Smart Urban Mobility
RAPID METRO - Profile
## Rapid Metro – Key Project Parameters

<table>
<thead>
<tr>
<th>Phase I: In Service since Nov '13</th>
<th>Phase II: In Service since Mar '17</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Route Length (km)</td>
<td>• Route Length (km)</td>
</tr>
<tr>
<td></td>
<td>5.1</td>
</tr>
<tr>
<td>• Project Cost (Rs. Cr)</td>
<td>2423</td>
</tr>
<tr>
<td>• Concession Agreement</td>
<td></td>
</tr>
<tr>
<td>• Financial Closure</td>
<td></td>
</tr>
<tr>
<td>• Start of Construction</td>
<td></td>
</tr>
<tr>
<td>• GoI Approval</td>
<td></td>
</tr>
<tr>
<td>• Commercial Operation</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.6</td>
</tr>
<tr>
<td></td>
<td>2423</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Rapid Metro: Phase I & II - Alignment

Phase I – Nov’13 : In Service
Phase II – Mar’17 : In Service

Recently commissioned

NH-8 to Jaipur
NH-8 from Delhi
DMRC Yellow line from Delhi

From Delhi to Jaipur
Rapid Metro – Salient Features: Many Firsts in India

• Fully privately funded metro rail project
• Metro rail system providing last mile connectivity
• Elevated Depot
• Common ticketing with another metro railway operator (DMRC)
• Pioneered Innovation with Station branding and naming rights in India
• Train wraps for advertising
• Turnkey supply contract for Key Railway systems
• Turnkey maintenance contract for Key Railway systems
Rapid Metro – Achievements

Environment friendly, Safe and Reliable mode of public transport in Gurugram

• **Punctuality:** 99.88 % since inception
• **Reliability** measured as Mean Distance Between Failures (MDBF): >10.0 Lakh Kms
• **Regeneration Efficiency (avg.):** >30% since inception
• **Availability levels:** 99.94 % since inception
• **Safety First:** No instance thus far of any de-boarding or serious safety related issue.
IL&FS Rail Limited: Strengths

We have expertise to support all the functional requirements of Mass Rapid Transit Projects such as:

• Develop and deliver integrated solutions for Rail Transit projects
• Financial Modelling and Analysis
• System Engineering and Integration
• Project Management and Change Management
• Interface Management
• Procurement Management
• Civil Construction
• Testing and Commissioning and Integrated Trials
• Operations and Maintenance

IRL has grown as one of the most efficient MetroRail Systems with best in class O&M performance indicators.
## Urban Mobility - Context

### Visible Trends

<table>
<thead>
<tr>
<th>Climate Change &amp; Sustainability</th>
<th>COP21</th>
<th>UNFCC</th>
<th>SDG-2015</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>To keep global warming below 2°C</td>
<td>Reduce the emission intensity of its GDP by 33%-35% by 2030</td>
<td>To achieve the 17 SDGs by 2030</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rapid Urbanization</th>
<th>~31% living in urban areas</th>
<th>53 cities with million plus pop.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>472x vehicular growth since 1951</td>
<td>10% decadal growth in vehicle pop.</td>
</tr>
</tbody>
</table>

| Digital Proliferation | 65 crs. smartphone users by 2019 |

<table>
<thead>
<tr>
<th>Demographic &amp; Societal Change</th>
<th>~65% population under 35 years</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rise in per capita income by 7.4%</td>
</tr>
</tbody>
</table>

### Requirements

- **Low Carbon Transport**
- **Demand Responsive Transport**
- **Smart and Integrated Services**
- **Segmented User Market**
Urban Mobility Trends in India

Urban Population Growth Rate

3%

35 to 53
One million plus cities

60 Mln
vehicles registered in the million plus cities

31% Urban Population contributes to 63% of India’s GDP

Rapid growth in vehicles has led to:

- Higher congestion - Decrease in average speed of vehicles
- Higher Pollution levels - Transport sector is the fastest growing consumer of fossil fuels & contributes 13% to carbon dioxide emissions
- Worsening Road Safety - 1.4 lakh accident deaths annually
Mass Transit Systems in India

**BRTS** (Operational – 7 & Under Construction – 5)

**METRO** (Operational /partly Operational – 11 & Under Construction including expansion – 12+)

**City Bus Service** (all Major Cities)

**Monorail** (Operational – 1)
“Mass Transit” Technology Options

- **METRO RAIL**
- **Light Rail Transit / Light Metro**
- **Tram**
- **Monorail**
- **Bus Rapid Transit (BRT)**
- **Cable Car**
Approach to Smart Mobility

- Integrated Public Transport
- Robust digital infrastructure for ticketing integration across modes
- Mobility integrated with land use
Integrated Public Transport – Salient Features

- Mass Transit system to be the backbone of Public transport
- Multi-Modal integration for
  - Seamless journey - enhanced user experience
  - Feeder/evacuation service
- Tailor made feeder service
  - E-Rickshaw /autos
  - Feeder buses
- Accessibility – pedestrian walkways
- Parking in the vicinity of metro stations – “Park & Ride” is a proven, global principle.
- Public Transport reach to >80% of city area
- Facilitate “densification” through framework for “Transit Oriented Development” around mobility corridor
- “Ticketing” integration across modes – need for robust infrastructure
Integrated Mobility Platform

One platform for information on mode choices, routes, fares, travel time

Journey options based on cost, time comfort and convenience

Information

Plan

Integrated Mobility Platform

Pay

Book

One journey one ticket

Selection of most suitable option for journey
Integrated Mobility Platform – Consumer Experience

1. Enter details
2. Get multimodal routes with option of
   • Travel cost
   • Travel time
   • Number of Interchanges
3. Book the preferred journey option & single payment
4. Receive mobile ticket for full journey

Enter Starting Location:
Ambience Mall, Gurgaon

Enter Destination:
CP New Delhi

Get journey choices

Hassle free journey
Institutional framework – creation of UMTA

• Creation of a Unified Metropolitan Transport Authority

• An executive body governed by a Board made up
  • Heads of various departments
  • Local elected leaders
  • Eminent citizens

• Empowered to set up SPV’s

• Functions for Urban Transport
  • Formulation of policies, strategies and financing
  • Co-ordination of various available modes of public transport
  • Integrated and holistic planning
  • Planning of road network and associated infrastructure
  • Organising and co-ordinating services
  • Management of urban transport funds
Smart Mobility in the Indian Context

• “Smart Mobility” in the context of developed countries may mean intelligent, ICT-based solutions (telematics) that enable:
  
  • Ease of individual transport (in megacities) while attending to environmental concerns
  • Mobile Office Applications (work flow management)

• In India’s context the term has to be redefined to include all modes of transport that enable:
  
  • Ease of Individual transport in rural and semi-urban areas as well as in urban mega cities while attending to environmental concerns
  • Creation of sustainable mass transportation systems as well as greater penetration of environmental-friendly (motor) vehicles for personal use
  • The distances to be covered in India may be large, both intra-regional and inter-regional
**Benefits for People**

**Accessibility**
- Ease of access to the transit stations within 500 meters
- Better first/last mile connectivity after organised IPT

**Seamless Travel**
- Enhanced user experience after seamless integration
- Encourages people to use public transport

**Reduced Travel Cost**
- Reduction in time for travel
- Reduction of operating cost for service providers
- Reduced time for transfers
- Reduced waiting time with desirable frequency of the system

**Reduction in Emissions**
- Reduction in Carbon Dioxide levels
- More energy efficient and cleaner mode of Public transport including IPT system

**Less Vehicles on Street**
- Elimination of vehicles from streets on a working day
- Providing mobility for reducing Social and gender inequality
- Increasing employment opportunities in TOD zones

**Socio Economic Development**
- Providing mobility for reducing Social and gender inequality
- Increasing employment opportunities in TOD zones
Benefits for Government

- Creates Public Infrastructure assets for the city
- Infrastructure cost savings
- Higher living standard attracts investments
- Inflow of skilled people, knowledge ecosystem
- Economic growth momentum to fuel high contribution to the exchequer

Economic Prosperity

Higher income for Govt.

Lasting Value

Environmental
A Viable Natural Environment
Sustainable Natural and Built Environment
Sustainable Economic Development

Social
Nurturing Community
Equitable Social Environment
Sufficient Economy

Economic
Sustainable Development
Thanks
BACKUP
Integrated Transportation for City - Benefits

- Convenient multimodal travel
- Transparent traveling information
- Reduction of operating cost
- Additional sales channel
- Improved utilization
- Optimized utilization of infrastructure
- Increased control of traffic management

Consumers
Service Providers
City/Public Authorities
<table>
<thead>
<tr>
<th>Metro</th>
<th>Staff Count Benchmark Per Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMRC*</td>
<td>13.00 / Route Km</td>
</tr>
<tr>
<td>BMRCL$</td>
<td>12.80 / Route Km</td>
</tr>
<tr>
<td>Rapid Metro#</td>
<td>12.52 / Route Km</td>
</tr>
</tbody>
</table>

*Source: MoUD’s REPORT OF THE SUB-COMMITTEE ON OPERATIONS AND MAINTENANCE SYSTEMS FOR METRO RAILWAYS NOV 2013

$ BANGALORE METRO LINE 1 + LINE 2 (42.3 KM)

# RAPID METRO PHASE I + PHASE II
O&M Staffing Comparative (Non-Managerial): Permanent Way Works – E&M Traction

<table>
<thead>
<tr>
<th>Metro</th>
<th>Staff Count Benchmark Per Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMRC*</td>
<td>9.00 / Route Km</td>
</tr>
<tr>
<td>BMRCL$</td>
<td>10.40 / Route Km</td>
</tr>
<tr>
<td>Rapid Metro#</td>
<td>6.68 / Route Km</td>
</tr>
</tbody>
</table>

*Source: MoUD’s REPORT OF THE SUB-COMMITTEE ON OPERATIONS AND MAINTANENCE SYSTEMS FOR METRO RAILWAYS NOV 2013

$ BANGALORE METRO LINE 1 + LINE 2 (42.3 KM)

# RAPID METRO PHASE I + PHASE II
## O&M Staffing Comparative (Non-Managerial):
### Signal, Telecom & AFC

<table>
<thead>
<tr>
<th>Metro</th>
<th>Staff Count Benchmark Per Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMRC*</td>
<td>5.90 / Route Km</td>
</tr>
<tr>
<td>BMRCL$</td>
<td>6.80 / Route Km</td>
</tr>
<tr>
<td>Rapid Metro#</td>
<td>4.43 / Route Km</td>
</tr>
</tbody>
</table>

*Source: MoUD’s REPORT OF THE SUB-COMMITTEE ON OPERATIONS AND MAINTANENCE SYSTEMS FOR METRO RAILWAYS NOV 2013

$ BANGALORE METRO LINE 1 + LINE 2 (42.3 KM)

# RAPID METRO PHASE I + PHASE II
### O&M Staffing Comparative (Non-Managerial): Rolling Stock and Depot M&P

<table>
<thead>
<tr>
<th>Metro</th>
<th>Staff Count Benchmark Per Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMRC*</td>
<td>1.25 / Car</td>
</tr>
<tr>
<td>BMRCL$</td>
<td>1.60 / Car</td>
</tr>
<tr>
<td>Rapid Metro#</td>
<td>0.86 / Car</td>
</tr>
</tbody>
</table>

*Source: MoUD's REPORT OF THE SUB-COMMITTEE ON OPERATIONS AND MAINTANENCE SYTEMS FOR METRO RAILWAYS NOV 2013

$ BANGALORE METRO LINE 1 + LINE 2 (42.3 KM)

# RAPID METRO PHASE I + PHASE II
### O&M Staffing (Non-Managerial) : Comparison Based on Benchmarks

<table>
<thead>
<tr>
<th>Department</th>
<th>DMRC</th>
<th>BMRCL</th>
<th>RMGL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation and Revenue</td>
<td>325</td>
<td>320</td>
<td>313</td>
</tr>
<tr>
<td>Permanent Way &amp; Works E&amp;M and Traction</td>
<td>225</td>
<td>260</td>
<td>170</td>
</tr>
<tr>
<td>S&amp;T and AFC</td>
<td>148</td>
<td>170</td>
<td>111</td>
</tr>
<tr>
<td>Rolling Stock and M&amp;P</td>
<td>75</td>
<td>96</td>
<td>52</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>773</td>
<td>846</td>
<td>646</td>
</tr>
<tr>
<td><strong>Manpower % over RMGL</strong></td>
<td>19.6</td>
<td>31.0</td>
<td>Base</td>
</tr>
</tbody>
</table>

# For a typical 25 km line with 60 coaches and a maintenance depot. Comparison based on these major departments only.

Layer 1 Private Security (non-CISF) further adds to significant cost advantage.
Rapid Metro Phase I - Snapshot

Operation Control Centre

Seamless Interchange with DMRC

India’s First Elevated Depot

750V DC 3rd Rail, SG Track
Rapid Metro Phase I - Snapshot

Vodafone Belvedere Towers

IndusInd Cybercity Station

Wrapped Train

Sikenderpur Crossover
## Challenges – Mobility

<table>
<thead>
<tr>
<th>System</th>
<th>Urban Mobility Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metro</td>
<td>• Network Coverage currently limited to South Gurgaon</td>
</tr>
<tr>
<td>Buses</td>
<td>• Unreliable; Overcrowded, Poor Image</td>
</tr>
<tr>
<td></td>
<td>• Limited Network Coverage</td>
</tr>
<tr>
<td>IPT</td>
<td>• Unreliable &amp; Unorganised</td>
</tr>
<tr>
<td></td>
<td>• Unsafe, Price swings</td>
</tr>
<tr>
<td>Aggregators</td>
<td>• Lower access to technology &amp; service</td>
</tr>
<tr>
<td></td>
<td>• Not affordable to all classes</td>
</tr>
<tr>
<td>Roads</td>
<td>• Congestion; Inaccessible</td>
</tr>
<tr>
<td></td>
<td>• NH-8 acts as a barrier</td>
</tr>
</tbody>
</table>

**Lack of a comfortable & integrated system unable to offer a seamless public transport journey**
### Integrated Mobility Platform Ecosystem

<table>
<thead>
<tr>
<th>Commuters Mobility Needs</th>
<th>Shift from private vehicular mobility to integrated transit accessibility – Seamless, Convenient, Affordable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Real-time transit information and planning</td>
</tr>
<tr>
<td></td>
<td>Single payment mode</td>
</tr>
<tr>
<td></td>
<td>Seamless journey through Integrated modes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mobility Integration infrastructure</th>
<th>Physical integration</th>
<th>Sharing of data</th>
<th>Operational integration</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Rapid transit stations and parking lots</td>
<td>Fare integration and online payment</td>
<td>Institutional integration</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Stakeholders</th>
<th>Infrastructure providers</th>
<th>City administrators</th>
<th>Transport modes operators</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>• Telematics, telecomm companies</td>
<td>• Municipal Corporations</td>
<td>• Ride sharing/pooling Companies/individuals</td>
</tr>
<tr>
<td></td>
<td>• IT and payment systems</td>
<td>• Transport Authorities</td>
<td>• Public transport providers</td>
</tr>
<tr>
<td></td>
<td>• Parking operators</td>
<td></td>
<td>• Aggregators/taxi services</td>
</tr>
</tbody>
</table>
Role of Local City Authorities

The local authority has critical role to play in planning, integrating and supporting the integrated transportation mechanism. The requirement of society viz. • Ease of planning travel • Ease of travel • Ease of interchange • Predictability are important factors in planning. The various modes of travel must operate within defined rules/regulations.
Mobility Challenges

Rapid Urban Expansion

- Huge stress on urban infrastructure and services
- Haphazard growth and urban sprawl
- Excessive reliance on private transport and burgeoning vehicle count
- Absence of a seamless integrated public transport option

Liveability

- Vehicular emissions and Construction are major sources of pollution, although diffused
- Attendant challenges of congestion and rapidly deteriorating air quality
- Heightened expectation of young and upwardly mobile population

Critical need to improve liveability, addressing challenges of mobility and environment.
City governments can establish an institution that brings all of these projects together in an integrated way. This institution requires to overcome transportation challenges, active participation and collaboration of different players:

Functions of the Institution
1. Develop and implement comprehensive ITS strategies that are long term, flexible and integrated with the city's transport vision.
2. Adopt customer-centered approaches to improve services, understand customers and influence customer behavior patterns.
3. Integrate service delivery across transport modes.
4. Secure funding and apply innovative business models.
5. Effectively manage implementation by addressing the complexity of ITS projects.