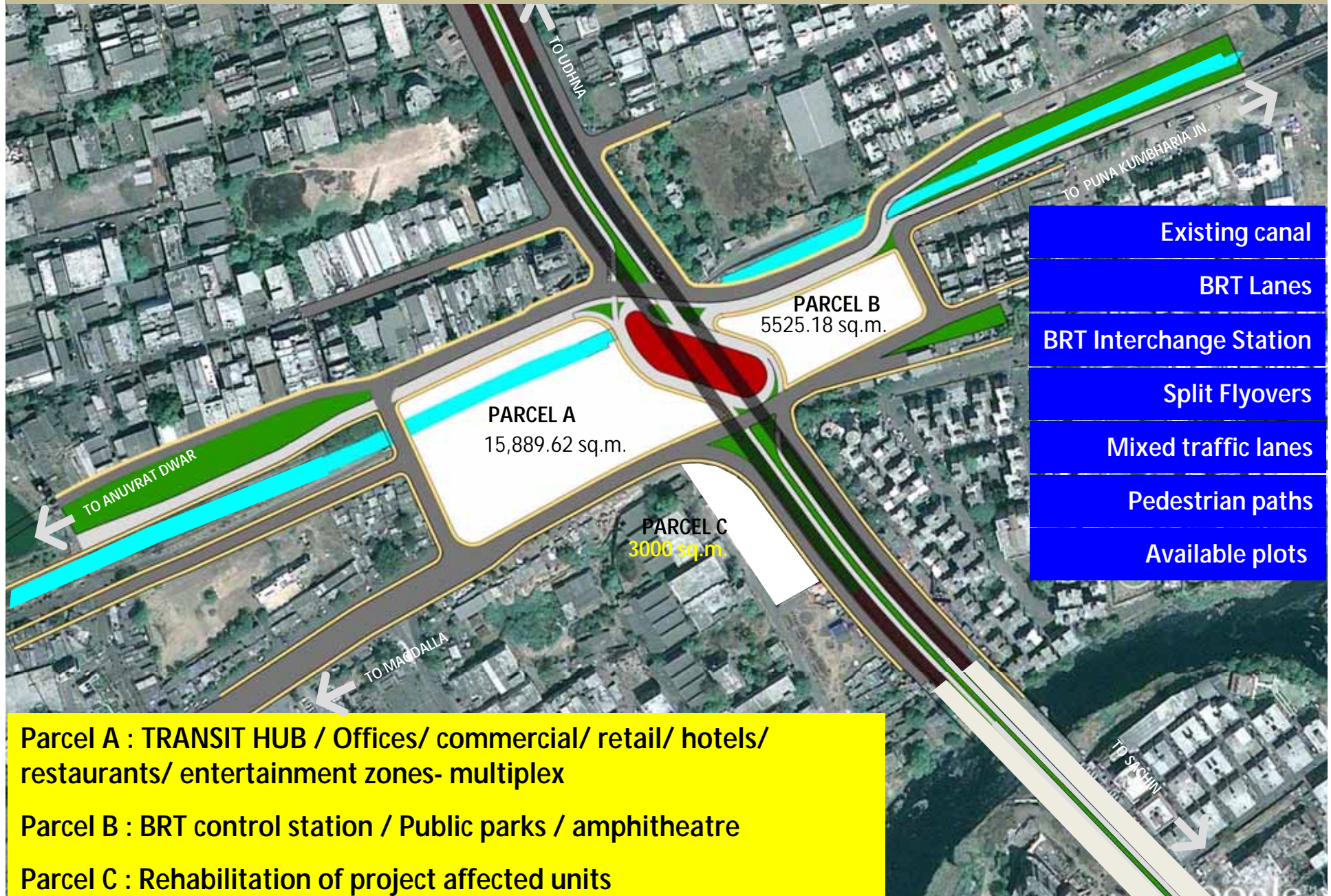


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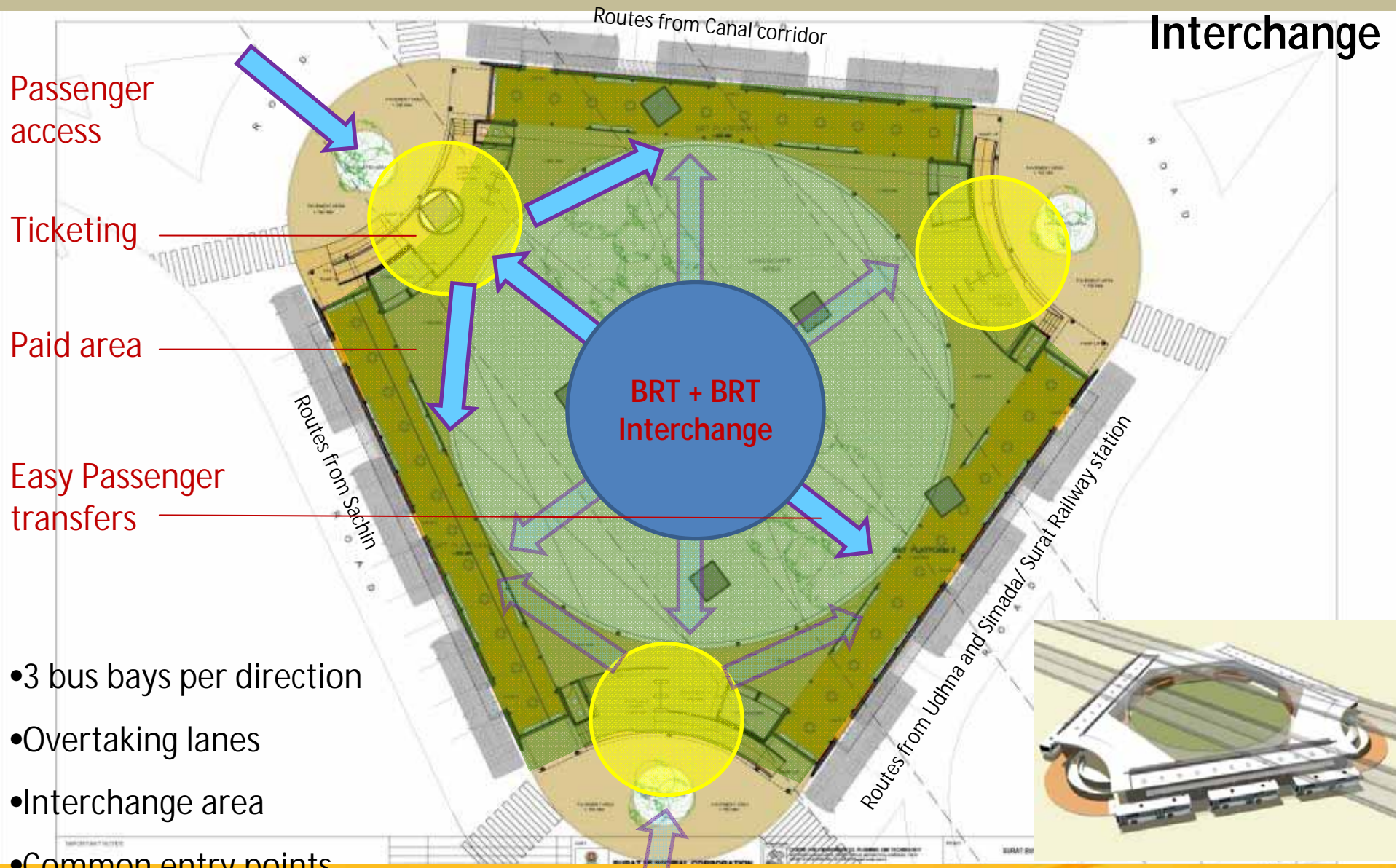
# INTERCHANGE





# Surat

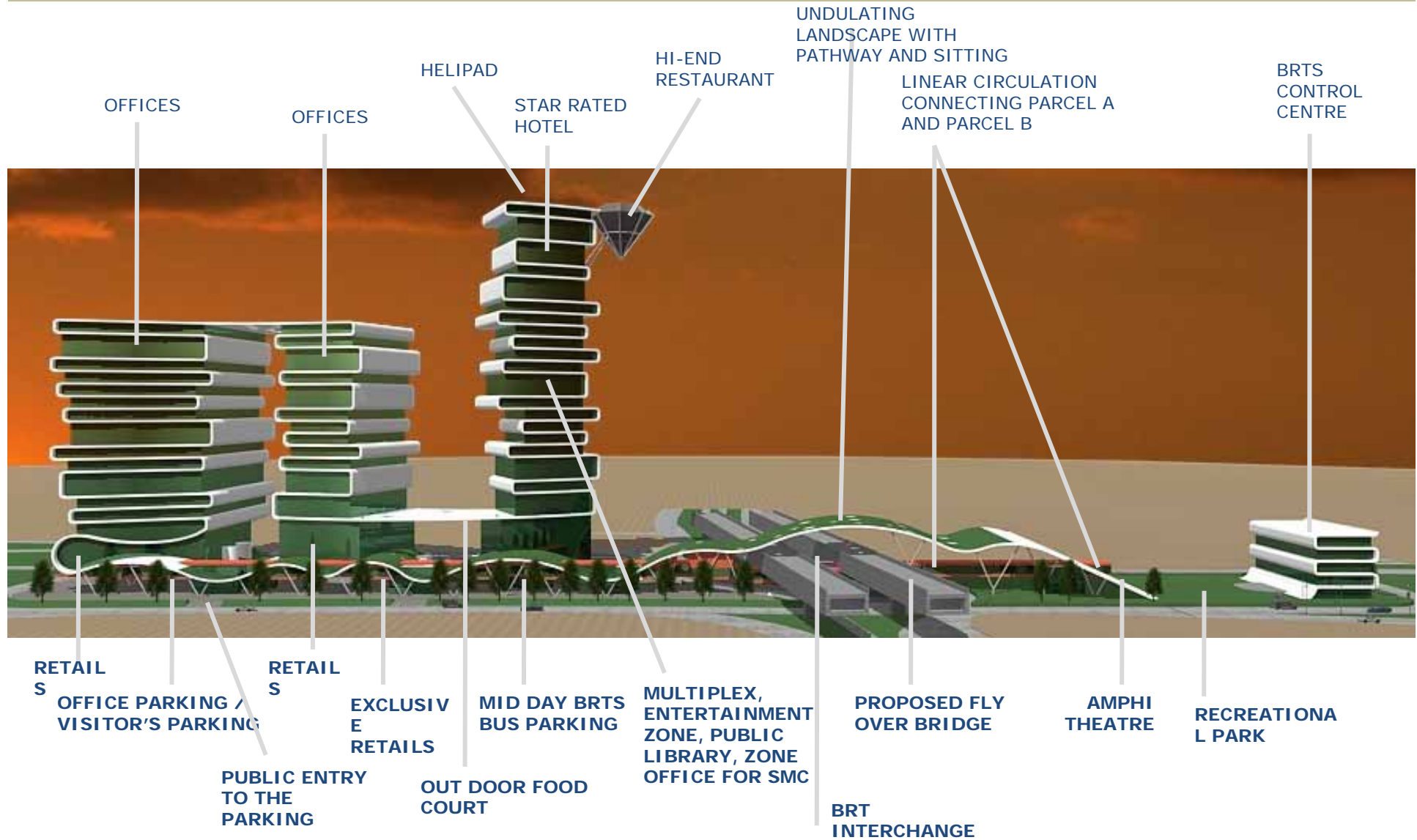
## Interchange



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# INTERCHANGE - project components



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# Ahmedabad

## Transit Oriented Development



*Source: AUDA DP 2021*



# AMTS Network Scenarios

## Immediate



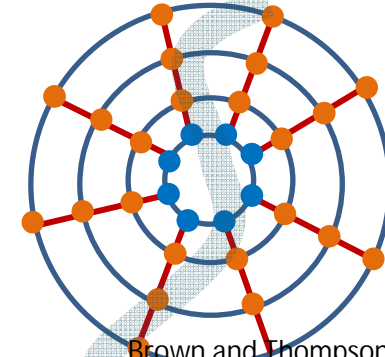
- Phase out routes which are in direct competition with BRT
- De Centralize Lal darwaja

## AMTS Rerouting



- Strengthening the trunk routes
- Complimenting and feeder routes for BRTS
- Remove Overlapping
- Routes from BRTS
- Rerouting the routes from the BRT overlaps

## Direct Connections

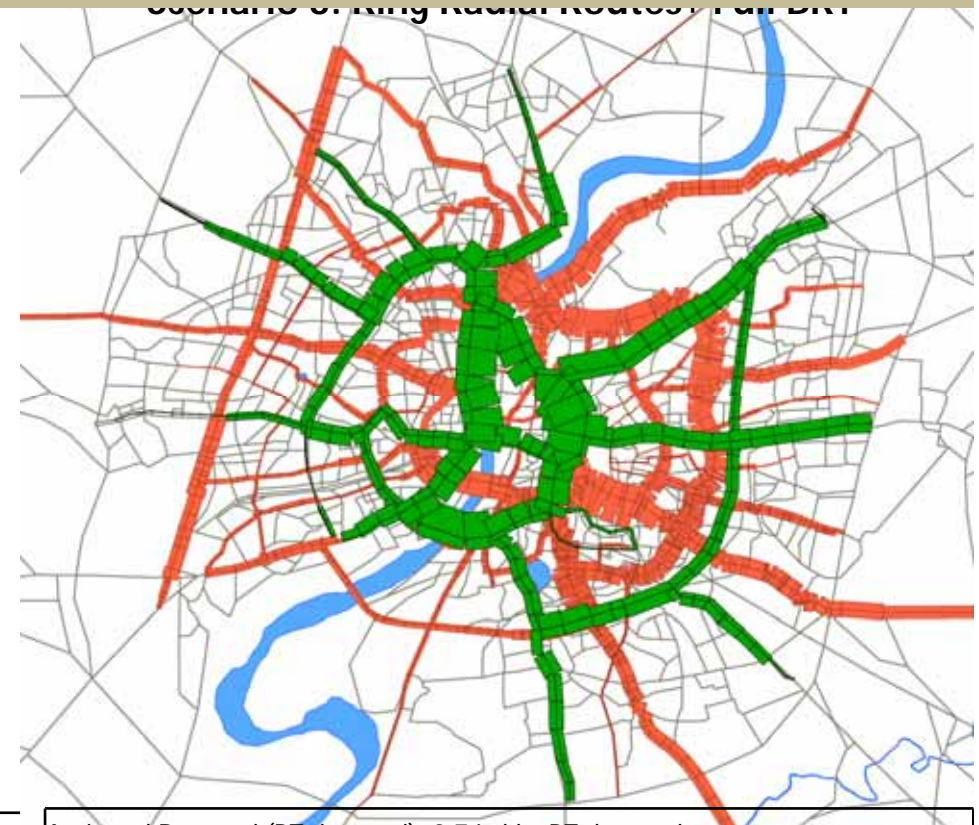
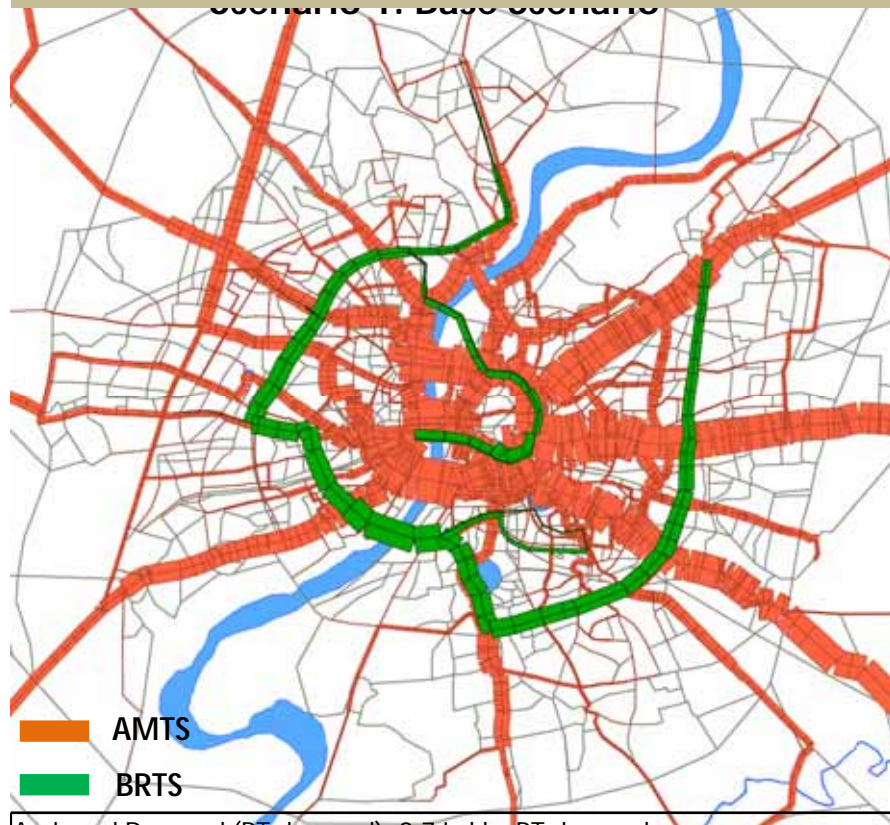


Brown and Thompson - 2008

## AMTS rapid

- The transportation demand in Ahmedabad is largely radial
- Strengthening existing radial routes and identifying new radial routes to provide AMTS Rapid

# Scenarios Comparision



Assigned Demand (PT demand): 9.7 Lakhs PT demand

Modes	Boarding	Pass. Km.	Pass. Hrs.
AMTS	1404603	12187043	790596
BRTS	163945	1514031	63501
	<b>1568548</b>	<b>13701074</b>	<b>854097</b>
Transfer Rate		1.59	
Avg Trip Leg Length (km)		8.73	
Pass. Km. Savings (compared to Base Scenario)		-	
Pass. Hrs. Savings (compared to Base Scenario)		-	

Assigned Demand (PT demand): 9.7 Lakhs PT demand

Modes	Boardings	Pass. Km.	Pass. Hrs.
AMTS	1547218	7258482	461833
BRTS	911855	4983246	209121
	<b>2459073</b>	<b>12241728</b>	<b>670953</b>
Transfer Rate		2.49	
Avg Trip Leg Length (km)		4.98	
Pass. Km. Savings (compared to Base Scenario)		10.65%	
Pass. Hrs. Savings (compared to Base Scenario)		21%	



Thank you...  
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**Prof.H.M. Shivanand Swamy**  
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Centre of Excellence in Urban Transport (CoE)  
CEPT University,  
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