Framework for Maximizing Non-Fare Box Revenue for Metro Systems.

MENTOR: O. P. AGGARWAL

Presented by: Yash Choudhary, Karia Parth, Shafeeq Ahmed
Urbanization

Sprawling cities

Growth of Urban Population Since 1951-2011 in India

Source: http://www.indiaspend.com/investigations/urbanisation-sounds-great-but-who-has-the-money-to-fund-it
Issues of urbanization:

Congestion
- Pollubution
- Accidents

The Times of India, New Delhi, 24, June-2014

Delhi sees most road deaths in India

New Delhi: About 40 bus-loads of citizens die on the capital’s roads every year but the deaths do not shock any one and governments over the years have been little to stop it. From 2008 to 2013, more than 12,800 people died in road accidents here. Last year alone, there were a total of 3,400 deaths.

An assessment of road ac-
didents done by the Centre for Science and Environment (CSE) reveals that not only does Delhi have the most dis-
terous roads in the country but pedestrians and bikers are at the greatest risk on them. On average, five people die in road accidents every day and four of them are ei-
ter pedestrians or two-
wheelers riders.

The traffic police have identified 128 accident hot spots — places where three or

more fatal accidents, or 10 ac-
dicents have occurred in a year — and the CSE assess-
ment shows that northwest and southwest Delhi have the most such spots. Known de-

sign-wise, signal-free arterial

roads are the most dangerous.

Ironically, roads that have re-
ceived the maximum govern-
ment attention and resources for widening and signal-free movement have the highest accident rates.

“Those features have, in

fact, turned arterial roads in to death traps. Especially dangerous are spots where flyovers begin, such as Outer

Ring Rd, AIIMS, Sariotha-Vihar, Mahipalpur, Rajinder, TTO st,

and Mori Bagh,” says the repor released on Monday.

The report identifies 18 key arterial roads, de-

veloped to be high-speed corridors, record nearly 75% of all

deaths in Delhi alone.

> 1,280 lost their lives, P 6

CHOKING CITIES

INDIAN METROS AND B-TOWNS ARE AMONG THE MOST POLLUTED CITIES IN THE WORLD

Reliance on fossil

fuels such as coal to run power plants, vehicular

pollution, inefficient use of energy in buildings and use of biomass for cooking and heating.

Coal-fired power

plants, private motor

vehicles, inefficient

energy use in build-
ings and use of biomass for cooking and heating.

Dust, construction acti-

vity and vehicular pollution.

Increasing vehicular
density and con-

struction activities. Sea breeze has kept the situation from becoming worse.

Vehicular pollution, re-

fineries, chemical

plants, industrial units and a dumping ground where mixed garbage is burnt.

Mixed fuel use by commercial

vehicles, large number of private vehicles and high AC usage.

WHO norms suggest the annual

PM2.5 mean should not be higher than 10 micrograms per cubic metre.

Vehicular pollution, construction

activities, industrial activities; a dip in pollution levels registered over the years.

Toxic industrial waste, domestic waste, vehicular pollution, rise in constructions.

*Figure indicates annual mean concentration of particulate matter (PM) with diameter of 2.5 microns or less (micrograms per cubic metre). Source: WHO

Text by Kaushik Deha
Scenario of Metro in India

Growing cities, growing population and growing traffic has invariably called for a shift from private modes of conveyance to public transport.

- India’s first metro, the Kolkata Metro, started working almost 25 years ago. But, however it was not very successful and the reasons could be attributed to:
  - Lack of funds planning as is known that such projects require huge capital investments
  - A long gestation period
  - Complex technology
  - Lack of integration between various systems of mass transportation
  - The absence of comprehensive traffic and transportation planning.

- While researches show that the ideal modal share of public transport should be around 70%, however it is in tune to only 35% – 40% in India’s metro cities.

- India is looking to create a world class infrastructure with its existent Kolkata and Delhi Metros with the addition of Mumbai, Bengaluru, Hyderabad, Chennai, Jaipur, and Kochi metros in the next few years while proposals for MRTS for Pune, Chandigarh, Ahmedabad, Kanpur, Ludhiana, Bhopal, Indore and Faridabad are being chalked out.
Metro Rail Projects across India
Scenario of Metro in India

Challenges

• System **planned as a corridor** rather than a network

• No **suitable bus system** to improve ridership

• Poor Public Transit in India

• Government policies are on improvement and development of roads

• **Fare is the only major** source of revenue

• **Overlapping** of Metro on existing public transit network

• **Political willingness** and a sign of development

All this has resulted in **Low fare system** - Insufficient fund to operate and repayment of loans

**Share of GoI/MoUD towards Equity/PTA/SD (Rs. In Crores)**

- Increasing no. of Metro projects
- Quantum of money required will rise/ Huge funding requirements
- MoUD & State governments can't bear all those costs.
- New streams of revenues/ funding avenues have to be tapped
This Project Aim to maximize the revenue of Non Fare box revenue and make a metro projects more economical sustainable as fare-box revenue are not sufficient to sustain the operations and repayment of loans.

Major sources of revenue for Metro Projects are:

1. Fare Box – which accounts to almost 80-90%
2. Non-Fare Box – which accounts to 10-20%

The problem with Fare Box System is that we are not able to recover the cost, also the actual ridership is low than that planned. So, mostly it goes into loss.

So, there is a need to improve the non-fare box revenue share where fares are very dynamic and gesture low revenue.
Background and Need

Literature Review

Case Studies

Policy

List of Non fare revenue Sources

Developing a frame work and criteria analysis for a city
### Case Studies

#### International

1. Hong Kong  
2. Singapore  
3. New York  
4. London

#### National

1. Rapid Metro  
2. Hyderabad Metro  
3. Mumbai Metro line – 01  
4. Airport Express Line  
5. Delhi Metro
<table>
<thead>
<tr>
<th>Population:</th>
<th>1,315,392</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area:</td>
<td>80.6 Sq. Km</td>
</tr>
<tr>
<td>Density:</td>
<td>16,320 persons/ sq. km</td>
</tr>
</tbody>
</table>

Transport Characteristics:
- PT Fare as share of Income: **0.81%**
- Avg. Trip Length: **7.80 Km**
- Avg. Journey Time: **19.50 min**

MRTS:
- Length of Mass Transit (Km): **175 Km**
- Daily Ridership on Mass Transit: **4.63 Million**
- Daily MT Ridership per pop.: **0.65**
- MT Fare as share of Income: **1%**
- Mass Transit Coverage: **2.17**

Operation Costs: **913.91 USD**

Non Fare Box Revenue:
- Property Rental (22%), Property Development (45%), Station Commercial (24%), Advertisement and Mis (9%)
1. Hong Kong

- Tool Adopted is Rail + Property Development Process
- Govt. grants property development rights of station & surrounding areas to MTR.
- MTR prepares Master Plans of “Station & Surrounding Sites”
- Land premium is negotiated with Govt. on a “Greenfield Basis”, prior to tendering development sites
- In property developments, the Corporation enter into partnerships with reputable developers whereby the developers bear all development costs, including land premium and construction costs, and therefore all development risks. MTR supervises construction of projects and profit sharing either in form of percentage of profits or assets in kind.
- Integrated Rail + Property Development is cornerstone of the MTR’s success in Hong Kong. **MTR is both the transit authority as well as the property owner.**
2. Singapore

Population: 532,000
Area: 714.3 Sq. Km
Density: 745 persons / sq. km

Transport Characteristics:
- PT Fare as share of Income: 0.76%
- Avg. Trip Length: 9.40 Km
- Avg. Journey Time: 30 min

MRTS:
- Length of Mass Transit (Km): 138.9 Km
- Daily Ridership on Mass Transit: 2 Million
- Daily MT Ridership per pop.: 0.39
- MT Fare as share of Income: 1%

Operation Costs: 427.28 USD

Non Fare Box Revenue:
- Advertisement (15%), Rents (19%), SMART fleet operation (29%), Engineering Services (25%), Miss (12%)
3. New York

Population: 8,175,133
Area: 783.83 Sq. Km
Density: 10,430 persons/ sq. km

Transport Characteristics:

PT Fare as share of Income: 2.66%
Avg. Trip Length: 14.10 Km
Avg. Journey Time: 39.2 min

MRTS:
Length of Mass Transit (Km) : 419.72 Km
Daily Ridership on Mass Transit: 4.51 Million
Daily MT Ridership per pop.: 0.24
MT Fare as share of Income: 3%
Mass Transit Coverage: 0.54

Operation Costs: 7396.02 USD

Non Fare Box Revenue:
Advertisement (25%), Property Development (70%), Miss (5%)
4. London

Population: 7,825,200
Area: 1572.2 Sq. Km
Density: 4,977 persons/ sq. km

Transport Characteristics:
PT Fare as share of Income: 1.99%
Avg. Trip Length: 5 Km
Avg. Journey Time: 37 min

MRTS:
Length of Mass Transit (Km) : 404 Km
Daily Ridership on Mass Transit: 3.33 Million
Daily MT Ridership per pop.: 0.22
MT Fare as share of Income: 2%
Mass Transit Coverage: 0.29

Operation Costs: 3124.92 USD

Non Fare Box Revenue:
Advertisement (19%), Property Development (25%), Congestion pricing (12%), Grant (22%) Miss (22%)
**Transport Characteristics:**

PT Fare as share of Income: **3.75%**

Avg. Trip Length: **10.20 Km**

Avg. Journey Time: **30 min**

**MRTS:**

Length of Mass Transit (Km): **189.67 Km**

Daily Ridership on Mass Transit: **1.92 Million**

Daily MT Ridership per pop.: **0.12**

MT Fare as share of Income: **5%**

Mass Transit Coverage: **0.13**

**Revenue:**

Fare Box: **362.68 USD**

Non Fare Box: **235.73 USD**

**Airport Express Link - Delhi**

**MRTS:**

PPP model of development

**Capital cost: Land + Civil + Systems : Rs.5700 Crs**

DMRC: Rs. 2815 Crs.

Reliance Infra: Rs 2885 Crs.

**Revenue Model:**

Fare based Revenue

Non Fare based Revenue – TOD & Advertising

**Population:** 8,175,133

**Area:** 783.83 Sq. Km

**Density:** 10,430 persons/ sq. km
Hyderabad Metro

Population: 6,809,970
Area: 172 Sq. Km
Density: 39,592 persons/ sq. km

MRTS:
• Length of Mass Transit (Km) : 71.16 Km
• PPP model of development
• 3 high density corridors
• Will serve twin cities: Hyderabad & Secunderabad

Capital cost: Rs 14,132 Crs
GoTS: 10% & L&T MRL: 90%

Revenue Model:
• Fare based Revenue
• Non Fare based Revenue – Huge reliance on Property Development & Advertising
MRTS:

- Length of Mass Transit (Km): 5.1 km (phase 1) + 7 Km (phase 2)
- Metro Link from Delhi Metro Sikanderpur station on MG Road to Sector-56 in Gurgaon
- Haryana Urban Development Authority (HUDA)
- PPP model of development

Capital cost:
Phase 1: Rs. 1088 Crs
Phase 2: Rs. 2143 Cr

Revenue Model:
- Fare based Revenue – DMRC decided fare rates
- Non Fare based Revenue – Property Development & Advertising
Mumbai Metro Line-01

Population: 12,478,447
Area: 603 Sq. Km
Density: 20,693 persons/ sq. km

MRTS:
- Length of Mass Transit (Km): 11.4 Km
- PPP model of development

Capital cost: Rs. 3137.4 Crs
RInfra: 69%
MMRDA: 26%
Veolia: 5%

Revenue Model:
- Fare based Revenue
- Non Fare based Revenue – Limited Property Development & Advertising
<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Name of Cities</th>
<th>Area (sq. km)</th>
<th>Population</th>
<th>Density (persons/ sq. km)</th>
<th>Fare Box</th>
<th>Non- Fare Box</th>
<th>Metro Ridership (Million)</th>
<th>PT Share (in %)</th>
<th>Length of Metro Rail (in km.)</th>
<th>Revenue Sources of Non Fare Box</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Hong Kong</td>
<td>80.6</td>
<td>13,15,392</td>
<td>16,320</td>
<td>37%</td>
<td>63%</td>
<td>4.63</td>
<td>37.6</td>
<td>175.00</td>
<td>Property Rental (22%), Property Development (45%), Station Commercial (24%), Advertisement and Mis (9%)</td>
</tr>
<tr>
<td>2</td>
<td>Delhi</td>
<td>1483</td>
<td>1,38,50,507</td>
<td>9,339</td>
<td>88%</td>
<td>12%</td>
<td>1.92</td>
<td>16.0</td>
<td>189.67</td>
<td>Advertisement (48%), ATM, Shops (14%), Telecom business (16%), Rents (10%), Mis (12%)</td>
</tr>
<tr>
<td>3</td>
<td>Singapore</td>
<td>714.3</td>
<td>5,32,000</td>
<td>744</td>
<td>89%</td>
<td>11%</td>
<td>2</td>
<td>25.2</td>
<td>138.90</td>
<td>Advertisement (15%), Rents (19%), SMART fleet operation (29%), Engineering Services (25%), Mis (12%)</td>
</tr>
<tr>
<td>4</td>
<td>London</td>
<td>1572.2</td>
<td>78,25,200</td>
<td>4,977</td>
<td>83%</td>
<td>17%</td>
<td>3.33</td>
<td>14.0</td>
<td>404.00</td>
<td>Advertisement (19%), Property Development (25%), Congestion pricing (12%), Grant (22%), Mis (22%)</td>
</tr>
<tr>
<td>5</td>
<td>New York</td>
<td>783.83</td>
<td>81,75,133</td>
<td>10,429</td>
<td>70%</td>
<td>30%</td>
<td>4.51</td>
<td>15.3</td>
<td>394.29</td>
<td>Advertisement (25%), Property Development (70%), Mis (5%)</td>
</tr>
</tbody>
</table>
### Enabling mechanisms that can help to channelize funds for urban rail

<table>
<thead>
<tr>
<th>Sources</th>
<th>Key Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel Taxes/ Surcharges</td>
<td>• Fuel surcharges in Bogota, Colombia</td>
</tr>
<tr>
<td></td>
<td>• Cess on fuel in Bangalore</td>
</tr>
<tr>
<td>Employer contribution</td>
<td>• French Versement system</td>
</tr>
<tr>
<td>Others</td>
<td>• Congestion charges London</td>
</tr>
<tr>
<td></td>
<td>• Road Pricing in Seoul, Korea</td>
</tr>
<tr>
<td>Additional FSI/ TDRs</td>
<td>• Bangalore Metro</td>
</tr>
<tr>
<td>Betterment Levy or 'Land Value Tax'</td>
<td>• Gold coast, Australia</td>
</tr>
<tr>
<td></td>
<td>• Hong Kong</td>
</tr>
<tr>
<td></td>
<td>• Copenhagen, Denmark</td>
</tr>
<tr>
<td>Property development</td>
<td>• Hong Kong</td>
</tr>
<tr>
<td></td>
<td>• Copenhagen, Denmark</td>
</tr>
<tr>
<td></td>
<td>• Delhi Metro</td>
</tr>
<tr>
<td>Leasing/ Commercial</td>
<td>• Tokyo Metro</td>
</tr>
<tr>
<td></td>
<td>• Delhi Metro</td>
</tr>
<tr>
<td>Advertising (e.g. station naming)</td>
<td>• South-eastern Pennsylvania</td>
</tr>
<tr>
<td></td>
<td>• DLF metro Gurgaon</td>
</tr>
</tbody>
</table>

**Summing Up**

Indirect Sources

Proximate Revenue Sources

Direct Revenue Sources

Urban Rail (Metro) Project
Land Base Tool
• Increased FSI and Joint development
• TDR & Air rights
• Impact Fees

Non Land base Tool
• Integrated Ticketing
• Higher Parking Charges
• Auctioning of vehicle ownership rights in TOD

Others
• Advertisement
• Metro ambulance
• Station naming
• Joy rides
• Solar energy
• **NUTP: Focus on** Innovative financing mechanism

• **Metro Policy:** It emphasises on encoering PPP in various forms such as (i) Construction phase through DBFOT (ii) For operational phase (iii) Maintenance and Upgrading of Infrastructure through Gross Cost and Net Cost contract.

• **National TOD Policy:** TOD Policy focus on developing high density mixed use development in Transit influence zone, there by increase in ridership and improving financial and economical viability of project.

• **Value Capture finance Policy:** It focus about exploiting and generating revenue from land through various mechanisms which are as follows -:

Through Proper channelization and Utilization, land can be used as the major source for increasing non fare box revenue from existing 12-13% up to 20-22% maybe higher.

Improper frame work, lack to institutional arrangement and improper understanding towards the above tools have been one of the major reasons for lower non fare box revenue in India.
Land Value Capture Principals

- Taxpayers fund infrastructure yet few receive a direct benefit or windfall profit.
- Principal beneficiaries of new and upgraded infrastructure who receive a windfall profit should provide a reasonable share of project funding in return.
- Value capture methodology should be sound, systematic, evidence-based, equitable and acceptable to all parties.

### Frame work- Methodology

<table>
<thead>
<tr>
<th>Context</th>
<th>Analysis</th>
<th>Calculation</th>
<th>Decision</th>
</tr>
</thead>
</table>
| 1. Define draft project area  
2. Collect baseline data  
3. Assess planning controls  
4. Map market development (now against future)  
5. Identify negatives and challenges (such as statutory issues)  
6. Conduct gap analysis  
7. Identify value capture options | 1. Finalize project area  
2. Identify beneficiaries  
3. Build evidence of direct and actual benefit  
4. Select optimal value capture method(s) | - Finalize value capture package (multiple mechanisms can spread costs equitably – avoid duplication)  
- Calculate revenue (timing, structure, quantum and termination date of revenues) | Determine feasibility of implementing value capture proposition (assess whether revenue justifies process/effort) |
Methodology

1. Input Domain

- Concept Master Plan Design
  - FAR
  - Development Density
  - Land Use Mix

- Transport Analysis
  - Private Cars Ridership
  - Metro Ridership

2. Assumptions
- Public Private Participation options.
- Population Growth estimate.
- Sales Value, based on Current rates.

3. Real Time Information
- Land Valuation.
- Development Costs.
- Transport Assessment.
- Infrastructure Assessment.

Financial Calculations
- Total Area
- Area for Infrastructure
- Green Zones
- Construction Costs
- Land Value
<table>
<thead>
<tr>
<th>Description</th>
<th>Land Value</th>
<th>Advertisement</th>
<th>Public transport</th>
<th>Other non fare box revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Impact Fees</td>
<td>Incremental Property Tax</td>
<td>TDR</td>
<td>Higher FSI</td>
</tr>
<tr>
<td>Institutional Set-up/arrangements</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rules/Regulatory framework</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market Assessment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resource</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

To be implemented for one of the city as per the discussion with mentor
THANK YOU