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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(An initiative of the Ministry of Urban Development, GOI)
CEPT University, Ahmedabad, India
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
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?
45000 Autos operating like Public Transport!
Challenge for Surat
To create Sustainable High Quality Public Transport

Technical Assistance: Centre of Excellence in Urban Transport, CEPT University, Ahmedabad. (An initiative of the Ministry of Urban Development, Government of India)
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
SURAT

Routes

Bus

Autos

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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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**Auto Passenger Survey - Analysis**

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

Average Trip Length: 6.9 Km

**Source:** Primary Survey, 2009
Auto Routes: Speed

Legend
- Auto routes
- Speed (Km/hr)
- 9 - 10
- 11 - 14
- 15 - 18
- 19 - 21
- Railway
- Roads
- River Boundary

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Willingness to Shift Survey

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

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

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 - Focus on Moving People..

Janmarg

- People moved: 150
- Area occupied - 84 sq. m
- Queue length - 24 m.
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.

Mixed traffic
- People moved - 155
- Queue length - 210 m.
- Phase time - 70 Seconds
- Cycle Length - 180 Seconds

18 M ARTICULATED BUS
CAPACITY- 140

Janmarg – Focus on Moving People..
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 - 537 m

Janmarg – Focus on Moving People..
### SIMULATION RESULTS FROM VISSIM

--- FROM HELMET TO SHIVARAJANI INTERSECTION

<table>
<thead>
<tr>
<th>Origin - Destination</th>
<th>Length (Km)</th>
<th>With BRT</th>
<th>Without BRT</th>
<th>Saving</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BRT</td>
<td>Mix Traffic</td>
<td>Average Delay (s)</td>
<td>Savings (s)</td>
</tr>
<tr>
<td><strong>Helmet</strong></td>
<td>2.1</td>
<td>103.5</td>
<td>338.605</td>
<td>235</td>
</tr>
<tr>
<td><strong>Helmet</strong></td>
<td>2.6</td>
<td>138</td>
<td>368</td>
<td>230</td>
</tr>
</tbody>
</table>

- 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?

<table>
<thead>
<tr>
<th>Element</th>
<th>Planned Width</th>
<th>% covered</th>
<th>Planned Width</th>
<th>% covered</th>
</tr>
</thead>
<tbody>
<tr>
<td>Footpath</td>
<td>2.25m</td>
<td>15%</td>
<td>2.25m</td>
<td>15%</td>
</tr>
<tr>
<td>Carriageway</td>
<td>9.25m</td>
<td>50%</td>
<td>7m</td>
<td>22%</td>
</tr>
<tr>
<td>BRT lane</td>
<td>3.65m</td>
<td>25%</td>
<td>3.65m</td>
<td>25%</td>
</tr>
<tr>
<td>BRT Stop</td>
<td>1.9m</td>
<td>22%</td>
<td>1.9m</td>
<td>25%</td>
</tr>
<tr>
<td>Parking</td>
<td>2.25</td>
<td>8%</td>
<td>6m</td>
<td>36%</td>
</tr>
</tbody>
</table>
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)
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 Constrn
• 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
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SURAT BRTS NETWORK

Public Transport Coverage
BRT Network Length: 102 km.
Feeder Network Length: 157 km.
Total PT Network Length: 250 km.
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
Scenario 2:
Proposed BRT and Light BRT Network Volume

<table>
<thead>
<tr>
<th>Pass. Volume per Day</th>
<th>BRT Network</th>
<th>LBRT Network</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Speed: 23 km/hr.</td>
<td>Speed: 20 km/hr.</td>
</tr>
<tr>
<td></td>
<td>HDW: 5 min.</td>
<td>HDW: 8 min</td>
</tr>
</tbody>
</table>

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Prototype Bus Station Completed

Activity Area

Trees retained along Footpath

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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.
Glimpse from Surat BRTS
SURAT

Anuwart Dwar to Kharwarnagar
Before & After – Canal Road

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Ahmedabad

Before & After - Anjali

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Surat

Public Area Development

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Public Area Development

- BRTS Corridor along Canal
- Informal sitting
- Children's play area
- Paved Area

Surat

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SURAT BRTS

ITS applications

- Operations Control
- Electronic Fare Collection
- Passenger Information System
- Traffic Signaling / ATC
Operations control & Passenger Information system

- Passenger Information System in BRT Stops and terminals
- Passenger Information System in Bus
- GPS/ GPRS module with two way voice and data communication

AUTOMATIC VEHICLE TRACKING & OPERATIONS CONTROL

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Electronic fare collection system

- Mobile Inspectors
- On Board E-Ticketing (BRTS and City Bus Conductors)
- Off Board ticketing
- Ticket Sale and Validation
- Cash Collection & Pass Issuing Centre
- Pass issuing center (at Terminals)
- Cash collection Centers (at Terminals)

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Parcel A: TRANSIT HUB / Offices / commercial / retail / hotels / restaurants / entertainment zones - multiplex

Parcel B: BRT control station / Public parks / amphitheatre

Parcel C: Rehabilitation of project affected units
Surat

• 3 bus bays per direction
• Overtaking lanes
• Interchange area
• Common entry points
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

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

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### Scenarios Comparison

**Scenario 1: Base Scenario**

- **Assigned Demand (PT demand):** 9.7 Lakhs PT demand
- **Modes**
- **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):** -

**Scenario 2: 46 AMTS Modified routes + Full BRT**

- **Assigned Demand (PT demand):** 9.7 Lakhs PT demand
- **Modes**
  - **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%

**Scenario 3: Ring Radial Routes + Full BRT**

- **Assigned Demand (PT demand):** 9.7 Lakhs PT demand
- **Modes**
  - **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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