Preface

Urban transport is increasingly becoming important in a developing country like India, wherein urbanization levels are steadily increasing and the growth of urban areas is determined by the prevalence of a good city transport. A variety of transport modes such as, walking, cycling, two-wheelers, para-transit, public transport, cars, etc. are used to meet these urban travel needs.

Following the success of the Delhi Metro as a mass rapid transit system, many cities have implemented or have come up with proposals for metro rail systems. A workshop on Learning’s of Urban Rail & Way forward was organised on 11\textsuperscript{th} June, 2016 wherein the following issues were deliberated:

(a) Institutional and Financial Framework  
(b) Standardization and Indigenization (civil, rolling stock and signalling)  
(c) Methods for increasing Non-Fare Box Revenue  
(d) Models of Private Participation  
(e) Innovative Financing  
(f) Innovative Design to reduce costs.

About 170 participants comprising middle and senior level officers from Ministry of Urban Development and State Governments, Metro Rail Corporations (operational/ under construction/ at planning stage), professionals, consultants, and other people working in the field attended the workshop.
## CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Executive Summary</td>
<td>iii</td>
</tr>
<tr>
<td>Introduction</td>
<td>1</td>
</tr>
<tr>
<td>Inaugural Session</td>
<td>1</td>
</tr>
<tr>
<td>Session 1: Institutional and Financial Framework for Implementation of Urban Rail</td>
<td>3</td>
</tr>
<tr>
<td>Session 2: Innovative Financing of Urban Rail</td>
<td>10</td>
</tr>
<tr>
<td>Session 3: Private Participation in Urban Rail</td>
<td>14</td>
</tr>
<tr>
<td>Session 4: Standardization &amp; Indigenization and Reducing Cost of Construction, Operation &amp; Maintenance</td>
<td>20</td>
</tr>
<tr>
<td>Session 5: International Learnings, World Bank Study</td>
<td>22</td>
</tr>
<tr>
<td>Annexures</td>
<td>24</td>
</tr>
</tbody>
</table>
Executive Summary

A National Level Workshop was organized with the objective to assimilate the various ingredients of a successful urban rail project and to contrive a way forward for action in future. For success in any field there is a need to constantly review, re-design and formulate new strategies. The topics for discussion comprised varied issues from institutional and financial models to innovations in cost reduction. It was attended by around 170 participants from metro companies, state governments etc. The summary of discussions and learnings are as below:

Institutional Framework: The model of 50:50 joint-ventures of Central and State Governments has been successful and is being followed by many States. However, Mumbai has the experience of the other models viz. PPP and complete state ownership. The pros and cons of all models were discussed and no distinct recommendation emerged. It came out that 50:50 model enables professional approach and the complete state ownership gives advantage of quicker approvals.

Public Private Partnership: The PPP projects in the country have experienced difficulties. Specific challenges pertain to delay in eliciting "right of way" and approvals from the local agencies leading time and cost overruns thus making the project unviable for the private partner. Appropriate risk allocation as well as enhanced financial support from the government would help alleviate the challenges. Completely privately funded projects like that of Rapid Metro in Gurgaon needs government support in enhancing non-fare box revenue and bridging the viability gap. It emerged that a simplified procedure of statutory approvals – online and in time, would go a long way in helping the timely completion of projects. There is a need for an enabling policy/ regulatory framework by GoI/ State Govt. Adequate dispute resolution mechanism is necessary and provision should be made for re-negotiation, if so warranted.

Innovative Financing: Innovative Financing is imperative for all metro projects which are capital-intensive in nature. Innovative financing is largely based on land value capture, station naming rights, enabling Transit Oriented Development with benefits accruing to the metro company, dedicated levies/ taxes, bonds and foreign borrowing. This is best achieved in a joint value – creating exercise between the Government, Local Planning Bodies and Urban Rail Agency. To enhance non-fare box revenue, it was suggested that all restrictions on commercial exploitation of land need to be removed. Integrated development of urban rail and cities including transit-oriented development is essential. Sale from advertisements is also another potential non-fare-box revenue sources.

Standardisation: DMRC listed out steps taken for indigenization of manufacture of rolling stock and other components. Standardisation of urban rail components (civil, rolling stock and signalling) to the extent possible is the first step to benefit from the size of the Indian market and should be initiated. L&T Metro, Hyderabad, suggested that technical specifications & standards should be based on modern technology, such as Communications Based Train Control (CBTC) Signalling and 1:40 Rail inclination, redundancy and life cycle cost analysis. However, it was also mentioned that certain amount of flexibility in the specifications should be provided to cater to the varying topography and landscape of cities.
Cost Effective and Innovative Design and Construction: During the discussions, it emerged that construction, operation and maintenance costs can be controlled through innovative designs and using ‘value engineering’ techniques as was exemplified by Nagpur. Hyderabad, Chennai and Kochi highlighted their good practices. Hyderabad mentioned that sustainability initiatives, such as harnessing solar energy to reduce operation cost should be included. Chennai listed its best practices in civil engineering and system design. Local innovations (jugaar) to reduce time and cost should be based wherever feasible and without jeopardizing safety. Integrated ticketing over various modes of transport in the city should be the norm in planning. It will provide convenience to commuters, as well as financial savings (Kochi).

Forum for Exchange Ideas and Experience: It was suggested that a common forum for all metro companies in India may be set up for exchanging and assimilating new ideas and learning in the various metro rail projects. It was suggested that more such workshops which would also include technical topics, should be organized.

Important lessons learnt from the World Bank study: The following points emerged from the initial finding of the study on Urban Rail being carried out by the World Bank:

1. Urban rail is a capital investment project that never stops. There is a need to deliver projects in immediate succession and continuation to benefit from the experience gained.
2. Asset management should be planned from “day 1” since assets will be there for more than 100 years.
3. It’s never too late to integrate land use and transport. TOD is one way of doing so. This is imperative for financial stability, as well as environmental sustainability.
4. New metro lines cost more than what can be recouped from fares, but the operational expenditure (including renewal) can be self-sustaining if fares are sufficient and there is a good level of non-fare revenue.
5. Fares fixation formula should be transparent. There are two key variables in this formula; one is inflation and the other is the wage level.
6. For reducing O&M cost, one could follow the example of Barcelona Metro where trained generalists drive the train, maintain the ticket machines as well as talk to the clients.
7. PPP is definitely a way of moving forward in urban rail with the lessons we have learnt. However, it should be acknowledged that there is a need for high capital grant for PPP projects. The revenue risk needs to be properly allocated. Internationally, the trend is either to allocate very little revenue risk; may be 5% to the concessionaire or no revenue risk at all.
Introduction

MOUD organized a National Level Workshop on Learning in Urban Rail on June 11th 2016 in Delhi with the objective of discussing learning’s so far and charting a way forward. The programme schedule and list of participants are placed at Annex 1 and 2 respectively. In all 13 presentations made; 1 by MOUD, 11 by different Metro rail organizations and one by the World Bank on ‘International experience with urban rail funding, institutional frameworks and PPP’. The list of presentations is placed at Annex 3.

Inaugural Session

The session was chaired by Shri. Rajiv Gaba, Secretary (Urban Development), Government of India; the other dignitaries at the dais were Shri. Durga Shanker Mishra, Additional Secretary (Urban Development), Government of India and Dr. Mangu Singh, Managing Director, Delhi Metro Rail Corporation Limited (DMRC).

Opening Address by Additional Secretary, MoUD:

The inaugural session started with a welcome address which included a brief about the metro projects status in the country through a presentation by Shri Mishra.

The presentation highlighted the need for this workshop i.e., the financial and the organizational structure for the metro projects.

He mentioned the following existing models financing of our organizational models available in India:

- The existing 50:50 JV model that is predominantly the major model available for the financing and organization structure was started with DMRC and later followed in other metros like Mumbai Line 3, Chennai, Bangalore, Nagpur, Lucknow, Kochi and Ahmedabad.
- The second model available is 100% central govt. funded. The first metro in the city of Calcutta (now Kolkata) by Indian Railways, then followed by North-South corridor in Kolkata on a 74:26 sharing between Ministry of Railways and Ministry of Urban Development respectively.
- The third model being completely a State Government; the initiative has been taken by the Government of Maharashtra for the Mumbai Mono Rail and the Govt. of Rajasthan for the Jaipur metro.
- The next model is the PPP wherein the Ministry of Finance has through its VGF schemes finances up to 20% of the capital cost. We have the example of the Mumbai metro line 1 promoted by Reliance and Hyderabad metro rail, which is promoted by the L&T.
- The last model is 100% private initiative, it is in the case of Gurgaon Metro.

The current status, of metro was also detailed out w.r.t. the kms operational, under construction and consideration Stage. Details given at Annex 4.

He listed the following challenges:

i. Institutional and Financial Framework for Implementation of upcoming Metro Projects
ii. Innovative Financing of Metro Rail Projects
iii. Innovative Design to reduce construction, operation and Maintenance costs
iv. Methods for increasing Non-fare Box Revenue
v. Models for successful Private Participation in Metro Rail Projects
vi. Standardisation and Indigenisation of metro components (civil, rolling stock and signalling) – Make in India

Key Note Address by Secretary, MoUD:

Secretary MoUD in his key note address raised some key issues; “Are we following the best model? Can we cut costs, can we run our metro rail on more sound commercial lines?” He alerted that the demand to commute in our cities will grow exponentially on account of the ongoing rapid urbanization and we should have a plan to avoid the challenge. He expressed concern about the financing needs and the role of private sector. To encourage PPP, the ‘dispute resolution mechanism’ has a vital role. To raise non-fare revenue restrictions to fully exploit commercially the land resources need to be avoided. He also insisted upon a proper appraisal method on whether a Metro rail is at all needed in a city. He highlighted the importance of knowledge sharing and the need to take advantage of the size of the Indian metro market.
Session 1: Institutional and Financial Framework for Implementation of Urban Rail

Moderator: Dr. Mangu Singh, Managing Director, Delhi Metro Rail Corporation Limited (DMRC)

Presenters:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Presenter</th>
<th>Designation</th>
<th>Organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shri. U.P.S Madan</td>
<td>Metropolitan Commissioner</td>
<td>Mumbai Metropolitan Regional Development Authority (MMRDA)</td>
</tr>
<tr>
<td>2</td>
<td>Shri. S. D. Sharma</td>
<td>Director (Business Development)</td>
<td>Delhi Metro Rail Corporation Limited (DMRC)</td>
</tr>
<tr>
<td>3</td>
<td>Shri. Pankaj Kumar Bansal</td>
<td>Managing Director</td>
<td>Chennai Metro Rail Limited</td>
</tr>
</tbody>
</table>

**Presentation 1:** Institutional and Financial Framework for Implementing Metro Projects - MMRDA

Experience – Shri U.P.S. Madan, Metropolitan Commissioner, MMRDA

Shri. Madan stated the major issue for implementing metro projects in today's times is the institutional framework to be adopted.

He shared his experience of Mumbai metro, Mumbai has prepared a master plan for metro Corridors in Mumbai (Figure 1). All the corridors being implemented in Mumbai are under three different institutional and financial models.

Table 1: Metro Kms planned for Mumbai Metro Master Plan

<table>
<thead>
<tr>
<th>Line No.</th>
<th>Corridor</th>
<th>Length (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Versova-Andheri-Ghatkopar</td>
<td>11.4</td>
</tr>
</tbody>
</table>
2. Dahisar-Charkop-Bandra-Mankhurd 39.8
3. Colaba-Bandra-SEEPZ 33.5
4. Wadala-Ghatkopar-Thane-Kasarvadvali 32
5. Thane-Bhiwandi-Kalyan. 23.3
6. SEEPZ- Kanjur marg 10.5
7. Andheri (East)- Dahisar (East) 18
8. Sewri-Prabhadevi 3.5

Total 172

Table 2: Comparison between different models existing for Mumbai Metro

<table>
<thead>
<tr>
<th>Items</th>
<th>Public Private Participation (BOOT) (Model-1)</th>
<th>Special Purpose Vehicle (Model-2)</th>
<th>Through the Multilateral / International institutions loan assistance&amp; Central, State Govt. sharing. (Model-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Metro Corridor</td>
<td>Line 1</td>
<td>Line 3</td>
<td>Line 2, 4 and 7</td>
</tr>
<tr>
<td>Length (in kms)</td>
<td>11.4 elevated</td>
<td>33.5 underground</td>
<td>118 elevated</td>
</tr>
<tr>
<td>Cost (in Cr) INR</td>
<td>2,356</td>
<td>23,136</td>
<td>over 40,000</td>
</tr>
<tr>
<td>Implementing Agency</td>
<td>Mumbai Metro Line One Project Limited (Reliance Infra and Mumbai Metropolitan Regional Development Authority)</td>
<td>Mumbai Metro Rail Corporation Limited, a Special Purpose Vehicle of Government of India and Government of Maharashtra (model followed by most of the cities)</td>
<td>Mumbai Metropolitan Regional Development Authority</td>
</tr>
<tr>
<td>Financing Pattern</td>
<td>VGF by GoI Rs. 471 cr., VGF by GoM 179 cr., Equity Rs. 512 cr. Debt Rs. 1,194 cr.</td>
<td>JV Model with equity (10.4%) and sub debt (4.4%) from GoI, equity (10.4%) and sub debt (7%) from GoM, loan from JICA (57%), balance property development, MIAL and MMRDA</td>
<td>State Government to provide sub debt for central taxes (50%), state taxes (100%) and land cost Loan assistance for systems up to 80% from funding agencies and 20% from MMRDA</td>
</tr>
<tr>
<td>Pros</td>
<td>• Least cost for the Govt./implementing agency (only VGF) • Most of the contribution (VGF) comes from GoI • Faster completion and lower cost – due to administrative and financial efficiency of the private sector</td>
<td>• Upto 15% funding from GoI; lower counterpart funding • Extensive appraisal helps in refining the project report • Benefit of expertise of GoI in the Board</td>
<td>• Civil works can commence immediately after State and Centre approvals (short period) • Simultaneous loan negotiations saves time • Disbursement can commence after 2 years • Faster completion means lower risk for</td>
</tr>
</tbody>
</table>

Ministry of Urban Development, GoI
<table>
<thead>
<tr>
<th>Items</th>
<th>Public Private Participation (BOOT) (Model-1)</th>
<th>Special Purpose Vehicle (Model-2)</th>
<th>Through the Multilateral / International institutions loan assistance &amp; Central, State Govt. sharing. (Model-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pros</strong></td>
<td>• Most risks transferred to the private partner</td>
<td>• Lengthy appraisal process, takes up to 2 years</td>
<td>project cost escalation and less hedging cost</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• More autonomy and flexibility</td>
<td>• More autonomy and flexibility</td>
</tr>
<tr>
<td><strong>Cons</strong></td>
<td>• Least control on implementation or operation</td>
<td>• Project cost escalates during appraisal period</td>
<td>• No contribution from GoI</td>
</tr>
<tr>
<td></td>
<td>• The current Metro Act does not provide for the PPP model</td>
<td>• Procurement of GC and works can commence only after loan negotiations</td>
<td>• Much higher counterpart funding by implementing agency</td>
</tr>
<tr>
<td></td>
<td>• Constant bickering between partners if things do not go according to the plan</td>
<td>• With less than 15% contribution, 50% control by GoI</td>
<td>• Risk if the funding process fails for some reason</td>
</tr>
<tr>
<td></td>
<td>• Inadequate dispute resolution mechanism</td>
<td>• Even with equal power, all responsibilities on State – increase in cost, Forex risk</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• Practical difficulties of Board meetings</td>
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<tr>
<td></td>
<td></td>
<td>• Project completed in 6 years as against 42 months announced</td>
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<td></td>
<td></td>
<td>• Project cost increased from Rs. 2,356 cr to Rs. 4,321 cr with both parties disagreeing about the reasons</td>
<td></td>
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<td></td>
<td></td>
<td>• Metro Act made applicable while under construction</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>• Powers of MRA given to Concessionaire being the ‘owner’ of the project</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Using the MRA’s powers, Concessionaire fixed the ‘initial fare’</td>
<td></td>
</tr>
<tr>
<td>Items</td>
<td>Public Private Participation (BOOT) (Model-1)</td>
<td>Special Purpose Vehicle (Model-2)</td>
<td>Through the Multilateral / International institutions loan assistance &amp; Central, State Govt. sharing. (Model-3)</td>
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<td>---------------------------------------------</td>
<td>----------------------------------</td>
<td>-----------------------------------------------------------------</td>
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<tr>
<td></td>
<td>ignoring the fare structure agreed in the Concession Agreement (CA).</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• CA trems ignored in other matters also</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Litigation and arbitrations – huge loss of time and money for both</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• CAG audit requested but couldn’t materialise</td>
<td></td>
<td></td>
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</tbody>
</table>

**Conclusion:**

- There is no ‘best’ model – all depends on the requirements of the project proponent
- Metro Act must have adequate provision for PPP with a fair distribution of powers and responsibilities
- Adequate dispute resolution mechanism for all PPP projects is necessary
- More autonomy and equal responsibility for states under Model 2
- GoI should consider giving assistance of 20% of the cost for Model 3

**Presentation 2:** Institutional and Financial Framework for Implementing Metro Projects by Shri S.D. Sharma, Director (BD), DMRC.

Shri. Sharma started his presentation on a positive note, stating the existence of different institutional and financial frameworks available in today’s time, the only need was to strengthen them.

In his presentation he highlighted about the Regulations, Acts and the Institutions which facilitates the implementation of infrastructure project within well defined legal framework.

He mentioned the need for strengthening the institutional and financial frameworks. The city level urban transport is controlled by multiple institutions. There is no single accountability for performance and maintenance of transportation infrastructure and system operations. The institution has to be a unified body which would coordinate with all the concerned organizations and regulate its functions. There is a need to regulate and integrate the operations of different modes of urban transport. Forma
of Unified Metropolitan Transport Authority (UMTA) is still in process. Though, some states have formulated the UMTA, but its effective working needs to be reviewed.

He discussed about the various acts related to regulation of metros and other urban transport systems. However, some other modes of mass rapid transit systems, namely, bus rapid and other light rail transit, the mono rail etc. have hardly having any institutional framework.

He mentioned the need for a single institution for all the guided transport system in the city.

Today there is a need for standardization of metros, the procedure for safety certification and technical clearance of metro system. The procedure issued by RDSO is cumbersome and if you follow this, there would be an additional delay of at least 2-3 years. There is a need to have an independent metro safety certification agency & metro research and standardization organization for timely completion of projects in light of approximately 700 kms. Coming up metro in the country by 2026.

He then discussed about the financial framework percentage of fund contributions from each stakeholder and other norms for different models of metro project implementation in India. He mentioned that the real beneficiary of metro rail project is the city/State and it is for them to initiate conducive framework for generating funds through other innovative methods for financing metro rail projects.

**Conclusion:**

Summing up, there is need to strengthen the institution of urban rail and making this sector self sustainable. There is need to have a Metro Research & Standardization Organization for indigenizing the components of urban rail. There is need for independent metro safety certification Organization. Innovative financing needs to be implemented by the State Government so that funds are released for financing of metro projects.

**Presentation 3:** Best Practices Followed by Chennai Metro by Shri P.K. Bansal, MD, CMRL.
Shri. P K Bansal started his presentation with the issue of equitable sharing of cost by the Central Government.

He shared the multi-modal integration being done by Chennai Metro. He mentioned that it was taken up at the design stage itself and all stakeholders have been duly consulted. Multi-modal integration have covered the two main railways stations i.e. Chennai Central and Egmore. Mofussil bus stand and Coimbatore Bus Stand are also covered in Phase 1 itself.

<table>
<thead>
<tr>
<th>S no.</th>
<th>Issue</th>
<th>Proposal</th>
<th>Way forward/benefit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Consultancy services</td>
<td>Avoid “Front loading” of foreign experts by GC</td>
<td>Hire Independent Consultants directly if needed</td>
</tr>
<tr>
<td>2</td>
<td>Civil – elevated construction</td>
<td>Use balancing girder - Cast-in-situ and Balanced Cantilever</td>
<td>Busy traffic need not be diverted</td>
</tr>
<tr>
<td>3</td>
<td>Civil – underground construction</td>
<td>Concreting of permanent lining in single pour and self -compacting concrete</td>
<td>Savings in time resource mobilization Good quality finish</td>
</tr>
<tr>
<td>4</td>
<td>Environment</td>
<td>Compensatory planting</td>
<td>Double the norms fixed</td>
</tr>
<tr>
<td>5</td>
<td>Handling cash</td>
<td>Use Cash Deposit Machines</td>
<td>Savings in payments to bank</td>
</tr>
<tr>
<td>6</td>
<td>Signaling</td>
<td>Signal room merged with telecom room</td>
<td>Saving in space and cost</td>
</tr>
<tr>
<td>7</td>
<td>Power supply</td>
<td>Single source of power supply for signal, telecom, PSD and AFC</td>
<td>Derived from main UPS</td>
</tr>
<tr>
<td>S no.</td>
<td>Issue</td>
<td>Proposal</td>
<td>Way forward/benefit</td>
</tr>
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</tr>
<tr>
<td>8</td>
<td>Telecom</td>
<td>Integrated operation of various systems</td>
<td>Saving in cost and space</td>
</tr>
<tr>
<td>9</td>
<td>Platform screen doors</td>
<td>Air Conditioning load reduced, Passengers protected from falling on track and piston effect</td>
<td>Saving in energy 60%</td>
</tr>
<tr>
<td>10</td>
<td>Automatic fare collection</td>
<td>Containers to collect tokens interchangeable</td>
<td>Ease of operation</td>
</tr>
<tr>
<td>11</td>
<td>Tunnel ventilation</td>
<td>Changing orientation of fan alignment</td>
<td>Around 30% space saving</td>
</tr>
<tr>
<td>12</td>
<td>Environment control</td>
<td>Secondary chilled water system eliminated, Primary pumps to cater to varying loads</td>
<td>Saving in space and energy</td>
</tr>
<tr>
<td>13</td>
<td>Lifts &amp; escalators</td>
<td>RDSO standard specifications to be adopted</td>
<td>To indigenize equipment &amp; components</td>
</tr>
<tr>
<td>14</td>
<td>Power Supply &amp; OHE</td>
<td>Adoption of GIS, Aluminium OHE fittings, BTRC eliminated</td>
<td>Saves space Light design Saving in capex and opex</td>
</tr>
<tr>
<td>15</td>
<td>Human resources</td>
<td>Pay scales of Jr. Engineers and Technicians reduced</td>
<td>Cost control in salary &amp; wages</td>
</tr>
<tr>
<td>16</td>
<td>Phase I – extension</td>
<td>Reduction in u/g station box size from 220m to 140m. Cantilever stations in elevated stretch</td>
<td>Reduction in land acquisition by about 30 to 50%</td>
</tr>
</tbody>
</table>
Session 2: Innovative Financing of Urban Rail

Moderator: Shri. Durga Shanker Mishra, Additional Secretary (Urban Development), GoI

Presenters:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Presenter</th>
<th>Designation</th>
<th>Organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shri. Pradeep Singh Kharola</td>
<td>Managing Director</td>
<td>Bangalore Metro Rail Corporation Limited (BMRCL)</td>
</tr>
<tr>
<td>2</td>
<td>Shri. Sharat Sharma</td>
<td>Director (Operations)</td>
<td>Delhi Metro Rail Corporation Ltd.</td>
</tr>
</tbody>
</table>

Presentation 1: Innovative Financing Techniques by Shri P.K. Kharola, MD, BMRCL

Primary sources of innovative financing are; Land Value, Dedicated Levies/ Taxes and Bonds/ Foreign borrowing. Metro bonds offer Minimum rate of interest of 8.79% for 10 years period (Bengaluru) against 10%+ bank rates and should be preferred. While soliciting foreign loans, it should be remembered that there is a big risk in the exchange rate fluctuation – which can be highly volatile and upset all repayment calculations. Though the Rupee loan may be costlier than the Euro denominated loan, yet the liability to pay interest and principal is fully ascertained. Other innovative financing techniques are:

- Levy of Cess and Surcharge at 5% of the market value of land or/ and building in future developments, to be credited to Metro Infrastructure Fund.
- To extend the benefit of 4 FAR for all properties lying within a distance of 150 m from the Metro Station and To levy a cess of 10% in respect of residential buildings and 20% in respect of commercial buildings on the additional FAR granted,
- To allow issue of TDRs in lieu of compensation for acquisition of land for the Project.
The estimated yield from Premium FAR and Royalty for Access to major commercial hubs is considered for three possibilities; 100% sale, Base case as 70% sale and Worst case as 50% as follows:

**Table 3: Yield from Premium FAR and Access (Bengaluru)**

<table>
<thead>
<tr>
<th>Projected Revenue Potential from FAR sale</th>
<th>Best Case Sale of (All figures in Rs crores)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>15 m s ft.</td>
</tr>
<tr>
<td>Assuming sale of a maximum limit of 1.0 additional FAR</td>
<td>1,143</td>
</tr>
<tr>
<td>Royalty for Access to major commercial hubs</td>
<td>285</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,428</strong></td>
</tr>
</tbody>
</table>

Other non-fare-box sources and their yield is estimated as follows:

**Table 4: Non-Fare Box Revenue - (Bengaluru)**

<table>
<thead>
<tr>
<th>Projected Revenue from other non-fare-box sources</th>
<th>Estimated yield (All figures in Rs crores)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Space Commercialization</td>
<td>281 (year 4)</td>
</tr>
<tr>
<td></td>
<td>219 (year 5)</td>
</tr>
<tr>
<td></td>
<td>51 (year 7)</td>
</tr>
<tr>
<td>Betterment Levy</td>
<td>500</td>
</tr>
<tr>
<td>Location &amp; Naming Rights; corporates will be allowed to add their name</td>
<td>360</td>
</tr>
<tr>
<td>Additional Cess would be levied within the entire area of the jurisdiction of the Bangalore Development Authority</td>
<td>50</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>Rs960cr</strong></td>
</tr>
</tbody>
</table>

Outer Ring Road (ORR) project in Bengaluru costing Rs 3600 cr is proposed to be financed through above listed innovative Financing Techniques (Rs 2131 cr - Conservative) and Balance Through Term Lending Agencies/ Viability Gap Funding (VGF): Rs 1469 cr.
Presentation 2:

In Delhi, the Non-Fare and fare box revenue is 12% and 88% respectively. The non-fare box earnings in FY 2015-2016 from 8 sources were as follows:

Table 5: Share of Earning-FY 2015-2016 in Crores

<table>
<thead>
<tr>
<th>S/N</th>
<th>Head</th>
<th>Amount</th>
<th>% age</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Advertisement</td>
<td>102.05</td>
<td>47.70</td>
</tr>
<tr>
<td>2</td>
<td>Telecom Business</td>
<td>35.19</td>
<td>16.45</td>
</tr>
<tr>
<td>3</td>
<td>ATM Business</td>
<td>29.78</td>
<td>13.92</td>
</tr>
<tr>
<td>4</td>
<td>Shops</td>
<td>12.81</td>
<td>5.99</td>
</tr>
<tr>
<td>5</td>
<td>Kiosks /AVM’s</td>
<td>7.81</td>
<td>3.65</td>
</tr>
<tr>
<td>6</td>
<td>Misc. (OMC of IT Park &amp; forfeiture of EMD/SD).</td>
<td>26.30</td>
<td>12.29</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>213.94</strong></td>
<td><strong>100.00</strong></td>
</tr>
<tr>
<td>1</td>
<td>IT Park</td>
<td>62.09</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>PD Area (Station Box)</td>
<td>62.71</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>124.80</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Grand Total</strong></td>
<td><strong>338.74</strong></td>
<td></td>
</tr>
</tbody>
</table>

48% of revenue among total revenue generated is by advertisements business. Various modes of display of advertisements its segment-wise percentage share is as under:

<table>
<thead>
<tr>
<th>S/N</th>
<th>Heads</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Outdoor Advertisements on Civil Structures</td>
<td>45%</td>
</tr>
<tr>
<td>2</td>
<td>Inside Stations Advertisement</td>
<td>28%</td>
</tr>
<tr>
<td>3</td>
<td>Inside Train advertisements</td>
<td>26%</td>
</tr>
<tr>
<td>4</td>
<td>Advertisements through innovative/Digital means</td>
<td>2%</td>
</tr>
</tbody>
</table>

As per Outdoor Advertisement Policy (OAP) 2008 when land belongs to other organizations and the structure has been built/installed such that it faces vehicular traffic, the concerned organization or the advertiser will have to share the revenue with local body. DMRC shared 35% revenue with South Delhi Municipal Corporation. Other local bodies are likely to follow. Issue of Revenue sharing with MCD’s needs to be settled as 35% is too high. This is rendering most paying advertisement contracts unattractive.

New Initiatives of DMRC are, Promoted goodwill: disputed cases monitored, resolved amicably or through conciliation and arbitrations, Consolidation of Tenders – Encourage competition, E-Tendering introduced, Uniform Tender Conditions, New Schedule of Powers – encourage fast decision, Policy for Licensing on walk in basis after failure of two consecutive bids, reserve prices disclosed, Policy for new initiatives/Start Ups, Realistic reserve price, Providing water electricity etc DMRC’s responsibility

New Avenues to boost Non Fare Box Revenue are; Semi-Naming Rights and Branding of stations, Train wrapping, Licensing of 103 future TOMs, Licensing of built-up Shops/Spaces as is where is basis, Advertisement On Smart cards and Tokens and Licensing for BTS Towers, Telecom Equipment, Fibre-Optics and small cells for telecom connectivity. New initiatives in Delhi resulted in providing facilities for Health Monitors, HP products vending Machines, automatic parcel delivery system and short term promotions.
**Way Forward**

Primary sources for innovative financing are; Land Value, Dedicated Levies/ Taxes, Bonds and Foreign borrowing. This is best achieved in a Joint Value-Creating exercise between Government, Local Planning Bodies and Mass Rapid Transit Agency. For full benefit, all restrictions on commercially exploiting land need to be removed. Integrated development of urban rail and cities including transit-oriented development is essential. Other non-fare-box revenue sources are several. Advertisements in various formats is the main source. In order to realize its full potential, the related policies and enactments need a review.
Session 3: Private Participation in Urban Rail

Moderator: Shri. UPS Madan, Metropolitan Commissioner, Mumbai Metropolitan Regional Development Authority (MMRDA)

Presenters:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Presenter</th>
<th>Designation</th>
<th>Organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shri. AK Saini</td>
<td>Head Railway Systems</td>
<td>L&amp;T Hyderabad Metro</td>
</tr>
<tr>
<td>2</td>
<td>Shri. Rajiv Banga, Managing</td>
<td>Director Systems</td>
<td>Rapid Metro Rail, Gurgaon</td>
</tr>
<tr>
<td>3</td>
<td>Shri. Praveen Goyal</td>
<td>Managing Director</td>
<td>Kochi Metro Rail, Kochi</td>
</tr>
<tr>
<td>4</td>
<td>Shri. Ramakrishna Reddy</td>
<td>Managing Director</td>
<td>Amaravati Metro Rail Corporation Limited</td>
</tr>
</tbody>
</table>


Hyderabad metro is one of the biggest PPP initiative in the country.

It is 72 Kms., sixty-six stations and 18.5 million sq. ft. Transit oriented development

Government of Telangana, that is the PPP partner, are paying for all the land acquisition, right of way and utility and the SPV company is implementing the project.

The financial closure is done for Rs.16,375 crore, wherein Rs. 1,458 is coming from Government of India as VGF. So, VGF is less than 20%, as mandated in NUTP 2006. The term loans have been raised from National Banks Consortium of Banks led by SBI.

The Current Status of the Project:

- Viaduct civil works
- Foundations: 57 Km
- Piers: 55 Km
- Span Erection: 45 Km
- 35 Rkm track Completed
- 25 Rkm OHE commissioned
- 17 Stations completed and work in progress@40 stations
- 2 Depot commissioned
- Stage 1 CMRS approval received (8 Kms)
• Stage 2 CMRS inspection in June’16 (12 Kms)
• 2 RoB completed out of 8

Key Challenges:

The key challenges are as follows:

Learnings from Hyderabad Metro

• Technical Specifications & Standards
  ✓ Modern technology
  ✓ Redundancy
  ✓ Life cycle cost (LCC)
• Statutory Approval
  ✓ Simplification of Process - online
  ✓ Timelines
• O&M
  ✓ Resource & spares sharing
  ✓ Indigenous vendor development
  ✓ Energy cost optimization – solar
  ✓ Benchmarking group – Indian metros

Summary

Hyderabad metro, is an example of innovative project management. The project operations will start for 20 kms. very shortly.

On PPP, probably it is high time, if country is going to involve in PPP model, we have to see how the Concession Agreement can be worked and taken with an equitable risk of allocation. It is important as the private partner needs return on equity over a long time period. This probably could be the
learning and there should be some clause in the contract. It should not a fixed term contract for a product or for a supply. There could be some framework such as re-negotiating in the major events. Probably, we have to look into how we re-negotiate the terms and come to a conclusion for the success of the project.

**Presentation 2:** Private initiative in Urban Rail – Shri Rajiv Banga, MD, Rapit Metro Gurgaon

Rapid Metro was developed as a “last mile connectivity” solution from Delhi Metros and Gurgaon line had the interchange station, called Sikanderpur.

<table>
<thead>
<tr>
<th>Phase 1: In Service</th>
<th>Phase 2: Under Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Route Length : 5.1 Km</td>
<td>Route Length : 6.6 Km</td>
</tr>
<tr>
<td>Project Cost : 1229 Cr</td>
<td>Project Cost : 2143 Cr</td>
</tr>
<tr>
<td>Concession Agreement : Dec’09</td>
<td>Concession Agreement : Jan’13</td>
</tr>
<tr>
<td>Financial Closure : Jun’10</td>
<td>Financial Closure : Jul’13</td>
</tr>
<tr>
<td>Start of Construction : Nov’10</td>
<td>Start of Construction : Sep’13</td>
</tr>
<tr>
<td>GoI Approval : Dec’11</td>
<td>GoI Approval : Nov’14</td>
</tr>
<tr>
<td>Commercial Operation : Nov’13</td>
<td>Commercial Operation : 2016 (planned)</td>
</tr>
</tbody>
</table>

**Figure 1: Rapid Metro - Key Project Parameters**

It is an elevated network and the interchange station is Sikanderpur. The services are aligned to enter to Delhi metro coinciding with the first service of theirs culminating with the last one, just past midnight. During peak hours the frequency is about four minutes which gets close to eight minutes during the non-peak hours. It is a three coach train and a flat fare system. It is probably a unique example of two independent metro systems working in very close tandem as far as the ticketing platform is concerned from a commuter perspective. It would not be any better, you don’t have to do anything except from one system, getting into the other one standing in queues and so on and so forth.

Many of the Achievements is the punctuality of the system, it is 99.85% since its inception. Its regeneration Efficiency on an average is 29.7%.

**Challenges encountered:**

- **Commercial development in the Cyber City area has been <45%:** directly impacts ridership potential
- **Lack of integration with urban mobility plan** – no feeder/evacuation service from the mass transit nodes, car parks etc.
- **Absence of appropriate regulatory/ policy framework** – anomaly of hugely capital intensive metro (at commercial rates of interest) & “regulated” framework on fares, competing with alternate forms of transport on an unregulated, asset light “aggregator” model.
Enabling framework for making PPP a sustainable proposition – alternate measures

• Metros will favourably impact real estate values around their alignment - *any strategy to render viability needs to capture such externalities*

• On a concept of **user/beneficiary to pay**, 
  
  • Adopt a “corridor” approach to monetise such values
  
  • Consider higher FAR for all properties within a prescribed distance from the metro alignment: levy a cess on the additional FAR granted
  
  • Enhancement of **property tax** in the influence zone

• Consider other measures viz. **Cess on fuel, parking taxes, congestion charges, auction based motor vehicle registration quota system etc.**

• **All revenues collected into a “Dedicated Urban transport fund”**

  “**Dedicated Urban Transport fund** created to meet the difference between the public fare paid by commuters and the technical fare (required by the private operator) to sustain the operations.

**Suggestions for future:**

• Viability gap funding is a **must**.

• Enhancing non-fare box revenues is a **necessity**.

• Alternate measures for augmenting non-fare box revenues:
  
  • **Property development rights** packaged into the concession or accorded as per TOD policy
  
  • Operationalisation of TOD policy:
    
    • Creation of Infrastructure Development Fund (IDF) corpus
    
    • Evolve mechanism for IDF disbursement to private sector projects – infusion as equity/grants that stay with the project till eventual transfer to Authority
    
    • While some cross subsidisation is inevitable, IDF benefits need to be administered corridor-wise for the metro network, to the extent possible
    
    • **Unconditional advertisement rights**, without encumbrances or levies by local bodies
  
  • Integration with urban mobility plan, city bus service, car parking etc. – *well beyond the remit of the private enterprise*
  
  • Enable access to lower cost of funding/ multi-lateral agencies - *State Govt./Authority may need to facilitate*
  
  • Minimise/eliminate taxes, levies & custom duties to reduce loading into initial investment
  
  • Principles of equity in **risk allocation**
• Risk mitigation measures to be built into the concession framework till specified benchmarks are achieved.
• IDF support to bridge the anomaly between back ended revenues due to traffic ramp-up considerations vs. front ended repayments
• Appropriate mechanism for renegotiation in line with recommendations of Kelkar Committee

Presentation 3: Unbundling for PPP – Shri Praveen Goyal, Director (Systems), Kochi Metro

The vision of Kochi Metro was to create a unified and inter operable multi modal transport system for Greater Kochi as well as to provide interchange hubs to achieve integrated time table, ticketing.

One of the areas where it started with out of the three was ticketing, and as far as the ticketing was concerned, basically the DPR, it was a conventional case leap AFC system with so much cost of Rs. 70 crore.

The major which is required to able to use the metro card just like a debit or credit card. The Kochi metro now is working on to integrate other modes of transport, just not in Kochi but can be used in
Learnings in Urban Rails and Way forward

other cities like Delhi or Nagpur. Turkey is one such example were it has integrated its transport system ticketing with the banks.

**Presentation 4:** How Metro Projects can be made Successful under PPP – Shri R. Reddy, MD, Amravati Metro

Shri. Reddy compared Shamshabad International Airport and Hyderabad Metro Rail, which are both PPP projects. The three stakeholders, concessionaire, GOIP and GOI are required to work the plan out for everyone’s benefit.

HIAL a concessionaire and Government of A.P. or Government of Telangana now, Government of India has taken 13% stake each. GMR has 63% and Airport Authority has 11% stake. It is a success story there, but when it comes to HML, Hyderabad Metro, the entire responsibility is only to L&T. GoI is participating in PPP by giving 1400 crores as VGF, but if it would have been different if it was IFL, interest free loan. Shareholding of SPV by both Govt’s is most important for Mega Projects to make it successful under PPP.

<table>
<thead>
<tr>
<th>SPV</th>
<th>Existing Govt. Funding Model</th>
<th>Proposed PPP Model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Two shareholders (GoI &amp; State Govt.)</td>
<td>3 Shareholders</td>
</tr>
<tr>
<td>Government of India funding</td>
<td>16% (4 Directors)</td>
<td>20% VGF (2 Directors)</td>
</tr>
<tr>
<td>Government of State funding</td>
<td>35% (4 Directors)</td>
<td>30% (2 Directors)</td>
</tr>
<tr>
<td>Third Party funding</td>
<td>JICA – 49% or other Agency</td>
<td>Concessionaire – 50% (5 Directors)</td>
</tr>
</tbody>
</table>

Pros & Cons

- It would take about 30 to 40 years for repayment of the loans to funding agencies.
- Concession period 50 years (or mutually agreed)
- Ticket rate fixation should rest with the SPV, which will be notified by the Govt.
- 3 share holders.
- BOUND to be SUCCESSFUL

Way forward:

- A more elaborate policy on Implementation of Metros under PPP model is required.
- The present policy of MoUD for Govt. funding models on 50:50 equity in the jointly owned SPV be reviewed.
- GOI, State Govt and Concessionaire should be the shareholders in the PPP-SPV
- If both Central and State Govt’s. contribution is 45-55% of the project cost in the form of interest free loan/ sub-ordinate debt/ Grant, the concessionaire can easily contribute the remaining 50% in the form of debt and equity
Session 4: Standardization & Indigenization and Reducing Cost of Construction, Operation & Maintenance

Moderator: Shri. I. P. Gautam, Managing Director, Metro link Express for Gandhinagar & Ahmedabad (MEGA)

Presenters:

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Presenter</th>
<th>Designation</th>
<th>Organisation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Shri. HS Anand</td>
<td>Director (Rolling Stock)</td>
<td>Delhi Metro Rail Corporation Ltd.</td>
</tr>
<tr>
<td>2</td>
<td>Shri. Brijesh Dixit</td>
<td>Managing Director</td>
<td>Nagpur Metro Rail Corporation Ltd. (NMRCL)</td>
</tr>
</tbody>
</table>

Presentation 1: Innovative Financing Techniques – Shri H.S. Anand, Director (RS), DMRC.

For achieving a standardisation MoUD had set up separate committees in May 2012 which are Fare Collection System, Metro Operations & Maintenance, Rolling Stock, Signalling Systems, Traction and Power Supply System, Track Structure.

The other step in cost cutting is indigenization of urban rail components. Delhi Metro rail has been asking for this in their tender documents. Latest tender conditions mandate that the Contractor must manufacture more than 75% cars within India as well as other specified items, required for maintenance either by setting up their own plant or by associating with suitable Indian companies. Specified items include rolling stock components, S&T items and Track Components. DMRC has achieved Indigenization in manufacture of rolling stock as follows:

- Phase-I: 220 cars out of 280 cars
- Phase-II: 914 cars out of 954 cars
- Phase-III: 786 cars out of 906 cars

In value terms the target is progressively increased indigenization: 90% in components and 100% for repeat order of Rolling Stock. For Jaipur, Kochi & Lucknow, 100% RS is to be Manufactured within India.

Presentation 2: Strategy for Cost Effective Design, Construction, Operation & Maintenance–Shri Brijesh Dixit, MD, NMRCL

Cost control, cost cutting, cost effectiveness and optimization have to be adopted as a philosophy so that the project is completed within the stipulated time & cost and with highest standards of quality and safety. Some of the steps taken by Nagpur metro rail corporation in cost cutting, cost effectiveness and optimization are listed in the table 6.
Table 6: Strategy for Cost Effective Design, Construction, Operation & Maintenance

<table>
<thead>
<tr>
<th>S No</th>
<th>Parameter</th>
<th>Step taken</th>
<th>Estimated Saving (Rs crores)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Design steps</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Viaduct width</td>
<td>Reduced to 8.5m from 10.3m</td>
<td>90</td>
</tr>
<tr>
<td>2</td>
<td>Viaduct casting</td>
<td>Parapet included</td>
<td>30</td>
</tr>
<tr>
<td>3</td>
<td>Reduction in Right of way</td>
<td>From 20m to 18m</td>
<td>Cost of land</td>
</tr>
<tr>
<td>4</td>
<td>Platform length for 3 coach trains</td>
<td>Reduced from 140m to 75m</td>
<td>108</td>
</tr>
<tr>
<td>5</td>
<td>Maintenance shed</td>
<td>Size reduced to half</td>
<td>100</td>
</tr>
<tr>
<td>6</td>
<td>S&amp;T</td>
<td>Cost effective Design</td>
<td>25</td>
</tr>
<tr>
<td>7</td>
<td>E&amp;M</td>
<td>Cost effective Design</td>
<td>4/year</td>
</tr>
<tr>
<td>8</td>
<td>Receiving Sub-Stations reduced</td>
<td>From 4 to 2</td>
<td>180</td>
</tr>
<tr>
<td>9</td>
<td>Rolling stock eligibility criteria</td>
<td>liberalized wide participation</td>
<td>Will save</td>
</tr>
<tr>
<td>10</td>
<td>General Consultant</td>
<td>Cost reduced by 40%</td>
<td>100</td>
</tr>
<tr>
<td></td>
<td><strong>Construction Steps</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Construction of Stations</td>
<td>Independent of Viaduct</td>
<td>Will Save time</td>
</tr>
<tr>
<td>2</td>
<td>To handle entire cash management process incl. AFC</td>
<td>Single banking entity</td>
<td>savings: ~Rs.260crs</td>
</tr>
<tr>
<td>3</td>
<td>Use of Pre-Engineered Building components,</td>
<td>Space Frame Trusses, and Precast RCC/PSC Members</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td><strong>Operation and Maintenance</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Energy saving</td>
<td>Solar Power generation right from the inception</td>
<td>8 Cr per annum</td>
</tr>
<tr>
<td>2</td>
<td>Manpower</td>
<td>Reduction to 20 men /km compared to 35 men /km</td>
<td>Rs.25 cr/year</td>
</tr>
<tr>
<td>3</td>
<td>Feeder Service</td>
<td>Will enhance ridership</td>
<td>More revenue</td>
</tr>
<tr>
<td>4</td>
<td>Improving ridership</td>
<td>Transit Oriented Development</td>
<td>Rs200 crs per year</td>
</tr>
</tbody>
</table>

These are based on the application of ‘value engineering’ techniques to each and every component of the project by asking questions such as; is it needed?: is there a better way of doing it? And so on.

**Way forward**

To reduce construction, operation and Maintenance costs, ‘Value engineering’ techniques should be applied to each component of the project. Indigenization should be given further push. Standardization of urban rail components (civil, rolling stock and signalling) is the first step to benefit from the size of the Indian market.
Session 5: International Learnings

World Bank is conducting a technical study for international perspective on institutional setup, innovative financing and private participation in Urban Rail. Study has been conducted in the cities of London, Sao Paolo, Toronto, Washington D C, Hongkong, Taipai, and Barcelona.

The Progress up-to-date and selected lessons are as follows:

Urban rail is a capital investment project that never stops. There is a need to deliver projects in immediate succession and continuation to benefit from the experience gained. Development is a long term game. Decisions need to be taken with a 100 year view. Asset management should be planned form “day 1” since assets will be there for more than 100 years.

As Metro rail will change land use; we should plan to make it beneficial to the metro rail and its customers. It’s never too late to integrate land use and transport. TOD is one way. It is good for financial stability, it is good for social policy and it is good for environmental sustainability. Its implementation is a challenge because the metro rail agency has no authority on urban planning. It is necessary to change the strategy and convert the stations into a gathering hub. Ridership revenue alone won’t make the urban rail sustainable.

“Infrastructure is long-term and strategic; politicians are short-term and tactical”. Politics is there in every country. Rather than wait for someone to win election and trying to convince them to do good things for transport, urban rail authority should be pro-active and influence politicians before election. Mega cities need metros with capacity to support their growth; it is difficult to shut down and expand a metro service once it is operating. Getting the service right takes the right people + the right environment to enable them.

New metro lines cost more money than can be recouped from fares, but the operational expenditure (including renewal) can be self-sustaining if fares are sufficient and there is a good level of non-fare revenue. This is done either by upfront subsidy in cash/ non-cash or by ongoing subsidy of debt obligations. In Europe, taxation regimes tend to have very high taxes. So the revenue shortfalls are made up by annual government grant. It is in no one’s interest for a metro company to be insolvent on the day one.

Urban rail projects should integrate not just the central government grant, but also businesses and the local government to contribute to the project. It will make the project politically impossible to kill. Revision of fare all over the world is political. Fares fixation formula is public and it is transparent. There are two key variables in those formulas; one is inflation and the other is to wage level.

On O&M cost, Barcelona trained generalists, who could both drive the train, if they needed and maintain the ticket machines and talk to the clients. It increased the job satisfaction from four ways, they had more autonomy, they were empowered to take decisions to improve the service and automatically they were able to give client oriented services and for the organization, that provided a lot of flexibility, more of resilience.
The mode selection criteria for any city going for urban rail in many countries is highly political. Correctly speaking looking for viability in project is the first and foremost criteria. There should be high existing public transport demand. Alignment should be reasonable in cost and technically feasible. The economic case for developing the city should be there.

PPP is a question of moving forward with the lessons you have. One of the things we can see in finance heavy PPPs for modalities is a very high capital grant of the order of 80-85 per cent. PPPs do not create new money. They are a financing modality, they are a delivery modality but they are not a funding modality. Risks should be allocated to the party best suited to manage them or mitigate them. That is fundamental in PPP. When it comes to revenue risk, the factors that are outside concessionaire’s control typically outweigh by a large number of factors that are within the concessionaire’s control. In general, avoid allocating all revenue risk to the concessionaire. Internationally, the tendency is either to allocate very little revenue risk; may be 5% to the concessionaire or to have no revenue risk at all.
One-day workshop on “Learnings in Urban Rail and Way Forward” on 11th June, 2016 at Delhi Metro Rail Corporation, Metro Bhawan Auditorium, Brigade lane, Barakhamba Road, New Delhi - 110001

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
<th>Speakers</th>
</tr>
</thead>
<tbody>
<tr>
<td>09:00 – 09:30</td>
<td>Registration</td>
<td>To be facilitated by DMRC</td>
</tr>
<tr>
<td>09:30 – 09:40</td>
<td>Welcome Address and Initiation</td>
<td>Additional Secretary (Urban Development), MoUD, GoI</td>
</tr>
<tr>
<td>09:40 – 10:00</td>
<td>Keynote Address</td>
<td>Secretary (Urban Development), MoUD, GoI</td>
</tr>
</tbody>
</table>
| 10:00 – 11:30 | Session – 1 Institutional and Financial Framework for Implementation of Urban Rail | i. By Metropolitan Commissioner, MMRDA  
ii. Director (BD), DMRC  
iii. Best Practices followed by MD, CMRL  
(10 minutes for each presentation followed by Q&A and brain storming) |
| 11:30 – 13:00 | Session – 2 Innovative Financing of Urban Rail                        | i. Innovative Financing by BD-BMRCL  
ii. Enhancing Non-Fare Box Revenue by Director (Operations) – DMRC  
(10 minutes for each presentation followed by Q&A and brain storming) |
| 13:00 – 13:45 | LUNCH                                                                |                                                                          |
| 13:45 – 15:00 | Session – 3 Private Participation in Urban rail                       | i. PPP Initiative by L&T Hyderabad Metro  
ii. Private Initiative by MD, Rapid Metro Gurgaon  
iii. Unbundling for PPP by Director Systems, Kochi metro  
iv. PPP Initiative by MD, AMRCL  
(10 minutes for each presentation followed by Q&A and brain storming) |
| 15:00 – 16:00 | Session – 4 Standardization & Indigenization and Reducing Cost of Construction, Operation & Maintenance | i. Standardisation & Indigenisation by Director (RS), DMRC  
ii. Cost Effective Design, Construction, Operation & Maintenance by MD, Nagpur Metro  
(10 minutes for each presentation followed by Q&A and brain storming) |
| 16:00 – 17:30 | Session – 5 International Learnings                                   | Presentation by Mr. Dominic Patella, Sr. Transport Specialist, World Bank (45 minutes) followed by Q&A |
| 17:30 – 17:35 | Vote of Thanks                                                        | Director (MRTS- I)                                                       |
| 17:35 – 18:00 | Tea and Networking                                                    |                                                                          |
## Annex 2

### List of Participants

**Ministry of Urban Development**

S/Shri

1. Rajiv Gauba, Secretary
2. D.S. Mishra, Additional Secretary
3. M.K. Sinha, OSD (UT) & EO JS
4. Ms. S K Ram, JS& FA
5. R.K. Singh, Director
6. Prakash Singh, Director
7. Janardan Prasad, Director
8. V. S. Pandey, Deputy Secretary
9. Ambuj Bajpai, Under Secretary
10. Deen Dayal, Under Secretary
11. Ms.S. V. R. Ramana, Under Secretary
12. Lohrii Kapani, Under Secretary

**Ministry of Railways**

S/Shri

1. Pankaj Tyagi, Dir. CE (Plg.)
2. Mohit Lila, Director / Works-I)
3. Ch. P. Sarathi Reddy, Director /Project (Elect.)
4. S B Bhavin, ED/Sig (Dev.)
5. Vinay Kr. Singh, CGM, PP&D
6. Raj Kumar, Dy. CMM/Con-II(ER)

**Ministry of Finance**

1. Shri Sitangshu Chakrabortty, Deputy Secretary, Deptt. of Expenditure

**NITI Ayog**

S/Shri

1. M Vijayakumar, Joint Advisor
2. Amit Bhardwaj, Sr Research Officer
3. Ms. Molishree, Research Officer
4. Ms. Shikha Juyal, Economic Officer
5. Shri Shashvant Singh, Young Professional
6. Shri Manish Kumar, Intern
7. Ms. Suchi Mathur, Intern

**Ministry of Road Transport and Highways**

1. Shri B.K. Sinha, Chief Engineer
2. Shri O.P. Srivastava, Superintending Engg.
MMRDA

S/Shri

1. U.P.S. Madan, Metropolitan Commissioner,
2. Siddarth Gondhale, Transport Planner
3. Shantanu Wagh, Transport Planner
4. Rahul Wasnik, Transport Planner

Govt. of Bihar

1. Shri Neeraj Sexena, Executive Engg. Cum Nodal Officer, UD & Housing

Govt. of Jharkhand

1. Shri Harsh Mangla, Director /DMA
2. Shri Nishikan, DIMTS

Guwahati Metropolitan Development Authority

1. Shri Anurag Singh, CEO
2. Shri Anant Lal Gyani, Joint Secretary

World Bank

1. Shri Atul Agarwal, Sr. Transport Specialist
2. Ms. Nupul Gupta, Sr. Transport Scientist

Delhi Metro Rail Corporation Limited

S/Shri

1. Mangu Singh, Managing Director
2. H.S. Anand, Director /RS
3. Jitendra Tyagi, Director/ Works
4. S.D. Sharma, Director / BD
5. D.K. Saini, Director/ Project
6. Sharat Sharma, Director/ Operation
7. K.K. Saberwal, Director / Finance
8. A.K. Gupta, Director/Electrical
9. Pramit Kumar Garg, Project Director / N-GN
10. D.R. Padmanabham, CRFO/N-GN
11. Vikas Kumar, ED/Operation
12. Ashwani Kumar, CE/Trg.I
13. Navmeet Kothari, CE/Trg.II
14. Pankaj Gupta, CE/E&M/AP
15. S.M. Saha, Dy. CE/P-II
16. Sumit Bhatnagar, CEE/RS-IV
17. S.N. Agarwal, CEE/PS-2
18. Anil Kapur, GM/Fin.
19. S.S. Joshi, ED/RS
20. Surya Prakash, ED/PD
21. S. Singh, ED
22. Yatender Kumar, CEE/UG
23. S. Sivamathan, GM/Finance
24. T.B. Ramesh, GM/Finance
25. R.K. Yadav, GM/PB
Learnings in Urban Rails and Way forward

26. S.K. Sinha, GM/HR
27. D.K. Sinha, GM/S&I
28. S. Kubba, CEE/RS
29. Mahavir Singh, GM/CS
30. Sudhir Mitra, Sr.DGM
31. A.K. Tripathi, DGM
32. Himanshu DGM
33. Manish Yadav, DGM/PB/I
34. Gautam Kumar, DGM
35. Sandeep, DGM
36. A.V.Patil, Dy.CA/contracts
37. Arun Kr. Singh, CE/PD
38. Sanjeev Maheshwari, Sr. AGM/IT
39. Pramod Kumar, Advisor/CS
40. I P singh, DGM/Civil
41. Papiya Sarkar, CA
42. Sumeet Singh, DGM
43. Dhananjay Sharma, DGM
44. Suyash Trivedi, Dy. CE/Cont.
45. S K Roy, DGM
46. Kamal Ram Meena, Dy. CEE/Pig
47. A Godgil, CPM
48. Rajesh Agarawal, Sr. DGM/env.
49. Dipankar Nath, Dy.CA-V
50. S P Dhasmanu, Dy. CEE/RS-1
51. Ramakant, DGM/System
52. M M Sharma, Trg. Coord
53. R S Mann, AM/Admin
54. Sidharth Kumar, Sr. CRA
55. Rohit Prakash, Sr. CRA
56. R L Dogra, Sr. AGM (F)
57. Ritesh Garg, PM-SQ
58. Chandrakant Shrivats, DGM/E
59. Mriunjay Kumar, DGM/RS/MB
60. Suresh Sharma, DGM /IT
61. Vikas Kumar, AM/Arch.
62. Tanu Singh, AM/RS
63. Subodh Pandey, AGM/IT
64. Mahinder Yadav, Dy. CPRO
65. R.G. Sharma, AM/CS
66. Niti Kothari, AGM/F
67. Bharat Bhushan, ASE/Tele
68. Gaurav Garg, AM/RS
69. Vinay Kumar, HM/Tele

Chennai Metro

1. Shri Pankaj Kumar Bansal, IAS, Managing Director
2. Shri L. Narasim Prasad, Director /Systems & Operations
3. Shri J. Hari Prasad, JGM /TVS

Bangalore Metro Rail Corporation Ltd.

1. Shri P.S. Kharola, Managing Director
**Learnings in Urban Rails and Way forward**

**Kochi Metro**

S/Shri

1. Praveen Goyal, Director/Systems
2. Rajendran AR, GM/RS&E
3. Jayananda, Manager/AFC
4. Mohammed Baheer, Sr DGM/Civil
5. Hari S Pillai, JGM/Civil

**Mumbai Metro**

S/Shri

1. S K Gupta, Director/Project
2. Indranil Sarkar, CFO
3. R K Sharma, ED/Elect
4. R Ramanna, ED/Planning
5. Rajiv, GM/RS
6. N M Bhatiya, Coordination Officer

**MEGA**

1. Shri I.P. Gautam, Managing Director
2. Shri Ramesh Kumar, DGM
3. Shri Navin Verma, AGM (F&A)
4. Shri Aditya Bhardwaj, AGM (PED)

**Nagpur Metro**

1. Shri Brijesh Dixit, Managing Director
2. Ramnath S, Executive Director
3. Shri Sunil Mathur, Director
4. Shri Mahesh Kumar, Director
5. Shri Ramesh Agarwal, PRO

**Lucknow Metro**

1. Shri Naveen Babu, Chief Engineer /Contract
2. Shri S.K. Mittra, GM (F)

**Kolkata Metro**

1. Shri Parashuram Singh, Director (P&P)
2. Dr. S.K. Panday, Director (Finance)

**L&T Hyderabad**

1. Shri Anil K Saini, Head Rly. System

**Amravati Metro (Vijaywada)**

1. Shri N. P. Rama Krishna Reddy, Managing Director
2. Shri U. J. M. Rao, General Manager

**NCRPB**

1. Shri Satyabir Singh, AD (T)
Learnings in Urban Rails and Way forward

**MMOPL**

S/Shri

1. Abhay Kumar Mishra, CEO
2. Vikas Verma, DGM/BD
3. Prashant Kumar, Sr Manager
4. Sanjay Rathi, Manager

**NMRC Noida**

S/Shri

1. Santosh Kumar Yadav, Managing Director
2. Saumya Shrivastava, Executive Director
3. Shailendra Kumar Bhatia, OSD
4. Sandeep Raizada, OSD (CBS)
5. P D Upadhyay, GM/Finance
6. V K Jain, DGM/Finance
7. Jai Prakash, DGM/HR

**MPMRCL**

S/Shri

1. Jitendra Kumar Dubey, E-in Chief/Director (Tech)
2. Manju Sharma, Add. Commissioner, UAD
3. Vijendra Nanavati, Technical Advisor
4. Kamal Nagar, OSD (Transport)
5. Sanjay Shrivastava, CFO
6. Chetan Bakshi, Advisor
7. V. Nanavati, Advisor (Tech)
8. Anoop Vijay, Chartered Accountant
9. Sandeep Jain, Company Secretary

**Rapid Metro Rail Gurgaon**

1. Shri Rajiv Banga, Managing Director
2. Shri Dilip Jadeja, Vice President

**UMTC**

1. Shri Ajai Mathur, MD & CEO
2. Shri Kishore Nathani, Sr Vice President
3. Shri Ankush Malhotra, Vice President
## Annex 3

### List of Presentations

<table>
<thead>
<tr>
<th>No.</th>
<th>City</th>
<th>Presenter</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Mumbai</td>
<td>Shri. UPS Madan, Metropolitan Commissioner, MMRDA</td>
<td>Institutional and Financial Framework for implementing Metro Projects – MMRDA Experience</td>
</tr>
<tr>
<td>2</td>
<td>Delhi</td>
<td>Shri. SD Sharma, Director (BD), Delhi Metro Rail Corporation Ltd.</td>
<td>Institutional and Financial Framework</td>
</tr>
<tr>
<td>3</td>
<td>Gurgaon</td>
<td>Shri. Rajiv Banga, Managing Director, Rapid Metro Rail, Gurgaon</td>
<td>Private initiative in Urban Rail</td>
</tr>
<tr>
<td>4</td>
<td>Vijayawada</td>
<td>Shri. Ramakrishna Reddy, Managing Director, Amaravati Metro Rail Corporation Limited</td>
<td>How Metro Projects can be made Successful under PPP</td>
</tr>
<tr>
<td>5</td>
<td>Bengaluru</td>
<td>Shri. Pradeep Singh Kharola, Managing Director, Bangalore Metro Rail Corporation Limited (BMRCL)</td>
<td>Innovative Financing Techniques</td>
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<td>6</td>
<td>Delhi</td>
<td>Shri. Sharat Sharma, Director (Operations), Delhi Metro Rail Corporation Ltd.</td>
<td>Enhancing Non-Fare Box Revenue</td>
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<tr>
<td>7</td>
<td></td>
<td>Mr. Dominic patella, Sr. Transport Specialist, World bank</td>
<td>International Experiences with Urban Rail Funding, Institutional Frameworks &amp; PPP – Progress update and selected lessons</td>
</tr>
<tr>
<td>8</td>
<td>Delhi</td>
<td>Shri. HS Anand, Director (Rolling Stock), Delhi Metro Rail Corporation Ltd.</td>
<td>Standardisation &amp; Indigenisation</td>
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<tr>
<td>9</td>
<td>Nagpur</td>
<td>Shri. Brijesh Dixit, Managing Director, Nagpur Metro Rail Corporation Ltd. (NMRCL)</td>
<td>Strategy for Cost Effective Design, Construction Operation &amp; Maintenance</td>
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<tr>
<td>10</td>
<td>Chennai</td>
<td>Shri. PK Bansal, Managing Director, Chennai Metro Rail Ltd. (CMRL)</td>
<td>Best Practices Followed</td>
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<td>11</td>
<td>Hyderabad</td>
<td>Shri. AK Saini, Head Railway Systems, L&amp;T Hyderabad Metro</td>
<td>PPP Initiative</td>
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<tr>
<td>12</td>
<td>Kochi</td>
<td>Shri. Praveen Goyal, Director Systems, Kochi Metro Rail, Kochi</td>
<td>Unbundling for PPP</td>
</tr>
</tbody>
</table>
Financing Metro Rail – PPP

20% Viability Gap Funding from Government of India

100% Fully Privately Financed Initiative

Metro Rail Projects – 12 Cities

316 Operational Kilometers
509 Under Construction Kilometers
Metro Rail Projects – Operational KM

<table>
<thead>
<tr>
<th>City</th>
<th>Operational KM</th>
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<tbody>
<tr>
<td>Delhi</td>
<td>212</td>
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<tr>
<td>Bengaluru</td>
<td>32</td>
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<td>Kolkata</td>
<td>27.3</td>
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<tr>
<td>Mumbai Metro</td>
<td>11.4</td>
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<tr>
<td>Chennai</td>
<td>10.15</td>
</tr>
<tr>
<td>Jaipur</td>
<td>9</td>
</tr>
<tr>
<td>Mumbai Monorail</td>
<td>9</td>
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<tr>
<td>Gurgaon</td>
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</tbody>
</table>

Total KM's operational: 316

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Metro Rail Projects – Under Construction KM

<table>
<thead>
<tr>
<th>City</th>
<th>Under Construction KM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delhi</td>
<td>115</td>
</tr>
<tr>
<td>Bengaluru</td>
<td>82</td>
</tr>
<tr>
<td>Hyderabad</td>
<td>71</td>
</tr>
<tr>
<td>Chennai</td>
<td>44</td>
</tr>
<tr>
<td>Nagpur</td>
<td>38</td>
</tr>
<tr>
<td>Ahmedabad</td>
<td>36</td>
</tr>
<tr>
<td>Mumbai Metro</td>
<td>33.5</td>
</tr>
<tr>
<td>Kochi</td>
<td>26</td>
</tr>
<tr>
<td>Lucknow</td>
<td>23</td>
</tr>
<tr>
<td>Chennai Mono</td>
<td>20</td>
</tr>
<tr>
<td>Mumbai Mono</td>
<td>11</td>
</tr>
<tr>
<td>Gurgaon</td>
<td>7</td>
</tr>
<tr>
<td>Jaipur</td>
<td>2.5</td>
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</tbody>
</table>

Total KM's under construction: 509
Learnings in Urban Rails and Way forward

Metro Rail Projects – Under Consideration KM

<table>
<thead>
<tr>
<th>Project</th>
<th>Length (KM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delhi Metro Phase IV</td>
<td>61</td>
</tr>
<tr>
<td>Guwahati</td>
<td>42.00</td>
</tr>
<tr>
<td>Nagpur</td>
<td>37.56</td>
</tr>
<tr>
<td>Kolkata</td>
<td>32.36</td>
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<tr>
<td>Indore</td>
<td>31.66</td>
</tr>
<tr>
<td>Pune</td>
<td>31.5</td>
</tr>
<tr>
<td>Patna</td>
<td>27.38</td>
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<tr>
<td>Bhopal</td>
<td>27.81</td>
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<tr>
<td>Vijayawada</td>
<td>26.03</td>
</tr>
<tr>
<td>Thiruvanthapuram</td>
<td>21.92</td>
</tr>
<tr>
<td>Kochi</td>
<td>15.5</td>
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<tr>
<td>Kozhikode</td>
<td>11.2</td>
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</table>

Total KM: 524

RRTS Phase 1

<table>
<thead>
<tr>
<th>Project</th>
<th>Length (KM)</th>
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<tbody>
<tr>
<td>Delhi-Gurgaon-Airport</td>
<td>100</td>
</tr>
<tr>
<td>Delhi-Sonipet-Dabri</td>
<td>111</td>
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<tr>
<td>Delhi-Ghaziabad-Meerut</td>
<td>10</td>
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</tbody>
</table>

Total KM: 381

World Bank Study

World Bank is conducting a technical study for international perspective on institutional setup, innovative financing and private participation in Urban Rail.

Study has been conducted in the cities of London, Sao Paolo, Toronto, Washington D.C, Hongkong, Taips, and Barcelona.
### Challenges Anticipated – Deliberation Required

<p>| | |</p>
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<tr>
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<tbody>
<tr>
<td>![Icon 1]</td>
<td>• Institutional and Financial Framework for implementation of upcoming Metro Projects</td>
</tr>
<tr>
<td>![Icon 2]</td>
<td>• Innovative Financing of Metro Rail Projects</td>
</tr>
<tr>
<td>![Icon 3]</td>
<td>• Innovative Design to reduce construction, operation and maintenance costs</td>
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<tr>
<td>![Icon 4]</td>
<td>• Methods for increasing Non-fare Box Revenue</td>
</tr>
<tr>
<td>![Icon 5]</td>
<td>• Models for successful Private Participation in Metro Rail Projects</td>
</tr>
<tr>
<td>![Icon 6]</td>
<td>• Standardisation and Indigenisation of metro components (civil, rolling stock and signalling) – Make in India</td>
</tr>
</tbody>
</table>

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**Thank you**
Institutional and Financial Framework for implementing Metro Projects – MMRDA Experience

Mumbai Metro Master Plan Implementation Status

- Line 1: completed and under operation for two years
- Line 2A and 3: tenders for civil work about to be awarded
- Line 7: tenders for civil work awarded
- Line 2B and 6 for government approval

All these corridors being implemented under three different institutional and financial frameworks

Model 1: Mumbai Metro Line 1

- 1st PPP Metro project in India under BOOT
- Started under Indian Tramways Act, later brought under the Metro Act
- Length: 11.4 km elevated. Approved Project Cost: Rs. 2,356 cr
- Bid criteria: ‘Fee for the whole concession period, VGF amount as the deciding criterion’
- RIL won the bid with 27.5% of VGF demanded
- Implementing Agency: MIMOPI (R Infra and MMRDA)
- Shareholding pattern: 14% R Infra and Veolia, 26% MMRDA
- Financing pattern: VGF by Gov Rs. 471 cr, VGF by GovM 179cr, Equity Rs. 512 cr, Debt Rs. 1,194 cr.

Pros and Cons of Model 1 (PPP)

- Least cost for the Govt. / implementing agency (only VGF)
- Most of the contribution (VGF) comes from Gov
- Faster completion and lower cost – due to administrative and financial efficiency of the private sector
- Most risks transferred to the private partner
- Least control on implementation or operation
- The current Metro Act does not provide for the PPP model
- Constant bickering between parties if things do not go according to the plan
- Inadequate dispute resolution mechanism

Actual experience of Model 1

- Project completed in 6 years as against 42 months announced
- Project cost increased from Rs. 2,356 cr to Rs. 4,321 cr, with both parties disagreeing about the reasons
- Metro Act made applicable while under construction
- Powers of MMRDA ‘given to the Concessionaire’ being ‘buyer’ of the project
- ‘Using the MRA’s powers’. Concessionaire fixed the initial fare ignoring the fare structure agreed in the CA
- CA terms ignored in other matters also
- Litigation and arbitrations – huge loss of time and money for both
- CAG audit requested but couldn’t materialise
Learnings in Urban Rails and Way forward

Model 2: Mumbai Metro Line 3 (SPV)
- Length: 33.5 km, fully underground,
- Completion cost: Rs 23,136 cr
- Implementation: 2014 – 2020
- JV Model with equity (10.4%) and sub-debt (4.4%) from GMR, equity (10.4%) and sub-debt (7%) from GoM, loan from JICA (57%), balance property development, MMRDA and MMRL
- Implementation through MMRDA, SPV of GoM and GoM – Chairman Secretary MMRDA, MD an MDV officer from GoM (model followed by most of the cities)

Pros and Cons of Model 2
- Upto 15% funding from GoI, lower counterpart funding
- Extensive appraisal helps in refining the project report
- Benefit of expertise of GoI in the Board
- Lengthy appraisal process, takes up to 2 years
- Project cost escalates during appraisal period
- Procurement of GC and works can commence only after loan negotiations
- With less than 15% contribution, 50% control by GoI
- Even with equal power, all responsibilities on State – increase in cost, Forex risk
- Practical difficulties of Board meetings

Model 3: Metro Line 2, 4, and 7 (MMRDA)
- 118 kms., fully elevated corridors, total cost over Rs 40,000 cr
- MMRDA will be the implementing agency
- Some works to be done directly by MMRDA by in-house projects, some through MMRDA as de sociation work
- Civil works funded by MMRDA, loan for systems from bilateral/multilateral agencies
- State Government to provide sub-debt for central taxes (30%), state taxes (100%) and land cost
- Loan assistance for systems up to 80% from MMRDA

Pros and Cons of Model 3
- Civil works can commence immediately after State and Centre approvals – much shorter period for approvals
- Simultaneous loan negotiations saves time
- Disbursement can commence after 2 years
- Faster completion means lower risk for project cost escalation and less hedging cost
- More autonomy and flexibility
- No contribution from GoI
- Much higher counterpart funding by implementing agency
- Risk of the funding process data for some reason

Conclusion
- No ‘best model’ – all depends on the requirements of the project proponent
- Metro Act must have adequate provision for PPP with a fair distribution of powers and responsibilities
- Adequate dispute resolution mechanism for all PPP projects necessary
- More autonomy and equal responsibility for states under Model 2
- GoI should consider giving assistance of 20% of the cost for Model 3

Thank You
Institutional and Financial Framework

**Presentation Profile**
- What is an Urban Rail?
- What is the Institutional framework?
- Existing Institutional Framework in Urban Transport
- Numerous Framework of Institutions
- Present Framework of Institutions for Metro Rail
  and few of its salient points including deficiencies
- Financial Framework:

**What is an Urban Rail?**
- Sub-urban Rail
- Metro Rail (Heavy, Medium, Light)
- Tram Way
- Rail Guided LRT

**What is the Institutional Framework?**
- Regulations/Acts
  Institutions are broadly defined as systems of rules which define the boundaries of any institution. These facilitate the implementation of a particular infrastructure project within well defined legal and functional norms. In case of Urban Rail, this is the responsibility of Central Government.
- Organization
  Institutions are also likely to be organizations, a set of the people who carry out a particular set of activities. In case of Urban Rail, this is the responsibility of State Government.

**Urban Transport—Existing Institutional Framework**
- Under the Constitution of India, responsibility for urban development, urban transport, rests with the state government.
- City level - At the city level, several agencies are involved in the management of various components of urban transport.
- Urban local bodies, under the Ministry of Urban Development, are responsible for a range of functions.

**Existing Institutional Framework inadequate**
- Urban Transport is controlled by multiple institutions. This multiplicity of institutions has resulted in no unity of command and hence fragmented functional responsibilities.
- There is also no accountability in ownership, performance, and maintenance of transportation infrastructure and system operations.
- Urban transport affects almost all and each agency reports to a separate ministry at the state and center level.
- There is no single apex agency for regulation & coordination between institutions.
- There is also no co-ordinating agency for integrating operations of different modes.
- Formation of UMTA is still in progress.
Numerous Institutions

- There is no legislation at present that covers the requirements of urban transport comprehensively.
- The Motor Vehicles Act deals with the licensing of vehicles.
- Railway Act covers intercity and sub-urban Rail.
- Metro Railways (Amendment) Act 2009 deals with the specific issues related to metro rail.
- Tramways Act deals with tramways.
- Other modes of mass rapid transit namely bus rapid transit, the light rail transit, the mono rail and several other guided modes of transport hardly have any institutional framework.

Institutional Framework for Metro Rail

- Metro Railways (Amendment) Act 2009
  - It comprises the following:
    - Railway's Act 1890
    - Railway's Construction of Works Act 1878
    - Delhi Metro (Operation and Maintenance Act)-2002
- Allocation of Business Rule
  - Planning and coordination of urban transport systems with technical planning of rail based systems being subject to the terms of work allocated to the Ministry of Railways, Railway Board.
  - Non-Government Railway - Matters in so far as provision for control by the Ministry of Railways, Railway Board as provided in the Railways Act, 1981 (24 of 1981) or in the contracts between the Government and Railways, or in any other statutory enactment, namely, regulations in respect of safety.

Institutional Framework for Organisation

- Special Purpose Vehicle (SPV)
  - Formation of SPV with 50:50 participation by Central and Government for implementation of an urban infrastructure Projects is now time tested and has produced the desired results.
  - A Special Purpose Vehicle (SPV) be formed for implementation of the project.
    - The SPV should be registered under the Companies Act, 2013 as a joint venture of GOI and concerned state government.
    - The SPV should have full time MD, Director (RS), Director (Works) and Director (Finance).
    - The SPV will also have equal number of nominees directors of GOI & state government.
    - Organisation down below should also be made up by selecting the best cover through competitive examination.

State Government to abide by the GOI’s Guidelines

- State Government to abide by the GOI guidelines on:
  - Uniformity
  - Standardisation
  - Safety certification
  - Security related issue and
  - Service level benchmarks
- Integration of various modes of transport which would act as feeder system to the proposed metro.
- State government to provide multimodal integration, including sub-urban railways (including Indian railways) to provide a well connected network in the region.
- State government to ensure that the metro rail project provides for:
  - First and last mile connectivity
  - Accessibility and
  - Adequate security arrangements

Learnings in Urban Rails and Way forward
State Government to abide by the GOI’s Guidelines (contd.)
- Enter into a Memorandum of Understanding (MOU) with the GOI to effect the various terms and conditions of the approval of the project.
- State Government to provide common mobility card across all modes and all operators in the city for:
  - Integrated ticketing
  - Seamless travel

FINANCIAL FRAME WORK

Items involved
- Percentage of Fund Contributions from each Stakeholder and other norms
  - Government Funded
  - Build, Operate and Transfer (BOT)
  - Public Private Partnership (PPP)
  - Completely Private Funded

Complete Funded by Government - Percentage Fund Contributions and other norms
- GOI contributes not more than 20% of the cost of the project excluding the cost of land and state taxes.
- 20% ceiling includes cost of central taxes to be shared between GOI & concerned state government in equal ratio.
- State Government shall also contribute funding to the extent of 20%.
- Cost of land to be fully borne by the state government.
- ODA/Multilateral loan is arranged by GOI and on lent to metro rail companies (SPVs) on back to back basis.
- GOI provides ODA Loan amount as Pass Through Assistance (PTA) to the metro rail companies (SPVs) to meet the contractual commitments.

Raising of Funds
- Particularly by City Authorities by the help Institutions to be set by State Government

Percentage Fund Contributions and other norms (contd.)
- Exchange rate variation is shared either equally between GOI & state government or by the state government.
- State Taxes are either reimbursed or exempted by the state government.
- The cost of the metro rail projects sanctioned so far have not included the impact of service tax.
- Service Tax being a central levy, GOI may consider to bear the impact of the service tax on the lines of sharing of other central taxes.

Examples: Chennai, Bangalore, Kochi, Delhi Metro, Nagpur, Lucknow Metro, Mumbai Metro Line 3

BOT - Percentage Fund Contributions and other norms
- GOI contributes not more than 20% of the cost of the project excluding the cost of land and state taxes.
- 20% ceiling includes cost of central taxes to be shared between GOI & concerned state government in equal ratio.
- State Government shall also contribute funding to the extent of 20%.
- Cost of land to be fully borne by the state government.
- Private Party (Concessionaire) to bring balance of the Project Cost.
- Any Additional Viability Gap Funding to be met from State Government Funds.
- Concessionaire is to operate and transfer back the project after 30 years to SPV Government Company.
- Example: Hyderabad metro, Mumbai Metro Line 1
### PPP—Percentage Fund Contributions and other norms

- Cost of the Civil Structures and construction thereof is borne by the SPV and all other systems including Track, Traction Signalling and rolling Stock is procured and implemented by the Concessionaire at his cost.
- Concession is normally for 30 years.
- GoI contributes not more than 20% of the cost of the project excluding the cost of land and state taxes.
- 20% ceiling includes cost of central taxes to be shared between GoI & concerned state government in equal ratio.
- State Government shall also contribute funding to the extent of 20%.
- Cost of land to be fully borne by the state government.
- There may be any subsidy or premium, both will be to the State Government Accounts.
- Concessionaire to operate and transfer back the project after 30 years to SPV Government Company.

**Example: Delhi Airport Line**

### Completely Private Funded

- Entire cost (equity + loan) of the project is brought by the concessionaire and project implemented, operated and handed over back to the SPV/State Authorities after the concession period is over.
- Concession is normally for 30 years.
- In lieu of the above, State Government extends the various concessions to the concessionaire including sweeterer like land for property Development, tax exemptions, etc. etc.
- Land is provided by the State Government free of cost.
- There may be any premium, it will be to the State Government Accounts.
- Concessionaire to operate and transfer back the project to SPV Government Company/City Authorities once the tenure of the project.

**Example: GGN Rapid metro**

### Summing Up

- There is need to strengthen the institutions for Urban Rail including making this sector independent of Railway Ministry.
- There is need to have a Metro Research and Standard Organization for indigenizing the remaining components of Urban Rail and also for Safety certification.
- There is need to have independent Metro Safety certification organization.
- There is need to resort to innovative financing on the ground which is otherwise only on papers.
Private initiative in Urban Rail

Rapid Metro Gurgaon

- Developed as a “last mile connectivity” solution from Delhi Metro's gurgaon line at slanerdar interchange station to ema thru' cyber city
- Phase I - 5.2 km thru’ SPV (RMGL)
  - India’s first fully privately funded metro facility in PPP Format
  - Construction & commissioning in 36 months
  - Operations commenced since 14th Nov'13
- Phase II - 6.6 km thru’ SPV (RMGL)
  - Currently under construction
  - Targeted to be in service by end 2016
- Promoters:
  - IILFS Transport Networks Limited
  - IILFS Rail Limited

Rapid Metro – Key Project Parameters

<table>
<thead>
<tr>
<th>Phase I: In Service</th>
<th>Phase II: Under Construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Route Length</td>
<td>5.1 Km</td>
</tr>
<tr>
<td>Project Cost</td>
<td>1229 Cr</td>
</tr>
<tr>
<td>Concession Agreement</td>
<td>Dec'09</td>
</tr>
<tr>
<td>Financial Closure</td>
<td>Jun'10</td>
</tr>
<tr>
<td>Start of Construction</td>
<td>Nov'12</td>
</tr>
<tr>
<td>Govt Approval</td>
<td>Dec'11</td>
</tr>
<tr>
<td>Commercial Operation</td>
<td>Nov'13</td>
</tr>
</tbody>
</table>

Rapid Metro Phase I

- In Service Since Nov '13

Rapid Metro Phase I + Phase II

Salient Features – Snapshot

- Project
  - Elevated Network
  - Delhi Metro Smart Cards and Tokens applicable
  - Launch: 14th November 2011
  - Fare: Rs. 10-

- Network
  - Interchange station: Hindonagar
  - Length: 5.2 km
  - Number of Stops: 5
  - Average speed: 30 km/hr
  - Train frequency: 6-9 minutes
Learnings in Urban Rails and Way forward

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
- Turnkey supply contract for key Railway systems
- Turnkey maintenance contract for key Railway systems

Rapid Metro – Achievements
- Punctuality: 99.5% since inception
- Reliability measured as Mean Distance between Failures (MDF) > 1.5 Lakh Kms
- Regeneration Efficiency (avg.): 19.7% since inception
- Availability (avg.): 94.64% since inception
- Common ticketing with another metro railway operator (DMRC)
- Elevated Depots for maintenance and stability
- Pioneered innovation with station branding and naming rights in India
- Train wraps for advertising

Rapid Metro – challenges encountered
- Commercial development in the Cyber City area has been <45% directly impacts ridership potential
- Lack of integration with urban mobility plan – No feeder/evacuation service from the mass transit nodes, car parks etc
- Absence of appropriate regulatory policy framework – anomaly of highly capital intensive metro (at commercial rates of interest) & “regulated” framework on fares competing with alternate forms of transport on an unregulated, asset light “aggregator” model.

Metro Rail projects – PPF framework
Viability improvement measures based on Rapid Metro experience
Learnings in Urban Rails and Way forward

Metro Rail Projects – PPP Model

- Connectivity solutions are central to urban mobility – Mass transit solutions like metro rail have significant positive impact on the city and the society at large.
- Development of metro rail projects are hugely capital intensive although viability of such projects is always a challenge.
- Private sector brings in efficiency & leveraging potential in addition to entrepreneurship, innovation technology etc.
- Need for an enabling framework by GoI/State Govt.
  - Government to extend support with an enabling framework supplemented with appropriate grants, concessions, opportunities, land rights, subsidies and risk cover etc.
  - Authority to monetise benefits and channelise back into such projects.

Enabling framework for making PPP a sustainable proposition – alternate measures

- Metros will favourably impact real estate values around their alignment – any strategy to render viability needs to capture such externalities
- On a concept of user/beneficiary to pay
- Adopt a “corridor” approach to monetise such values
- Consider higher FAR for all properties within a prescribed distance from the metro alignment: levy cess on the additional FAR granted
- Enhancement of property tax in the influence zone
- Consider other measures viz. cess on fuel, parking taxes, congestion charges, auction based motor vehicle registration quota system etc.
- All revenues collected into a “dedicated urban transport fund”

“IITIIS

PPP Metro Projects – suggestions for future

- Viability gap funding is a must.
- Enhancing non-fare box revenue is a necessity.
- Alternate measures for augmenting non-fare box revenues:
  - Property development rights packaged into the concession or accorded as per TOD policy
  - Operationalisation of TOD policy
  - Creation of Infrastructure Development Fund (IDF) corpus
  - Incentive mechanism for IDF disbursement to private sector projects
  - Infusion as equity/grants that stay with the project till eventual transfer to Authority
  - While some cross subsidisation is inevitable, IDF benefits need to be administered corridor wise for the metro network to the extent possible
  - Unconditional advertisement rights, without encumbrances or leases by local bodies

PPP Metro projects – suggestions for future

- Integration with urban mobility plan, city bus service, car parking etc. – well beyond the remit of the private enterprise
- Enable access to lower cost of lending/ multi-lateral agencies – State Govt./ Authority may need to facilitate
- Minimise / eliminate taxes, levies & custom duties to reduce loading into initial investment
- Principles of equity – in risk allocation
  - Risk mitigation measures to be built into the concession framework till specified benchmarks are achieved
  - IDF support to bridge the anomalies between back ended revenues due to traffic ramp-up considerations vs. front loaded repayments
  - Appropriate mechanism for renegotiation in line with recommendations of Kiel Committee

Thanks
How Metro Projects can be made Successful under PPP

By,
Ramakrishna Reddy,
MD.
Amaravati Metro Rail Corporation Limited
Vijayawada, AP.

What is PPP???
• Public Private Partnership (PPP)
• It is not Public(GOI)Public(State Govt) Partnership (PPP) ?

Following Metro projects in India are Privatised
1) Delhi Airport Metro Express Line (DAMEL)
2) Rapid Metro Gurgaon Phase I
3) Mumbai Mono Rail
4) Mumbai Metro line-1... This is only PPP project
5) Hyderabad Metro Rail Project

In reality there is no Public (Govt) partnership [shareholding] in projects 1,2,3 & 5. Hence these metro projects are privatised projects by respective State Govts. Mumbai Metro line-1 can be called as PPP project as there is MMRDA share of 30%

Cont.....
➢ In a Public Private Partnership project, there has to be a share holding of Govt, State Govt. and Developer in the SPV
➢ There has to be Directors representing from both Govt’s. in the SPV
➢ Shareholding of Govt/State Govt. can be to any extent which can be decided in the policy

My previous Experience

Shamshabad International Airport Unviable Project was made viable Under PPP

Mainly because of 30% stake holders in the SPV

Concessionaire

GoAP

GoI
Learnings in Urban Rails and Way forward

**Share Holding Pattern in HIAL and HML**

<table>
<thead>
<tr>
<th></th>
<th>HIAL</th>
<th>Single Share Holder</th>
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<tbody>
<tr>
<td>Govt</td>
<td>15% (10 Directors)</td>
<td></td>
</tr>
<tr>
<td>MANIB</td>
<td>11%</td>
<td></td>
</tr>
<tr>
<td>Central Govt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Govt</td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>HML</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Govt</td>
<td>13%</td>
<td></td>
</tr>
<tr>
<td>HML shares</td>
<td>60%</td>
<td></td>
</tr>
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</table>

Share Holding of SPV with both Govt’s is most important for Mega Projects to make it successful under PPP

**Comparison of METRO with Govt. Funding Model & Proposed PPP Model**

- Govt 90% Share 1 Director
- JICA 5% Share 1 Director

Comparison of PPP model with Govt. Funding model:

- Govt 90% Share 1 Director
- JICA 5% Share 1 Director

**Typical Example of Funding Pattern**

<table>
<thead>
<tr>
<th>Sr. No</th>
<th>Organisation</th>
<th>Type of Funding</th>
<th>Amount (Rs/Cr.)</th>
<th>% of Contribution excluding land</th>
<th>Acquisition Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Govt</td>
<td>Equity</td>
<td>878.50</td>
<td>14.50%</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Govt</td>
<td>Equity</td>
<td>878.50</td>
<td>14.50%</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Govt</td>
<td>Equity</td>
<td>878.50</td>
<td>14.50%</td>
<td>878.50</td>
</tr>
<tr>
<td>4</td>
<td>Govt</td>
<td>Equity</td>
<td>878.50</td>
<td>14.50%</td>
<td>878.50</td>
</tr>
<tr>
<td>5</td>
<td>JICA / Bilateral / Multilateral</td>
<td>Loan</td>
<td>798.00</td>
<td>100.00%</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Total Project Completion Cost excluding Land and State Taxes</td>
<td>5815.00</td>
<td>100.00%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Govt</td>
<td>Land Acquisition</td>
<td>5815.00</td>
<td>100.00%</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Total Project Completion Cost including Land Acquisition, E&amp;F not excluding State Taxes</td>
<td>6715.00</td>
<td>100.00%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Govt</td>
<td>State Taxes</td>
<td>5815.00</td>
<td>100.00%</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Govt</td>
<td>State Taxes</td>
<td>385.00</td>
<td>100.00%</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Total Project Completion Cost including land acquisition, E&amp;F and State Taxes</td>
<td>7150.00</td>
<td>100.00%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Project Cost Break Up**

- 42 km Project cost Rs. 13488 crs
- Developers’ investment 50% (5+5)
- Cost Components:
  - Central Govt: Cost Rs. 7444 crs 55%
  - State Govt: Cost Rs. 4283 crs 31.9%
  - General charges: 268 crs 2%
- Excavation Cost Rs. 2435 crs 9.5%
- E&M Components: Cost Rs. 2310 crs 9.9%
- Developer’s share: 20% of GOI share of SPV

**Way Forward**

- No specific policy on implementation of Metro under PPP model is available, except for contributing maximum 20% VGF
- The present policy of MoUD for Govt. funding model is on 50:50 equity, in the jointly owned SPV.
- Same recommendation is available in MoUD Policy for PPP model, but GOI is not implementing such share holding system.
- GOI, State Govt and Concessionaire should be the share holders in the PPP-SPV
- If both Central and State Govt’s contribution is 45-55% of the project cost in the form of interest free loan/sub-ordinate debt, then, the concessionaire can easily contribute the remaining 50% in the form of debt and equity.
- IIF/SIDC can be paid back after main debt is cleared or after 25 years from COD, which waver is later.

Thus, Metro Projects can be made Success under PPP
Innovative Financing Techniques

OVERVIEW

- FINANCING INFRASTRUCTURE
  - Current Challenges
- INNOVATIVE FINANCING TECHNIQUES
  - Classification
- METRO BONDS
  - Market Appetite
- RUPEE DENOMINATED FOREIGN LOAN
  - Rupee Loan
  - Overhead
  - Market Appetite

FINANCING INFRASTRUCTURE
CURRENT CHALLENGES

- Capital Intensive Projects
- High Reliability on the Borrower
- Support from Central & State Government
- Use of Multilateral Financial Institutions
- Inadequate availability of Long-Term debt from Domestic Financial Institutions
- Long Construction Periods
- Securing Adequate and Stable Funding by combining Balance streams through Innovative Financing Techniques in necessary to deliver ambitious integrated infrastructure Strategies

METRO BONDS
Way Banker

- If term loans are taken then the borrower has to adjust to the repayment schedules etc.
- Even term loan lenders often consider raising money through bonds, add a spread and pass it onto the borrower.
- Minimum rate of interest
- The rating of the State Government & Central Government helps in mobilizing funds at reasonable rates.

METRO BONDS
Market Appetite

- BMRCL published the first Metro Bond issue and the media picked up this success story of BMRCL and helped in increasing the investors' appetite for the Bond issue.
- There were 12 investors, and the bond was fully subscribed at 8.79% for a 10-year period.
- The then prevailing bank debt lending rate was above 14% spread. This demonstrates investor’s confidence in the company and Metro Project.

RUPEE DENOMINATED FOREIGN LOAN
Way Rupee

- Metro have to borrow from foreign source as the funds required large with long repayment period
- Borrowing from multilateral and bilateral agencies helps in better country of documents and also provide a sufficient comfort for domestic borrowing as well as bond investors.
- A major risk is foreign exchange fluctuation which can be highly volatile and it can upset all repayment calculation.
Learnings in Urban Rails and Way forward

CASE STUDY
BANGALORE METRO - PHASE 1 & PHASE 2

- Levy of cess and surcharge under Section 15A of the
  para 23
- The rates of cess and surcharge vary from 3% to 15% of the
  market value of land and buildings
- To finance the cost of Metro infrastructure and equipment
  through the sale of
- The funds will be used for the construction of
- The project is expected to create 60,000 jobs

CASE STUDY
PROPOSED OMR METRO ALIGNMENT

- The proposed alignment includes
- The alignment will start from
- Estimated project cost:
- OMR Metro will be the first

PREMIUM FAR

- The land falling within 1 km of the existing
  Metro line will be sold
- Additional FAR will be allowed to
- FAR in the first 100 meters:
- FAR in the next 200 meters:
- FAR in the rest of the plots:

PREMIUM FAR PRICE DETERMINATION

- The Premium FAR will be determined
- FAR in the first 100 meters:
- FAR in the next 200 meters:
- FAR in the rest of the plots:

PREMIUM FAR ESTIMATED YIELD

- The estimated yield from the
  Premium FAR is expected
- Premium FAR will be
- Premium FAR will be

SETTLEMENT LEVY

- The concept of Settlement Levy finds
- Settlement Levy is charged on
- The levy is collected on
- The levy is expected to
- The levy will be used for

Ministry of Urban Development, GoI
Page 48
Learnings in Urban Rails and Way forward

Ministry of Urban Development, GoI

Page 49
Learnings in Urban Rails and Way forward

**ADDITIONAL CESS**

- While the Premium FAR as well as the Development Levy would be confined to the influence zone i.e. the areas in the vicinity of the Mass Transit Corridor, the levy of additional cess has no such restriction.
- The cess would be levied within the entire area of the jurisdiction of the Bangalore Development Authority (BDA) on approval of new Projects/Developments.
- The levy of cess and surcharge is governed by Section 19A of the Karnataka Town and Country Planning Act, 1961.
- The cess is levied as at the time of granting approval for development of land or buildings. The BDA has already notified levy of cess for Metro rail purposes which has been questioned in the High Court.
- Estimated yield as unit rate cess is estimated to be INR 0.50 OR on a conservative model.

**WAY FORWARD**

- Promote Integrated Development of Urban Transit and retain existing values.
- Through adoption of innovative financial techniques, scour, levies through levy of cess i.e. about 45-50% on a Conservative model is the Total Construction Cost (TCC).
- Reduce Transit Investment, Operational and Maintenance Costs through provision of integrated networks and innovative funding techniques.
- In a joint Venture/Collaboration, the Government, Local Planning bodies and Mass Rapid Transit Authorities can contribute significantly to infra creation either through sharing revenues (PPP, Hybrid Contract) or through Transit Oriented Development (TOD).
- Unite unexplored and unused in urban areas in finance highly capital intensive projects and promote transit-oriented development for the economic development, well-being, and viability today and for their sustainable future.

**THANK YOU**
Enhancing Non-Fare Box Revenue

**Background**

- DMRC got the mandate of earning revenue from non-fare box.
- Non-fare and fare box revenue is 12% and 88% respectively.
- As per MoUD’s directives, DMRC buildings being operational structures are exempted from prior approval from building plan.
- It is necessary to seek completion certificate from local bodies.

**Revenue details (in crores)**

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<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Advertisement</td>
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<td>3</td>
<td>Shops</td>
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<td>9.9</td>
<td>19.79</td>
<td>20.08</td>
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<tr>
<td>5</td>
<td>Kiosks (A/M)</td>
<td>3.2</td>
<td>7.6</td>
<td>8.21</td>
<td>8.32</td>
<td>7.81</td>
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<td>6</td>
<td>Misc. (CMC of IT Park &amp; forfeiture of EMD/SD)</td>
<td>14.5</td>
<td>12</td>
<td>21.67</td>
<td>23.8</td>
<td>68.9</td>
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<td></td>
<td>Total</td>
<td>118.7</td>
<td>131.7</td>
<td>143.56</td>
<td>158.86</td>
<td>413.94</td>
</tr>
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</table>

**Share of Earning-FY 2015-2016 in crores.**

<table>
<thead>
<tr>
<th>S/N</th>
<th>Head</th>
<th>Amount</th>
<th>% age</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Advertisement</td>
<td>102.05</td>
<td>47.70</td>
</tr>
<tr>
<td>2</td>
<td>Telecom Business</td>
<td>15.34</td>
<td>6.45</td>
</tr>
<tr>
<td>3</td>
<td>ATM Business</td>
<td>29.57</td>
<td>13.92</td>
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<td>4</td>
<td>Shops</td>
<td>12.81</td>
<td>5.89</td>
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<tr>
<td>5</td>
<td>Kiosks</td>
<td>7.81</td>
<td>3.56</td>
</tr>
<tr>
<td>6</td>
<td>Misc. (CMC of IT Park &amp; forfeiture of EMD/SD)</td>
<td>16.30</td>
<td>7.35</td>
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<tr>
<td></td>
<td>Total</td>
<td>212.44</td>
<td>100.00</td>
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<tr>
<td>7</td>
<td>IT Park</td>
<td>62.09</td>
<td>29.12</td>
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<tr>
<td>8</td>
<td>PD Area (Station Box)</td>
<td>62.71</td>
<td></td>
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<tr>
<td></td>
<td>Total</td>
<td>124.80</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Grand Total</td>
<td>238.74</td>
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</tbody>
</table>

**% Share of Earning 2015-16**

- Shops 12%
- Kiosks 5%
- Telecom Business 16%
- ATM Business 14%
- Advertisement cut from all sectors 48%
Learnings in Urban Rails and Way forward

New Initiatives
- Promoted goodwill: disputed cases monitored, resolved amicably or through conciliation and arbitrations.
- Consolidation of Tenders – Encourage competition
- E-Tendering introduced
- Uniform Tender Conditions
- New Schedule of Tenders – encourage fast decision
- Policy for Licensing on walk in basis after failure of two consecutive bids, reserve prices disclosed.
- Policy for new initiatives/ Start-Ups
- Realistic reserve price
- Providing water electricity etc: DMRC’s responsibility

New Avenues to boost Non Fare Box Revenue
- Semi-Naming Rights and Branding of stations
- Train wrapping
- Licensing of 103 future TOMS.
- Licensing of built-up Shops/Spaces as is where is basis
- Advertisement on Smart cards and tokens
- Licensing for BTS Towers, Telecom Equipment, Fibre-Optics and small cells for telecom connectivity etc.

New Avenues to boost Non Fare Box Revenue
- New initiatives policy resulted in providing
  - Health Monitors,
  - HP products vending Machines,
  - automatic parcel delivery system,
  - Short term promotions etc.

Airport Line
- DMRC took over the operation & maintenance of Airport Express Line from M/s. DAMPEL in July 2013.
- DMRC called Licensees and confirmed to respect and continue all the agreements signed with M/s Reliance.
- Provided they agree to continue and sign modified and new Contracts with DMRC retaining same terms.
- Strategy adopted to increase the ridership, need be even by reducing the Fares.
- Once the ridership picked up from 10,000 (July’ 13) to 36,000 presently, new Contracts for non-fare box revenue awarded.

Revenue Generation from Airport Line

<table>
<thead>
<tr>
<th>Year</th>
<th>Fare Box Revenue</th>
<th>Total Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013-14</td>
<td>24.84</td>
<td>39.74</td>
</tr>
<tr>
<td>2014-15</td>
<td>38.59</td>
<td>48.86</td>
</tr>
<tr>
<td>2015-16</td>
<td>44.86</td>
<td>65.00</td>
</tr>
</tbody>
</table>

* PB Revenue for the period of (Oct’13 to Mar’14) and Fare-Box for revenue for the period of Jul’13 to Mar’14.

Proportion of PB Earning Vs. Fare-Box Earning

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Period</th>
<th>Non Fare Box Revenue</th>
<th>Fare Box Revenue</th>
<th>Total Revenue</th>
<th>PB Share of Total Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2013-14</td>
<td>3.31</td>
<td>24.84</td>
<td>39.74</td>
<td>8.33%</td>
</tr>
<tr>
<td>2</td>
<td>2014-15</td>
<td>10.27</td>
<td>38.59</td>
<td>48.86</td>
<td>21.02%</td>
</tr>
<tr>
<td>3</td>
<td>2015-16</td>
<td>20.94</td>
<td>44.86</td>
<td>65.00</td>
<td>31.82%</td>
</tr>
</tbody>
</table>
Learnings in Urban Rails and Way forward

**Activities carried out in FY 2015-16 (Airport Line)**

- Commercial spaces at Shivaji Stadium (SJSU) has been successfully licensed.
- Office spaces at D-21 Corporate Park licensed out.
- New Delhi Metro Station (NDRU) contract for commercial spaces awarded.
- Due to customer oriented approach, Revenue from revenue sharing contracts (including Advertisement Contract) increased by 287% in FY 2015-16 as compare to FY 2013-14.
Learnings in Urban Rails and Way forward

Impediments

- As per Outdoor Advertisement Policy (OAP) 2008, in case land belongs to other organizations, the structure has been built/installed and it faces the vehicular traffic plying on it, the concerned organization or the advertiser with their permission will have to share revenue 25% of the revenue if the device is installed in non-MCD/NDMC area, an 50% if it is MCD/NDMC territory.
- Left with no alternative as a way forward, DMRC had to agree revenue share of 35% recently with south DMC.
- Others are likely to follow the suite soon.

<table>
<thead>
<tr>
<th>SR.</th>
<th>Advertisement Type</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Outdoor Advertisement on Civil Structures</td>
<td>45%</td>
</tr>
<tr>
<td>2</td>
<td>Inside Stations Advertisement</td>
<td>25%</td>
</tr>
<tr>
<td>3</td>
<td>Inside Train advertisements</td>
<td>25%</td>
</tr>
<tr>
<td>4</td>
<td>Advertisements through innovative/Digital means</td>
<td>2%</td>
</tr>
</tbody>
</table>

Impediments

- On 27th September’ 2006, MOUD defined Metro’s “Operational Structures” as:-
  - All Metro Stations and tracks supporting structures at grade, elevated and underground including entry structures, ancillary buildings to house DG sets, chiller plants and electric sub-station, supply exhaust and tunnel ventilation shafts etc.
  - Depots and maintenance workshops.
  - Traction sub-stations, Operational Control Centers.
**Impediments**

- On 27th September 2007, MOUD clarified interalia:
  - "..... The issue has since been examined in consultation with the MRTS Division of this Ministry and it has been decided with the approval of Competent Authority that construction of structure above the platform over the footprint of the Metro Station is an integral part of the Metro Station building, and is, therefore, to be treated as part of the operational structure of the Metro Station.

- It may be reiterated, Metro Stations have already been included in the list of operational structures as per relevant provisions of MPD 2021.
  - MOUD further decided “NOC for property development shall be issued to DMRC and DMRC in turn will issue NOC to developers appointed. This NOC should be honoured by concerned agencies for e.g.: MCD, DDA, etc. while sanctioning building plans submitted by the developers.”
  - MCD’s do not follow above guidelines, they are not able to issue Completion plan in want of building plan and at times treat DMRC activities illegal.

- On sealing one of the DMRC’s property at Indirapuram, the Hon’ble Lt Governor on 16th June 2010 recorded:-
  - “Commercial establishments within the footprint of the Metro Station complex is to be considered integral part of the Metro station only and there would be no requirement for any building approval from the MCD.
  - Further, it was also clarified that the commercial establishments within the footprint of the Metro Station would be liable to the property tax and secure trade license from the MCD as per MCD regulations.

**Way forward Airport line........

- As the fares have bottomed up, we are exploring the other possibilities to increase Non Fare box revenue.
  - DIAL. AI, Jet are persuaded to start check in at New Delhi and Shiva G stadium, to increase the foot falls.
  - Tender for carrying white goods through empty luggage carrier floated.
  - New spaces are being explored for commercial / Offices at Shriji Stadium, New Delhi Metro Station.
  - Tender for commercial spaces at D-31 Corporate Park
  - ATM sites at feasible locations of existing stations.
  - Identification of possibilities for e-lobby/Digital Banks/Money Shoppe.

- Health Trade license application include
  - Proof of legal occupation
  - Proof of sewer connection
  - Buildings sanction plan along with completion certificate
  - Prof of mixed land use
  - Fire clearance
  - DMRC pays the property tax and trade license issue is settled by the licensees.
  - Issue of Completion certificate needs to be settled early.
  - Issue of Revenue sharing with MCD’s also needs to be settled as 35% of top line is too high.
  - This is rendering most paying advertisements unattractive

**Way forward........

- Full Inventory being taken
  - New areas are being explored
  - Outdoor advertisements scope to be expanded to event management and short time activities
  - Digital media advertisement to be encouraged at stations and TOMs
  - Licensing of vacant Token counters
  - Advertisement on tokens
  - Identification of possibilities for e-lobby/Digital Banks/Money Shoppe
  - Requesting MOUD for early settlement of disputed issues.

---

Thank You
for
Giving me an opportunity
for sharing my views
International Experiences with Urban Rail Funding, Institutional Frameworks & PPP – Progress update and selected lessons

Summary and objectives

Influenced by MANY external factors...

1. Internationally, what factors make an Operator successful?
2. What can Governments do to help Operators succeed & perform?
3. What can Operators do to help Governments make good decisions?

Progress Update

Case Study Metros so Far

Agenda

1. Summary and objectives – why this initiative?
2. Progress update
3. Sharing selected lessons
4. Questions and discussions

Why?

- Success of a metro is not in infrastructure alone. Much more depends on the organization that operates it.
- Operators perform miracles every morning and again every evening.
- Their good deeds mostly go unnoticed BUT their imperfections are often widely publicized.
- It is time to tell their story.
1.) Metro is a capital investment that never stops...

2.) Your metro will change land use. Plan on changing your metro when it does. Better yet – plan to make changing land use beneficial to your metro and its customers.

Example: <City Name?>
Learnings in Urban Rails and Way forward

The triple win of TOD

Financial sustainability
- Captive traffic
- Increased revenue
- Divisibility

Social policy
- Higher to housing density
- Reduce urban sprawl
- Increase ease of access to employment

Environmental sustainability
- Fresh air
- Transits public transport
- Reduce traffic

How does Operator & Govt. make it work?

- Network
- Transit sense
- Community engagement
- Healthcare
- Public services
- Green space

Gobbling up cash to feed the railway

It’s never too late to integrate

What our case study metros have said

Challenges to implementing TOD

- “The first problem we have here is we cannot accept the transport
- “We have the metro, we are opening the city.”
- “We have the authority on urban planning, the roadmap...”

Thinking commercially about TOD

- “The bigger the plan, the more potential for commercial opportunities
- “How we design places and spaces...”
- “In every city, institutional assets won’t be sustainable to the entire city, is showing us...”

3) Think of the politics and manage upwards (within the rules)

Example – anonymous metro

During a mayoral campaign, transport was a key election issue.

The Operator publicly posted a list of 8 actions that could be taking to improve services in short / medium term.

All but 1 candidate adopted the Operator’s list as their electoral platform. The Operator is now implementing the improvements with political support.

Make good projects politically hard to kill

Local contributions present strong case for central govt. funding

Incomes from projects difficult to parcel (HM would have issue GBP 16 billion in investment but one per GB 4.3 billion)
Learnings in Urban Rails and Way forward

Critical to engage with elected leaders

What our case study metros have said

<table>
<thead>
<tr>
<th>Casework</th>
<th>Challenges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrastructure is expensive and requires political will and support.</td>
<td>The cost to develop metro systems is enormous, but the benefits are immense.</td>
</tr>
<tr>
<td>The public is demanding more and more from the metro system.</td>
<td>The politician’s demand for a metro system is driven by the general demand from the public.</td>
</tr>
<tr>
<td>The metro system needs to work closely with the government.</td>
<td>The government needs to provide financial and political support.</td>
</tr>
</tbody>
</table>

BUT metros that manage up good to get what they want

- The Danish system is very efficient and is well integrated with the city's public transport system.
- The Japanese system is highly efficient and provides excellent service.
- The Indian system is also very efficient and provides excellent service.

4) You get nothing more than the metro you pay for... but you can also get less

Heavy metros & not so heavy metros

Estimated ridership per hour per direction (RPPH)

<table>
<thead>
<tr>
<th>Metro</th>
<th>Ridership</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy</td>
<td>80,000</td>
</tr>
<tr>
<td>Not heavy</td>
<td>60,000</td>
</tr>
</tbody>
</table>

5) Getting the service right takes the right people + the right environment to enable them.

Automation for organizational transformation?

Barcelona’s new operating model

- Increased job satisfaction
- Autonomy
- Empowerment
- Efficiency
- Improved service
- Increased operational efficiency
- Flexibility
-效率

Source: With permission from Transports Metropolitans de Barcelona
Learnings in Urban Rails and Way forward

**Beyond technology**

- Strategy
- Functional Context
- Organization
- Project Management
- Safety

**London’s asset management organization**

- Asset management internal consultancy / centre of excellence
- Asset strategies
- Project sponsors

- Strategic, Technical advice
- Infrastructure, rolling stock
- Optimising, managing risks
- Work with public and stakeholders
- Planning, implementation and evaluation

**What our case study metros have said**

- "Every day is battle, who understands a lot more than a year’s project study"
- "We need longer horizon, need more strategic thinking before the design process"  
- "We do not overemphasize opening of a project, need to plan after a proper pre-construction"  
- "We need lots of infrastructure getting the right mix of competent people in"  
- "The technical aspect of the project requires practice within 2 years after the launch"

5.) Funding and finance modality may be the most powerful influence on an operator

**Simple and brutal economics of metro**

- New metro lines cost more money than can be recouped from fares.
- ...but operational expenditure (including renewal) can be self-sustaining if fares are sufficient and there is a good level of non-fare revenue.
- Sustainable fares policy is crucial as is the approach to managing subsidies

**Ways this is managed**

- Upfront subsidy in cash
- Ongoing subsidy of debt obligations
- Upfront non-cash subsidy
- Different companies / balance sheets for Opex & Capex

**London’s infamous “bat diagram”**

- A warning from history!

15 year funding agreement struck in 2007 (recently breached)
- Rough estimates 10% - 30% cost savings due to stability of funding
- "When you look back at our success, a large part of it is down to stability of funding"
Learnings in Urban Rails and Way forward

Thank you!

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Transport & ICT
The World Bank
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Washington, DC 20433, USA
T: +1 202 473 4610
dominic@worldbank.org

Questions

• How can we ensure that the planning stage is well coordinated with the implementation stage?

• How can we ensure that the public transport system is multi-modal?

• What are the challenges in establishing sustainable fare policies?

• How can we ensure that the fare adjustment mechanism is effective?

• What are the main recommendations for new metro projects?

6) Effectiveness is more important than efficiency, but you need both

What our case study metro stations have said

- “The fare is a public good, it is not a service charge. It is not a cost recovery mechanism.”

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- “The fare is a public good, it is not a service charge. It is not a cost recovery mechanism.”
Standardisation & Indigenisation

<table>
<thead>
<tr>
<th>Standardisation &amp; Indigenisation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Standardisation:</strong></td>
</tr>
<tr>
<td>1. MoUD had set up separate Committees in May ‘12 for achieving Standardisation:</td>
</tr>
<tr>
<td>a) Fare Collection System</td>
</tr>
<tr>
<td>b) Metro Railway Operations &amp; Maintenance</td>
</tr>
<tr>
<td>c) Rolling Stock</td>
</tr>
<tr>
<td>d) Signalling systems</td>
</tr>
<tr>
<td>e) Traction and Power Supply System</td>
</tr>
<tr>
<td>f) Track Structures</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Standardisation &amp; Indigenisation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Strategy for increased Indigenisation:</strong></td>
</tr>
<tr>
<td>1. DMRC as a policy encourages <strong>Quality Indigenisation</strong> in procurement of all major value systems.</td>
</tr>
<tr>
<td>2. Suitable mandatory clauses are incorporated in the tender specifications for achieving progressively increased manufacturing of cars and sub-systems in India</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Standardisation &amp; Indigenisation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Indigenisation - Manufacturing of RS:</strong></td>
</tr>
<tr>
<td>1. Notable achievements in manufacturing of modern state of the art Metro RS:</td>
</tr>
<tr>
<td>a) Phase-I: 220 cars out of 280 cars (RS1 type-BG) manufactured in BEML, Bangalore</td>
</tr>
<tr>
<td>b) Phase-II: 165 Bombardier set up green field plant at Savi, near Vadodara in Gujarat, 570 cars out of 14 cars (RS2 type-BG) have been manufactured indigenously</td>
</tr>
<tr>
<td>c) Phase-I: 192 cars out of 196 cars (RS3 type-SG) have been manufactured in BEML</td>
</tr>
<tr>
<td>d) Phase-I: 98 cars (RS1 type-BG) manufactured in BEML</td>
</tr>
<tr>
<td>e) Phase-I: 136 cars (RS1 type-BG) manufactured in BEML</td>
</tr>
<tr>
<td>Phase-I: 220 cars out of 280 cars Manufactured in India</td>
</tr>
<tr>
<td>Phase-II: 914 cars out of 956 cars Manufactured in India</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Standardisation &amp; Indigenisation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Indigenisation - Manufacturing of RS:</strong></td>
</tr>
<tr>
<td>Procurement of Phase-III RS:</td>
</tr>
<tr>
<td>a) 162 cars (RS2 type-BG) manufactured by BT at Savli</td>
</tr>
<tr>
<td>b) 162 cars (RS3 type-SG) manufactured at BEML</td>
</tr>
<tr>
<td>c) 366 cars out of 480 cars (RS10 type-SG) contracted for manufacture in BEML</td>
</tr>
<tr>
<td>d) 96 cars (RS1 type-BG) contracted for manufacture in BEML</td>
</tr>
<tr>
<td>Phase-III: 785 cars out of 906 cars Manufactured in India</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Standardisation &amp; Indigenisation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Indigenisation - Manufacturing of RS:</strong></td>
</tr>
<tr>
<td>1920 Cars out of 2140 Cars</td>
</tr>
<tr>
<td>For DMRC Phase-I, II &amp; III projects Manufactured in India in the facilities created at:</td>
</tr>
<tr>
<td>BEML (brown field) – 1190 Cars</td>
</tr>
<tr>
<td>BT (green field at Savli) – 740 Cars</td>
</tr>
<tr>
<td>BT exporting 400 Cars for Queensland from Savli Alstom exporting 132 Cars for Sydney from SriCity</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Standardisation &amp; Indigenisation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Indigenisation - Content in value terms:</strong></td>
</tr>
<tr>
<td>In the recently placed orders on BEML and BT the indigenisation content in value terms is estimated as:</td>
</tr>
<tr>
<td>1. Contract RS1’ (BT - 162 Cars) : &gt;80%</td>
</tr>
<tr>
<td>2. Contract RS13’ (BEML - 96 Cars) : &gt;80%</td>
</tr>
<tr>
<td>TARGET with progressively increased indigenisation : 90%</td>
</tr>
</tbody>
</table>
Strategy for Cost Effective Design, Construction Operation & Maintenance

In NMRCL cost control, cost cutting, cost effectiveness and optimization have been adopted as a philosophy with each team member committed and contributing to it so that the project is completed within the stipulated time & cost and with highest standards of quality and safety.

COST EFFECTIVENESS IN DESIGN

VIADUCT

- Via duct segment width reduced to 8.5m as compared to conventional 10.2m due to:
  - adoption of tees and cruciforms
  - elimination of side-walkways
  - elimination of RCC cable trunks
  - elimination of pre-cast parapets
  - adoption of 60 t for 120 t

Reduction in weight by 60 t per span (15%).

Optimization of the viaduct design parameters

Reduction in time and cost of completion of Viaduct

Estimated savings: Rs. 90 Cr

VIADUCT

- Parapet Casting along with segments
  - Casting of 70 cm Parapet integrated with Segment
  - doesn’t need separate casting, transportation, launching and stitch concrete

Saves Time & Cost

Estimated savings: Rs. 30 Cr

COST EFFECTIVENESS IN DESIGN

Land - Right of Way

- Reduction in "Right of way" from 20m to 15m due to:
  - Reduction in width of segment from 10.2m to 8.5m.

Estimated savings: 10% area & cost of land Acquisition
**Learnings in Urban Rails and Way forward**

**COST EFFECTIVENESS IN DESIGN
STATIONS**

- **Station Platform length:** Reduced to 75m from 140m as:
  - Train composition of NMRCL consists of 3 coaches (length 66m)
- Stations have been designed for extension of Platform in future, if the need arises.

Estimated savings: Rs. 100 Cr (₹ Rs. 1 cr = ₹ 100)

**COST EFFECTIVENESS IN DESIGN
DEPOTS**

- Maintenance shed in depots: Size reduced to half compared to DPR due to:
  - Ecost composition of NMRCL Trains.
- **Stabling Lines:** Reduced to one third due to:
  - Trains are to be maintained in depot once in three days.
  - Only trains requiring maintenance (one third) to be stabled at Depot and remaining trains (two third) to be stabled at Terminal Stations.
  - No roof covering for stabling lines.
- Overall track length of depots reduced to 8km from 10 km.
- Reduction in length of inspection bay lines to 80m from 160m.
- Reduction in length of repair bay lines to 80m from 160m.
- Elimination of measurement of jigs & fixtures for repairs of electronics equipment included in AMC of OEM.

Estimated savings: Rs. 10 Cr

**COST EFFECTIVENESS IN DESIGN
Signalling & Telecom**

- Separate tenders for signalling & telecom for more competitive leaks.
- Elimination of sub master clocks and servers thereof at stations.
- Virtualization of telecom subsystem servers in OCC leading to hardware optimization.
- Elimination of 48Vdc DC supply in the Telecom system design.
- Signalling rooms eliminated from stations not having interlocking

Estimated savings: Rs 25 cr

**COST EFFECTIVENESS IN DESIGN
E & M**

- Only LED Lighting on universal basis over entire metro system.
- Regenerative VVVF Drive for 1k and Elecrolators also saving 20% energy.

Estimated savings: Rs 4 Cr/year

**COST EFFECTIVENESS IN DESIGN
TRACTION**

- **Reduction in number of Receiving Sub- Stations from four to two**
  - by feeding traction power at Interchange Station to both the corridors
  - Reduction in transformer ratings
  - Optimization of cable sizes
  - Elimination of neutral sections

Estimated savings: Rs. 100 Cr

**COST EFFECTIVENESS IN DESIGN
Rolling Stock**

- Pioneered the complete liberalization of eligibility criteria of bidders to achieve widest possible participation from across the world

Will lead to competitive bidding
Learnings in Urban Rails and Way forward

General Consultant for NMRCL
- 25% of work content of GC made milestone based for the first time & providing the flexibility of main-power thereof operating from outside Nager
- Man-Months of GC reduced by 40% to 136 Man-Months per KM

GC cost reduced by 40% ~Rs. 100cr

COST EFFECTIVENESS IN CONSTRUCTION

Construction of Stations independent of Viaduct Construction
- Launching of Viaduct Girder continuously through the Station area

Saving in Time & Cost
- Delay in Construction of Stations will not affect commissioning of Metro corridor
- Will Save cost over future due to delays

COST EFFECTIVENESS IN CONSTRUCTION

5D-BIM
- 5D-BIM (5 Dimensional Building Information Modelling)
- NMRCL has adopted most advanced Digital Project Management tool '5D-BIM' which will help in checking the quantity of materials, claims by contractors and escalation due to change orders.

Most of the iconic projects in progress worldwide are adopting '5D-BIM' for Project Management

A very tight control over Cost, Time, Quality & Safety

COST EFFECTIVENESS IN CONSTRUCTION

AFC
- Single banking entity to handle entire cash management process of NMRCL incl. AFC
- Proposed to be financed on a revenue sharing model
- Open loop common mobility card proposed for all modes of transport in Nager

Estimated savings: DPR provision of AFC at the cost of ~Rs. 266cr

Approximate savings expected: 20% (Rs. 56cr)

Use of Pre-Engineered Building (PEB), Space Frame Trusses, Precast RCC/PSC Structure Members
- Wherever possible it shall be used at Stations, Depot and Viaduct

Ensure lower Cost, High Quality and faster Construction
Learnings in Urban Rails and Way Forward

Light Weight Tubular OHE Portals
- To improve aesthetics
- To be used for fixing CCTV surveillance and lights for Track, OHE, Signalling, Maintenance
- Will also detect presence of unwanted persons on Viaduct with alarm

Reduction in Cement content of RCC & PSC Structure
- Conventional system: More Cement for stronger Concrete.
- Recent studies show: More cement produces more heat of hydration leading to surface cracks reducing durability of Structure.
- Addition of fly ash & Silica fume reduces Cement content without impacting Concrete Strength.
- Increased durability and better finishes.

COST EFFECTIVENESS IN O & M

Cost Effectiveness in O&M
- Manpower: Anticipate reduction of manpower requirement to 20 men/month compared to current average of 25 men/month.
- OHE: Night vision cameras for direct maintenance.
- Avoid heavy rain and hot weather forcutting
- Avoid movement of dummy train in the morning
- Use of Predictive Maintenance in place of Time based maintenance.
- BMC of Electronic equipment for 10 years after DLP for Rolling Stock.
- Outsourcing of simulator avoiding procurement of simulator.

Estimated savings: Rs.25 cr/year

COST EFFECTIVENESS IN O&M

Feeder Service
- To connect Metro commuters to all other modes of transport through a common multi-modal platform
- A common city mobility plan with route rationalization is planned for providing faster and last mile connectivity

Will enhance ridership & revenue

COST EFFECTIVENESS IN O&M

Transit Oriented Development (TOD)
- In addition to fare box revenues, NMRCL projects is unique in terms of financial viability due to additional revenues from:
  - Transit-Oriented Development: GOM notification issued
  - Increase in stamp duty by 1% notification under issue
  - Half of TOD premium & 1% increase in stamp duty to accrue to NMRCL as non-fare box revenue

Accrual of revenue to NMRCL: Rs.200 crs per year

Property Development Initiatives under TOD
- Right From Inception

International Architects M/s. from France (construction) & engaging a Property Development Expert) appointed as Main Architect for ultra-change Station at Vikhroli and IOCX Station at Gore-Mira
- Selected through International Architectural design Competition wherein 23 International/National Architects participated
- Construction cost of station portion to be borne by NMRCL and rest of the development to be on PPP basis for developer selected by bidding

<table>
<thead>
<tr>
<th>NMRCL/IRC</th>
<th>50% ACRE</th>
<th>25% ACRE</th>
<th>25% ACRE</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.050 sq.m</td>
<td>0.219 sq.m</td>
<td>0.219 sq.m</td>
<td>0.219 sq.m</td>
</tr>
<tr>
<td>2.500 sq.m</td>
<td>0.548 sq.m</td>
<td>0.548 sq.m</td>
<td>0.548 sq.m</td>
</tr>
<tr>
<td>4.000 sq.m</td>
<td>0.867 sq.m</td>
<td>0.867 sq.m</td>
<td>0.867 sq.m</td>
</tr>
</tbody>
</table>

Average anticipated sales per year from FY17-18 would be: 150,000 Sq.m
Learnings in Urban Rails and Way forward

Ministry of Urban Development, GoI

Page 71
Best Practices Followed

PLANNING – UNIQUE FEATURES
- About 60% of the corridors in Phase-I are UG and the remaining Elevated. This is the highest UG tunnelling for any start up Metro.
- Multi Modal Integration Strategy has been built in to the Project Design stage itself.
- Covers the major arterial roads and connects important transport hubs such as Airport, Chennai Central station, Egmore station, Chennai Mofussil Bus Terminus (CMBT), etc.
- Airport link is given as part of the Phase-I Project itself.

GENERAL CONSULTANCY SERVICES
- “Frent loading” of foreign experts by GC – Needs to be cautioned.
- Hidden costs (Travel, accommodation, communication costs, office supplies etc) to be closely monitored.
- Review of CV’s and interview proposed GC candidates prior to deployment to ensure value for money.
- Developing in-house competencies to avoid full dependency on the external Consultants.
- Way Forward:
  - To hire Independent Consultants directly only where in-house competencies are not available.

CIVIL – ELEVATED CONSTRUCTION

BALANCING GIRDERS
- Cast-in-situ Concrete segment casting.
- This was necessitated due to busy road fly-over.
- It is unavoidable to divert busy traffic.
- Main Span = 75 m;
- Adjacent Spans = 53m+46m

BALANCED CANTILEVER
ELEVATED CONSTRUCTION – GUINDY ROB

- Viaduct is crossing over Railway tracks (skew) at an angle of 79°.
- Total length of 105m, Span – 35m, 70m.
- It is a open web girder composite girder. Total weight -770 Tons (540+230).

CIVIL - UG

- Specially designed hntal beam for supporting the tunnel rings during excavation for cross passage.
  - Replaces heavily designed steel C-beam used earlier
  - Easy to install
disable – saving time
  - Minimization of resources
- Concreting of permanent lining in single pour by using specially designed single piece one-of-a-kind framework and self compacting concrete.
  - Savings in time
  - Improved resource
  - Mobilization planning
  - Good quality finish

ENVIRONMENT

- Compensatory planting works in the ratio of 1:12. For 2,400 trees felled and planted 81,400 saplings in and around Chennai city.
- Compensatory planting double the norms fixed.
- Toyota Miyawaki method of afforestation being attempted for first time.

BUSINESS DEVELOPMENT

- Cash Deposit Machines:
  - First of its kind in Metro of INDIA
  - Revenue generator, Bankers paying CMRL for the space leased, to put up the CDMs, also CMRL can deposit the collections immediately, as against the prevailing T+1 day system.
  - Savings in service payments to bank for station cash collections.
  - Safe and secure.

ROLLING STOCK
**Learnings in Urban Rails and Way forward**

**Signaling**
- Single source of power supply for signal, telecom, PSD and AFC derived from main UPS
- Signal room dispensing with Non-interlocked stations duly shifting cabinets to Telecom room—saving in AC capital and running cost plus releasing space for PU
- Hot stand-by feature of On-Board ATP
- Seamless changeover from main to standby system without stopping the train.
- Introduction of stud weld avoiding hole in the web of the rail for S-Bond connection—ease of maintenance and replacement. Avoid weakening of rail strength.

**Telecom**
- Fence intrusion detection system in Depot Perimeter: by detecting the vibrations on barbed wire fence.
- Passenger Information display and PA announcements for single line operation of trains
- Integrated Operator Works Station for Telecom Systems of PAVA, PIDS, CCTV & ACID, instead of individual works stations, saving on Equipment Cost and Room Space.

**Platform Screen Doors**
- Reduction in Air Conditioning load by reducing loss of cool air into tunnels
- Protecting passengers from track side piston effect
- Reduction in platform width thereby reducing station box size

**Automatic Fare Collection**
- First metro in India to start operations with 30 full complement Ticket Vending Machines (TVM’s)
- 95% ticket sales through TVM’s- a trend started by CMRL
- First TVM’s in India to dispense “Bank notes as Change” as of today.
- Token containers used to vend and collect tokens are interchangeable among the equipment’s resulting in ease of operations.

**Tunnel Ventilation System**
- Smoke free evacuation route in the event of train on fire due to PSD
- SIL 3 SCADA control system for TVS system developed from scratch
- Train Motion Sensors: Used to operate Tunnel Exhaust Fans only when required (no continuous operations)
- Minimizing bends in duct thereby reduced energy consumption
- Way Forward:
  - Phase 1 Ext & Phase 2: Around 30% space saving by changing orientation of fan alignment
  - Multi-Duty Fans to minimize the numbers of fans

**VAC(ECS)**
- Chiller System: Peak load 400 TR (Without PSD 1000 TR) 30% energy savings
- VFDs: water cooled chillers: Ensures energy saving during part load
- Variable Speed Fans: VRF AC units: Twin compressors with inverters has increased Coefficient of performance & efficiency at part load conditions
- Primary chilled water system with VFD: Secondary chilled water system was eliminated, savings in space/energy. Primary pumps with VFD to cater varying loads
- Air curtains: Located at entrance of the concourse level to minimize leakage of conditioned air from concourse level to minimise thereby energy saving
- Way Forward:
  - Space optimization in Phase 1 ext for Chiller plant & Fans rooms
  - ARU/Fans at concourse level to feed concourse & Platform by eliminating ARU/Fans room in platform level
**Learnings in Urban Rails and Way Forward**

**Lifts & Escalators**
- Frequent tripping of Lifts and Escalators was fixed due to problem in input power quality. The distorted power led to Lifts and Escalators being identified due to Harmonics and delays were introduced in the sensing devices.
- For the first time, users of escalators, signages have been especially placed to enhance the eye-catching potential.
- Way Forward:
- EDSO standard specifications can be adopted to indigenize escalator equipment & components.

**Power Supply & OHE**
- Adoption of GIS, reduces the space requirement.
- Aluminium OHE fittings is adopted. Lighter design.
- BTMC was eliminated, cost saving in investment as well as maintenance.

**MEP**
- LED Lighting and VRF air-conditioning and Hydraulic system was provided in Stations for Electrical Energy savings around 50%.
- Room flooding system is avoided in Low voltage and Medium voltage Power rooms. Panel flooding system has been provided there by saving of Rs. 20 Lakh per station.
- EMS system is disposed in Elevated stations thereby saving 1 Crore per station.
- Normal Detector provided inline of VESDA (Very Early Smoke Detection Apparatus) thereby savings of Rs. 30 Lakh per station.
- O&M MEP services are power outsourced.
- Planned Solar panel as a roof for upcoming elevated stations.

**Operations – 10KM(7 STN)**
- Customer care operations at stations is outsourced.
- Staff made redundant have been re-trained and redeployed as Stations Controllers & Train Operations.
- Dwelling time reduced at Stations to save AC energy.
- Twin Single Line working:
  - Owing to contractual issues the Terminal Station could not be commissioned in time for Revenue Operations.
  - Main Lines of CII & MM are provisioned for Bi-directional working.
  - Using the above feature, single line working has been introduced on both lines, for a distance of 5 Kms.
- Transformation of customer access to Ticketing Services.
- Closing down Ticket Offices & take thru TVMs.
- Personalized services now TVMs by redeploying staff from Ticket Offices.
- Enhanced services to passengers as these staff also function as facilitation agents.

**Human Resources**
- Introduced PG Diploma in Metro Rail Technology Course at IIT, Madras.
- Conducted Online test All Over Tamil Nadu even for ITI and Diploma holders to ensure timely recruitment of O&M staff.
- Introduced E-Office in CII, Paperless Office, easy tracking and effective monitoring of files & Digital storage.
- Conducted learning classes / screening of Tamil movies for non Tamil speaking officials / staff.
- Conducted Food & games carnivals at Metro Stations to increase ridership and publicity.

**Cost Control in salary & wages of Jr. Engineers and Technicians by reducing pay scales**

<table>
<thead>
<tr>
<th>Details</th>
<th>Diploma Holders</th>
<th>Technician Graduates</th>
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<tbody>
<tr>
<td>Designation</td>
<td>Jr.</td>
<td>Technical Graduates</td>
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<tr>
<td>Pay Scale</td>
<td>Rs. 30,000</td>
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<tr>
<td>Base Pay</td>
<td>Rs. 25,000</td>
<td>Rs. 25,000</td>
</tr>
<tr>
<td>DA (% of basic)</td>
<td>7.4%</td>
<td>7.4%</td>
</tr>
<tr>
<td>HRA (% of basic)</td>
<td>6.6%</td>
<td>6.6%</td>
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<tr>
<td>Seniority Allowance</td>
<td>Rs. 1,250</td>
<td>Rs. 1,250</td>
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<tr>
<td>Gross Pay</td>
<td>Rs. 3,90,000</td>
<td>Rs. 3,90,000</td>
</tr>
</tbody>
</table>

Ministry of Urban Development, GoI
**Phase I - Extension**

- Reduction in station box size of UG STN from 250m to 140m
- Leading to reduction in construction & operation cost
- Optimized systems room size/location without compromising on redundancy
- Platform Screen doors to reduce platform width and AC load
- Cantilever stations in elevated stretch leading to reduction in land acquisition
- Land acquisition reduced by around 30 to 50%
- Station over central pier system with only landing areas in ground level
PPP Initiative

Current Status

- Viaduct civil works
  - Foundations: 57 km
  - Piers: 53 km
  - Span fraction: 46 km
- 35 km track completed
- 15 km UTR commissioned
- 12 stations completed and work in progress: 40 stations
- 2 Depot commissioned
- Stage 1 MR approval received (8.6 km)
- Stage 2 CMS inspection in June '16 (12.6 km)
- 2 RoW completed out of 8

Key Challenges

- Enabling Works
  - Alignment Fixing
  - Land/ReW
  - Utility Diversion
- Construction Challenges
  - Urban Environment
  - Traffic Management
  - Logistics/Construction Safety
  - Concurrent Ergg
  - Skilled Manpower

Technical Challenges

- Technology Selection – Modern vs Proven
- Systems’ Integration

Financial Challenges

- Delay in Revenue Operations
  - Continuous RoW – Time Overrun
  - Increased IDC
- Volatile Financial Market
- High Capex and Opex
- Revenue uncertainty
- Visibility Gap

Concessionaire Scope

- Faster Financial closure
- Innovative Project Management
  - Electronic Document Control System
  - IT tools: Primavera, Tillos
  - War Room
- Rapid Organizational setup
- Faster Execution – precast structures
- Modern Technologies
  - CBTC Signalling
  - 1:40 Rail Indication

Government Scope

- Continued Support
- Complete land handover
- Substantial Right of Way
- Multi-modal Integration
- Active Role in Utility diversion
- Focus on Metro Project at highest level

Ministry of Urban Development, GoI
Learnings in Urban Rails and Way forward

- O&M structure – Operator model
  - Outsourced model
  - IT based Maintenance Management Tools
- Statutory Approvals on time – early engagement
- Sustainability Initiatives
  - Zero discharge
  - Solar Energy

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Learnings & Take-aways

- Technical Specifications & Standards
  - Modern technology
  - Redundancy
  - Life cycle cost (LCC)
- Statutory Approval
  - Simplification of Process - online
  - Timelines
- O&M
  - Resource & spares sharing
  - Indigenous vendor development
  - Energy cost optimization – solar
  - Benchmarking group - Indian metros

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Summary

- Hyderabad Metro
  - an example of innovative project management
  - L&T Group & GoT3 committed for the Project
  - Revenue operations to start soon
- PPP Initiatives for future Projects
  - Tweaking the Model CA with existing experience
  - Equitable risk allocation
  - Renegotiation in case of major events
Thank You
Unbundling for PPP

**The Background**

- Approved DPR envisaged conventional AFC system for KMRL.
- Estimated cost was INR 74.92 crores.

**The solution**

- KMRL appointed consultant for “Common Smartcard Ticketing Solution” (CSTTS) for Kochi region.
- A number of brainstorming sessions were held with the consultant for enhancing the ticketing system.
- An idea was generated for integrated ticketing system for Kochi region as part of preparation for UMTA.
- Financial institutions found to be better equipped to adopt fare collection system objectives.

**Case study**

1. İstanbul, Turkey
2. Izmir, Turkey
Learnings in Urban Rails and Way forward

PPP Structure
- KMRL with 3 member consortium
  - Lead Member – AXIS BANK LTD
  - Member – ASIS Technologies Ltd
  - Member – AGS India Technologies

Salient features
- CAPEX to be borne by the Consortium
- Royalty over a period of 10 years
- Maintenance and Software support for 10 years
- Revenue from both fare box and non-fare box transactions
- Web / Mobile / IVRS based customer interface and support
- Central Clearing House System is replaced by Bankhost
- Expected overall financial gain for KMRL over 10 years is 236 Crores

Fare Media
- QR Code (Mobile based / Print based)
  - Target: Mainly for occasional user
- PTM (RFID Paper Tickets)
  - Target: For Tourists, trippers, etc.
- EMV Cards (Prepaid)
  - Target: Regular users
- NFC (Mobile / Sticker Based)
  - Target: Regular users

Projects under implementation
- BMTC smart card
- Ahmedabad Bus
- Electronic Toll Plaza

The Way Forward
- MOUD and NPCI have prepared open source NCMC specification
- The business rule reside in the card itself, not at the backend
- The card can be used in any transit system which uses NCMC standards

NCMC Concept
- Acquirer / Operator specific non payment programs
  - EMV C0 Specifications
  - 60 / 80 Specifications

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Annex 4

Current Status of Urban Rail Projects across the Country

<table>
<thead>
<tr>
<th>S. No.</th>
<th>City</th>
<th>Length (km)</th>
<th>Operational</th>
<th>Under construction</th>
<th>Under consideration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Delhi</td>
<td>212</td>
<td>115</td>
<td></td>
<td>104</td>
</tr>
<tr>
<td>2</td>
<td>Bengaluru</td>
<td>32</td>
<td>82</td>
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<td></td>
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<td>3</td>
<td>Kolkata</td>
<td>27.39</td>
<td></td>
<td></td>
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<tr>
<td>4</td>
<td>Mumbai Metro</td>
<td>11.4 (Line 1)</td>
<td>33.5 (Line 3)</td>
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</tr>
<tr>
<td>5</td>
<td>Mumbai Monorail</td>
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<td>11</td>
<td></td>
<td></td>
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<td>6</td>
<td>Chennai</td>
<td>10.15</td>
<td></td>
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<td>7</td>
<td>Jaipur</td>
<td>9</td>
<td>2.5</td>
<td></td>
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<tr>
<td>8</td>
<td>Gurgaon</td>
<td>5.1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Under construction**

9  Hyderabad   71  
10  Chennai     44  
11  Nagpur      38  
12  Ahmedabad   36  
13  Kochi       26  
14  Lucknow     23  
15  Chennai Mono 11  

**Under Consideration (Metro Rail)**

16  Guwahati  61  
17  Delhi NCR  55.3  
18  Visakhapatnam  42.55  
19  Chandigarh  37.56  
20  Kanpur      32.38  
21  Indore      31.55  
22  Pune        31.5  
23  Patna       27.88  
24  Bhopal      27.81  
25  Vijayawada  26.03  
26  Thiruvanathapuram  21.82  
27  Kozhikode  13.3  
28  Kochi Extn.  11.2  

**Under Consideration (RRTS Phase 1)**

1  Delhi-Gurgaon-Alwar  180  
2  Delhi-Sonipat-Panipat  111  
3  Delhi-Ghaziabad-Meerut  90  