URBAN PUBLIC TRANSPORT PLANNING IN TEHRAN AND THE OUTCOME OF THE IMPLEMENTED BRT LINES

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Tehran Should Have integrated, Available, Safe, Easy, Comfortable and Clean transportation system with consideration of resources limitation and other conditions for improvement of life quality.
Tehran in ONE Glance

- **Tehran**: Capital of Islamic Republic of Iran,
- **Population**: 7,962,000
  - surrounded by towns: Karaj, Varamin, Eslamshahr, Shahriyar, ... pop 15.0 M
- **Area**: 740 Km\(^2\)
- **Population Density**: 10750 /km\(^2\)
- **Residents Trip**: 12.5 M
Modal Split of Trip in Tehran – 2006

Vehicle Classification in Tehran Trip Displacement (Modal Share) in 2015

TRANSPORTATION SYSTEM

Private 41.4%

Public 27.8%

Public-Semi 31%

Other Types 0.6%

Passanger car and pickup 35.1%

Urban Train (Metro) 7.3%

Taxi and Agencies 21.4%

Motorcycle and Bicycle 6.3%

Bus 18.2%

Any Kind of Service 9%

Minibus 3.3%

Van 0.6%

Modal Split of Trip in Tehran – 2006

Vehicle Classification in Tehran Trip Displacement (Modal Share) in 2015
Transport System and Environmental Concerns

More than 3.5 million vehicles account for 88 percent of air pollutant produced in Tehran

More than 1192 tons of air pollutant are disseminated in Tehran especially SO\textsubscript{x}, NO\textsubscript{x} and Co and suspended particles

Every private car consumes energy 9 times more than a public bus per passenger trip

Motorcycles are responsible for 49 percent of noise pollution in Tehran

Average Speed of Public buses was just about 14 km/hr
Possible Solutions

Demand Management

Restrictive Policies
- Restricted Traffic Zone
- Old vehicles Recycling
- Fuel Price increase for private cars
- ...

Regulative Policies
- Regulated working time
- Regular Technical Inspection
- ...

Promotional Policies
- Public Transport Promotion
- Public Knowledge Improvement
- ...

Challenges in Public Transport Development

- Partial private Operation: government sets fares, private sector takes all risks
- Poor availability of Services throughout the City
- Poor Integration with other Public and Semi-Public services
- Poor service quality: decreasing patronage
- Low fares: unable to renovate old and polluting fleet
- On board cash payment: revenue losses
- Weak supervision, monitoring and control
Poor Development
Poor Network Design
Poor Management and Control Mechanism

Low Quality
Unreliability
Unavailability

Public Transport Disadvantage Vs. Private Transport
A Systematic Approach to: Public Transport System Design

- **Bus** and **Railway** as the primary PUBLIC Transport Network
- **Van** and **Taxi** as the Secondary Complementary Services
- Priority to public services in Road Network Design
# 3 Layers in Bus system

<table>
<thead>
<tr>
<th>Layer</th>
<th>Speed</th>
<th>Capacity</th>
<th>Fare collection</th>
<th>Operators</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1: BRT Line</td>
<td>High</td>
<td>High</td>
<td>Off Vehicle</td>
<td>Public</td>
</tr>
<tr>
<td>L2: Regional Bus Line</td>
<td>Medium</td>
<td>High</td>
<td>Off Vehicle</td>
<td>Private</td>
</tr>
<tr>
<td>L3: Local Bus Line</td>
<td>Low</td>
<td>Medium</td>
<td>In vehicle</td>
<td>Private &amp; Public</td>
</tr>
</tbody>
</table>
Bus network Design (Layer 1 and 2)
An urban transit system equipped with ITS systems including **Speed** and **Accuracy** from Railway System and **Flexibility** from bus transit system.
BRT System Implementation Objectives

- Increasing public intention to Urban Bus Services
- Promoting Informed Route Choice Decision Making Culture and using multi modal public transport services
- Real time Fleet management
- Optimum Distribution of the Fleet based on the current demand patterns
Major Advantages of BRT System

- Smart Allocation of the buses to the routes and increased system productivity
- Limited implementation and arrangement costs comparing to railway systems
- Establishment of a single control center for BRT system management and coordination
- Maximum use of existing facilities and infrastructures
BRT System Architecture

- Dedicated Runway
- Intelligent and Integrated Management Mechanism
- BRT Specific Fleet
- BRT Specific Stations
BRT Implementation
Experience in Tehran

- More than 18 months of study and system design based on successful experiences in other countries
- BRT Network Design for Tehran including 10 Rapid Transit Lines
- Detail Design and implementation of the FIRST BRT line in Tehran in 2007
BRT Implementation
Experience in Tehran

- Implementing and operating line 2 and 3 in 2008 and reaching to a network of BRT with 50 km length
- Designing and implementing the 4th BRT line in one of the most important North-South corridors of Tehran with 21.5 km length in 2009
Running way

- Arterial Median (Physically Separated Lanes within Street Rights-of-Way)
- Exclusive Two-Way Facilities for BRT
BRT Vehicles

- 18-meter (60-foot) BRT vehicle configured with Six passenger service streams (three double doors) for a dense urban corridor with significant passenger turnover.
Station

- **Dimensions:**
  - Height: 5.00 m
  - Wide: 3.20 m
  - Length: 36, 40, 44 m
  - High of floor: 40 cm

- **Normal Station:**
  - 12 (18) gate for boarding for 2 (3) Bus in each direction
  - 4 (8) entrance gate with 3 (6) e-card reader
  - 5 (7) officer in each Station
ITS Application in Station (Camera system)

Features:
- Visual monitoring of Stations through two video cameras installed in each station (4 cameras are installed in larger stations)
- 2 LCD Monitors to show Passenger Information and in-station video cameras’ picture in each station
- Online video transmission to BRT Control Center

Goal:
- Diagnosis of Passenger congestion in station
- Improve Passenger Security
- Ensure equipments security
ITS Application in Station (E-Payment)

**Traditional System**
- Ticket Box for conventional Ticketing

**Electronic Ticketing**
- 3 Card Reader in Station
- Integrated system with Metro Card

**Objectives**
- Improving public culture and directing people toward multi modal transportation
- reducing heavy costs of traditional non electronic solutions
- improving transport planning possibilities
- better demand forecast for public fleet management
ITS Application in Station
(Headway Control System)

- Warning passengers before bus doors closing and bus preparation for leaving
- Fleet headway control by setting for bus stoppage and leaving time in the station
- Down–Counter for Bus Stopping Time
- Detecting Bus Availability
- Sending warning message to BRT Control Center incase of bus unavailability for several intervals through GPRS network
ITS Application in Running way
(running way Camera)

- Visual Monitoring system & Communication Infrastructure
- Full coverage visual monitoring system
- 17 Km Fiber Optic network as the essential communication infrastructure
- Applying Wireless and GPRS networks as the secondary solutions
ITS Application in Running way (Bus Priority)

- **Intersection Management**
  - Bus priority in intersection (Late start)
    - Intentional delay for those vehicles intersecting bus route in a same traffic signal phase
  - Centralized intelligent Intersection management through SCATS
  - Installation of solar flashing lights for zebra line areas throughout the route to improve pedestrians crossing
ITS Application – On board
(Passenger information System)

- **On-board Audio Information System**
  - Passenger information about the next station in order to facilitate passengers departure
  - Providing extra information about those stations nearby or on the way of other public transport facilities
  - Storing time, speed geographical positions data for offline data gathering in order to support traffic engineering needs
  - Online fleet management and control through GPRS communication
Management and Operation Control

- BRT Control Room
Bus Operations and Service Plan

- **Scheduling**
- **Bus ordering (2 Bus)**
- **Service Time: 24 hour in day**

![Image of bus schedule]

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
<th>J</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ناگران1</td>
<td>راه اول</td>
<td>راه دوم</td>
<td>راه چهارم</td>
<td>راه پنجم</td>
<td>راه هفتم</td>
<td>راه هشتم</td>
<td>راه نهم</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>جمشید</td>
<td>6:36</td>
<td>8:24</td>
<td>10:12</td>
<td>12:00</td>
<td>13:48</td>
<td>15:33</td>
<td>17:27</td>
<td>19:21</td>
</tr>
</tbody>
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BRT Event Logger System

- Detecting traffic events
- Control and management with camera and radio communication
- Detecting and recording traffic equipments defects and making necessary coordination to resolve problems a. s. a. p.
Fleet Operation Management

- Tracking System
  - Software application for on-line fleet management
  - Bus tracking through GPS satellite system and GPRS communication System
What We have Achieved

1. Improved image and reputation for Public transport system
2. Improved system productivity, quality and reliability
3. Improved service availability and optimum land use
4. Increased public corridor survey
5. Changed customer habits, educational income
6. Reduced 90% in staff
7. Increased transit 2140
8. Reduced 320
9. Improved in passenger distribution
10. Linking residential area
11. Network design of BRT line
12. Improved access to public
13. Improved headway control
14. Complementary design
What We have Achieved (Cont’d)

- Diverting 150.6 semi private vehicles
- Decreased emissions from 170.53 kg to 92.87 kg in the 18 km corridor

Resolving traffic bottlenecks and improved air quality and energy consumption
Tehran Public Transport Network - 2015
Tehran Long Term Urban Rail Network (2020)

4 Express Rail Line
8 Urban Rail Line
Thanks for Your Attention
And Happy New Iranian Year