

# Mumbai Urban Transport Project— Development and Challenges

*P Nair\* and Deepak Kumar\*\**

---

*The Suburban Railway system in Mumbai is perhaps the most complex, densely loaded and intensively utilized system in the world. Due to the magnitude of the project and the need for continuous assistance and involvement of the Government of Maharashtra, a separate corporation, the Mumbai Railway Vikas Corporation (MRVC) was set up jointly between the Ministry of Railways and the Government of Maharashtra. MRVC has made substantial improvements in the Mumbai suburban railway system since its inception, but it has to go a long way. This paper discusses the developments and the challenges of MRVC and a brief description of suburban systems of different Indian metro cities has also been presented.*

---

## About Mumbai Urban Transport Project

Over 88% of the commuters in Mumbai travel by suburban trains or Bombay Electric Supply and Transport Undertaking (BEST) buses. In other words, Mumbai's Suburban Rail System carries about 64 lakh (6.4 million) passengers per day. On the other, about 4700 passengers travel in a 9-car rake during peak hours, with a rated carrying capacity of only 1,710<sup>1</sup> (Details in Box 1).

This has resulted in, what is known as, super dense crush load of 14-16 standing passengers per square metre of floor space!<sup>2</sup>. Like other poor migrants in Mumbai, the people living in the railway slums could not find affordable housing when they came to the city and consequently were forced to make their homes wherever they could find space. Over the years, many of those who managed to find space to settle on government or privately owned land have gradually obtained informal tenure security as well as some basic services such as water, electricity and sanitation from the state government. This has resulted in the expansion of the city boundaries. The fast expansion of the city has increased the need for quick, safer and reliable transportation means running across the city.

---

\* Consulting Editor, *The ICFAI Journal of Infrastructure*.

\*\* Associate Consultant, The ICFAI University Press.

*Acknowledgement:* We would like to thank Dr. T Chandra Shekhar, Joint Metropolitan Commissioner and Project Director (MUTP), and Dilip N Kawathkar, Joint Project (P.R.), MMRDA, for facilitating the writing of this article by providing the necessary information and data.

---

<sup>1</sup> <http://www.mrvc.co.in/intr.htm>

<sup>2</sup> <http://www.mrvc.co.in/intr.htm>

Thus, the suburban railway system forms the backbone and is key to the development of Mumbai, the commercial capital of India. As a sequel to the Bombay Urban Transport Project (BUTP), which was completed in the year 1984, at a cost of about Rs. 390 million, the MMRDA (Mumbai Metropolitan Region Development Authority) has formulated a multi modal project viz. Mumbai Urban Transport Project (MUTP) to bring about improvement in traffic and transportation situation in the MMR with the World Bank assistance<sup>3</sup>. Mumbai Rail Vikas Corporation (MRVC), a joint venture of Indian railway and Government of Maharashtra, is set up for implementation of rail projects under MUTP.

### Key Features

- It is one of the largest ongoing urban transportation projects in the country.
- Perhaps the most complex, densely loaded and intensively utilized system in the world which has spread over 302 route kms and operates on 1500 Volt DC power supply.
- Two Zonal Railways, the Western Railway and Central Railway, operate the Mumbai Suburban Railway system.
- It covers three areas i.e., railways, roadways and rehabilitation. The major part of the money has been invested in spreading the railway network. Till now, about 20,000 families have been relocated, which shows that the project also takes care of socio-infrastructure issues.

### Partners and Funding of the Project

The project includes the partnership of Government of Maharashtra (GOM), Indian Railways (IR), Mumbai Metropolitan Region Development Authority (MMRDA), Mumbai Railway Vikas Corporation Ltd. (MRVC Ltd.), Municipal Corporation of Greater Mumbai (MCGM) and Bombay Electric Supply and Transport Undertaking (BEST).

On June 18, 2002, the World Bank sanctioned a loan of Rs. 26,020 mn (\$ 542 mn) i.e., 57% of the total cost while the total estimated cost of the project is Rs. 45,260 mn (\$ 943 mn)<sup>4</sup>. In addition, MRVC plans to raise revenue from commercial development of railway and advertising space for financing future projects. The funding for the Mumbai Urban Transport Project will come from the Government of Maharashtra, the union government, the railways and the World Bank.

Ministry of Railways (MOR) incorporated MRVC Ltd., a public sector unit of Government of India under Companies Act, 1956, on July 12, 1999. This was especially for the implementation of rail projects under MUTP (Mumbai Urban Transport Project). Under this project, the Ministry of Railways and Government of Maharashtra have shared an equity capital of Rs. 25 cr in the ratio of 51:49 to implement the *Rail Component* of an integrated rail-cum-road urban transport project called MUTP<sup>5</sup>, headquartered at Churchgate Station Annexe, Mumbai.

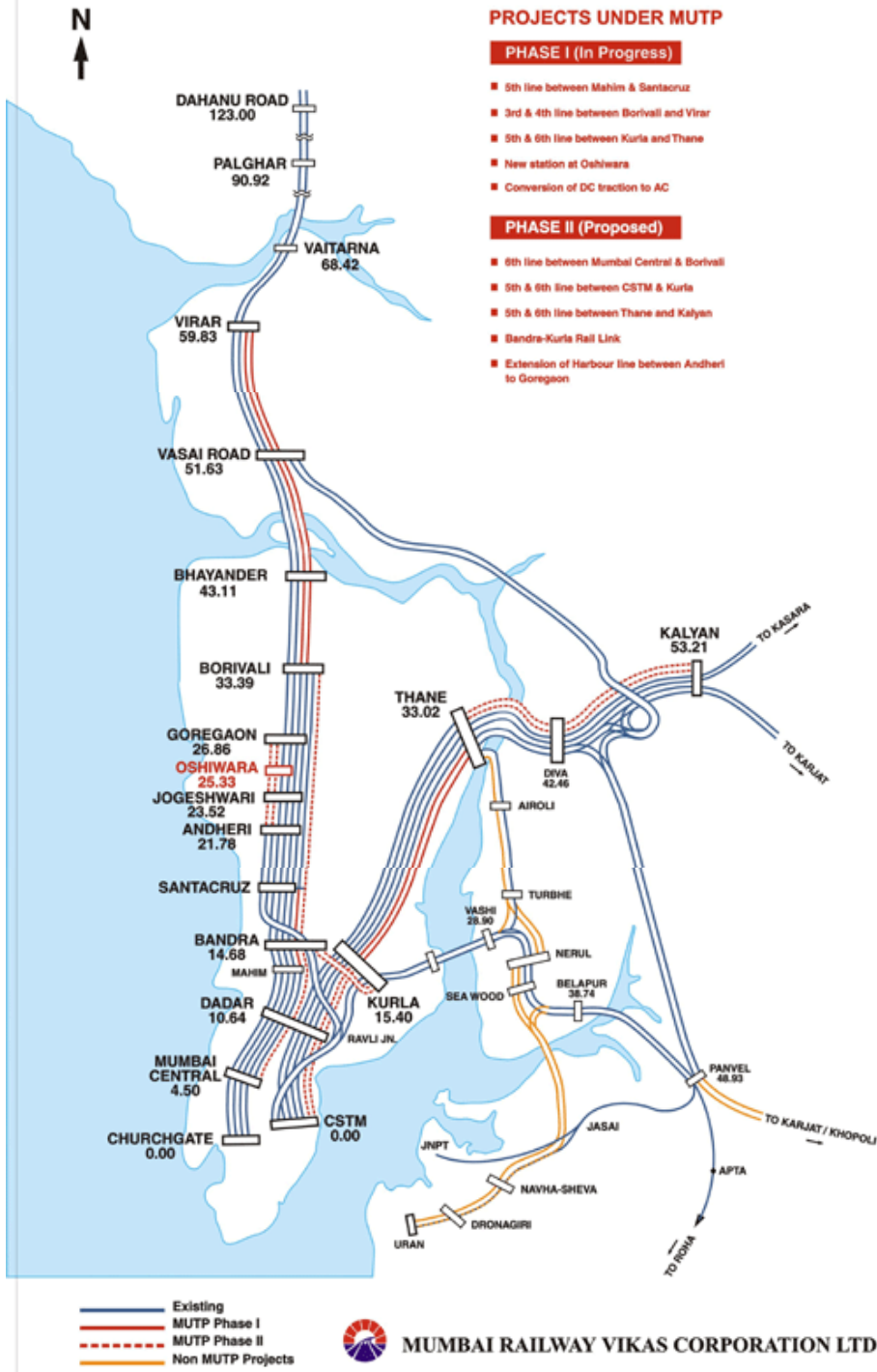
---

<sup>3</sup> [www.mmrdamumbai.org/projects\\_mutp.htm](http://www.mmrdamumbai.org/projects_mutp.htm)

<sup>4</sup> Mumbai Metropolitan Region Development Authority

<sup>5</sup> [http://www.all-science-fair-projects.com/science\\_fair\\_projects\\_encyclopedia/Mumbai\\_suburban\\_railway](http://www.all-science-fair-projects.com/science_fair_projects_encyclopedia/Mumbai_suburban_railway)

# MUMBAI SUBURBAN RAIL NETWORK



Source: <http://www.mrvco.in/overview.htm>

The entire cost of the *Rail Component* of the project is to be shared equally by Ministry of Railways and Government of Maharashtra. The purpose of the corporation is not only executing the projects identified so far, but is also involved in the planning and development of Mumbai Suburban Rail system. This is because of the increasing traffic in Mumbai Suburban Railway system which no doubt has the highest passenger density in the world, with more than 6.1 million commuters. The tariff has been increasing at an alarming proportion, but despite this, the Mumbai suburban railway system has provided an efficient and reliable service. This is the basic reason that led Ministry of Railways and the Government of Maharashtra to join hands.

For getting funding from the World Bank, the project has been divided into two phases. Phase I included the works of Quadrupling of Borivali-Virar section, provision of 5th line Western Railway, Kurla Thane additional pair of lines, extension of Harbour line to Goregaon and some system development works with a total estimated cost of Rs. 3125.20 cr (Refer Table 1).

The Mumbai Urban Transport Project II (MUTP-II) is the master plan for further integrated development of Mumbai's transport infrastructure. The improvements are expected to increase capacity by 35%, and will allow a higher frequency of train services during peak hours. AC-DC Electronic multiple units have already been introduced as part of the optimization plan, and eventually all of the Mumbai suburban system will switch from

<b>Table 1: MUTP Phases I and II</b>			
<b>MUTP Phase I (Rail Component)</b>		<b>MUTP Phase II (Rail Component)</b>	
<b>Capacity Augmentation Works</b>			
Quadrupling of Borivali-Virar section	509.0 cr	Kurla-CSTM 5th & 6th Lines	229.0 cr
Provision of 5th Line Western Railway	59.0 cr	Thane Kalyan Additional Pair of Lines	280.0 cr
Kurla Thane Additional Pair of Lines	166.0 cr	Borivali Mumbai Central 6th Line	294.0 cr
Extension of Harbour Line to Goregaon	59.0 cr	Bandra Kurla East West Link	480.0 cr
<b>System Improvement Works</b>			
Optimization of Western Railway	50.1 cr	S&T Upgrade to improve Headway	240.0 cr
Optimization of Central Railway	99.5 cr	DC to AC Conversion	147.0 cr
Optimization of Harbour Line	19.7 cr		
DC to AC Conversion	380.4 cr		
<b>Other Works</b>			
Resettlement & Rehabilitation	290.0 cr	Resettlement & Rehabilitation	71.0 cr
EMU Procurement & Manufacture	1359.2 cr	EMU Procurement & Manufacture	1967.0 cr
Maintenance Facilities for EMUs	64.3 cr	Maintenance Facilities for EMUs	42.0 cr
Stabling Lines for EMUs	48.5 cr	Stabling Lines for EMUs	42.0 cr
Track Machines	31.3 cr	Institutional Strengthening & Studies	30.0 cr
Institutional Strengthening & Studies	48.2 cr		
Grand Total Phase I	3125.2 cr	Grand Total Phase II	3881.0 Cr
Source: <a href="http://www.mrv.org.in">www.mrv.org.in</a>			

the 1.5 KV DC traction system to the 25 KV AC traction system which offers greater economies and efficiencies of operation<sup>6</sup>. By the way, the plan has been named 'MUTP-II' , as it is a predecessor of MUTP-I , which was completed in 1984 and provided several improvements to the suburban services . SPARC (Society for the Promotion of Area Resource Centres) has received the contract for preparing the Baseline Socio-Economic Survey (BSES) and the Resettlement Action Plans (RAPs) for the Project Affected Persons (PAPs) living along the railway track. SPARC has been assigned to carry out the work of 13 rails and one road sub-project under the Mumbai Urban Transport Project II.

### Challenges Found

- Major projects like the MUTP II have been delayed since the state and central governments have not been able to come to an agreement on the sharing of costs.
- *Constraints in Funding and Designing the Revenue Model:* The World Bank and other multilateral agencies have clearly indicated that funding would be available for viable and properly planned schemes. They want a portion of the funds to come from own sources, to ensure commitment from the local authorities. It would be unrealistic to expect all the repayments to be made through running revenue. The ideal situation would be to earn revenues so that at least the running expenses, plus interest, are met. For financing future projects, another challenge before MRVC will be—how to raise revenue from commercial development of railway land and air space.
- *Rehabilitation:* Apart from funding and designing the revenue model, there are various problems and challenges in implementing such a system. One of the foremost is slum clearance and relocation. Many of the central lines in particular have slum dwellers right on the tracks, which result in a number of deaths of slum dwellers per day. This considerably slows down the speed of the trains. The Railways argued that they are not responsible to shift the slum dwellers and it was considered to be the job of the authorities like the Municipal Corporation or the State Government Slum Clearance Board. But, till 1987, no significant result was seen. In 1988, however, Maharashtra's Housing Department suggested that the railways, the Mumbai state government and the Society for the Promotion of Area Resource Centres (SPARC) should undertake a joint survey to assess the number of households encroaching on Railways land and resettlement of the encroached households<sup>7</sup>.
- *Future Financing:* The light rail system is a method by which a huge number of people can be transported, with a reasonable degree of comfort, at the lowest cost per rupee of Investment & Running expenditure. But the initial investments are huge, and have to be planned very carefully. There is also a need for a proper backup transport system to bring people from their homes to the nearest station. There are ample opportunities for earning revenue from this system, through passenger fares, advertising, provision of ancillary facilities etc. Such opportunities will reduce the burden on an already overburdened public exchequer.
- *Future Challenge:* In future, the implementation of switchable technologies and magnetic rails will be a challenge to the light rail transit systems of the Indian cities.

---

<sup>6</sup> <http://irfca.org/faq/faq-metro.html>

<sup>7</sup> [www.unescap.org/tctd/pubs/files/bulletin69\\_d.pdf](http://www.unescap.org/tctd/pubs/files/bulletin69_d.pdf)

## Accomplishments

- Conversion from DC to AC system of power for suburban trains saves a huge saving in energy losses, which has lowered the cost of operation and the longer trains have attained greater pulling power.
- Modern information system with proper displays and safer halting technologies have been established.
- The passengers get both tangible and intangible benefits because of the introduction of longer train lengths and new design coaches. With the introduction of longer train lengths, the overcrowding has been reduced and the carrying capacity of the passengers has been increased by almost 35 % during peak hour. Moreover, the transit time has been reduced by 5-15 % and has improved the punctuality of trains. This is really a win-win situation for MUTP and the passengers. With the introduction of new design coaches, the better riding quality can be felt because of better lighting, ventilation and air circulation and these have also facilitated the smooth and easy passenger flow inside the coach.

A list of the accomplishments of MUTP, given by the World Bank, is as follows—

Benefits/Accomplishment	Beneficiaries
1. Enhanced rail system capacity, improved efficiency and service quality.	Rail commuters and other travelers in MMR currently representing over 80% of the public traveling over 80% of the transport.
2. Reduced congestion, travel time and delays for road traffic on project.	All road users but in particular: Commercial corridors/area vehicles on enhanced east-west, and roads over rail bridges (ROB), and bus users.
3. Provision of title to house with improved basic amenities and opportunities for economic rehabilitation.	Families that will have to relocate or will be affected through displacement or through change in their economic status due to involuntary resettlement.
4. Reduced emission from buses and other intensively used road vehicles.	Entire population of MMR but in particular, pedestrians and those living on or near to main traffic routes.
5. Enhanced institutional capacity to plan, operate, manage and maintain the transport system.	All involved institutions in the sector; benefits should flow through to all transport users through better services.
<p>Source: <a href="http://wbln1018.worldbank.org/sar/sa.nsf/00f6d051364efafc485256ba70058c8a2?OpenDocument">http://wbln1018.worldbank.org/sar/sa.nsf/00f6d051364efafc485256ba70058c8a2?OpenDocument</a></p>	

## Conclusion

There is no doubt that India needs such large integrated projects in order to ease the life of daily commuters. While there is no doubt that India lives in its villages, still the major engines of growth will continue to be through its major metros and mini-metros. This is

particularly true as regards the growth of the service sector. It could be expected therefore that—

- The mini-metros such as Hyderabad, Ahmedabad, Pune and Jaipur would swell rapidly in size and population.
- Townships would develop on the outskirts of the 5 major metros and a rapid mass transit system would be needed to transport people to their places of work.

Cities such as Delhi, Kolkata, Hyderabad and Chennai already use trains for mass transit purposes and it is only a question of upgrading the existing systems (See Box 2). Other major cities are yet to get started, although there is much talk of the same. There is also a need to gradually ensure that such enterprises are run by management professionals with core expertise in the sector to ensure better maintenance and efficiency. The days of entrusting it to the municipality are over. Thus MRVC has a long way to go, in order to provide better services to its commuters. ☐

Reference # 27J-2005-03-03-01

## Glossary

BSES—Baseline Socio-Economic Survey.

BEST—Bombay Electric Supply and Transport Undertaking.

BUTP—Bombay Urban Transport Project.

MMR—Mumbai Metropolitan Region.

MMRDA—Mumbai Metropolitan Region Development Authority.

MRVC—Mumbai Railway Vikas Corporation.

PAPs—Project Affected Persons.

RAPs—Resettlement Action Plans.

SPARC—Society for the Promotion of Area Resource Centres.

9-car rake: A train containing 9 coaches.

12-car rake: A train containing 12 coaches.

## References

1. [www.mrvc.org.in](http://www.mrvc.org.in)
2. <http://www.mrvc.co.in/intr.htm>
3. <http://www.mrvc.co.in/intr.htm>
4. [www.mmrda.mumbai.org/projects\\_mutp.htm](http://www.mmrda.mumbai.org/projects_mutp.htm)
5. Mumbai Metropolitan Region Development Authority
6. [http://www.all-science-fair-projects.com/science\\_fair\\_projects\\_encyclopedia/Mumbai\\_suburban\\_railway](http://www.all-science-fair-projects.com/science_fair_projects_encyclopedia/Mumbai_suburban_railway)
7. <http://irfca.org/faq/faq-metro.html>



**Box 1: The Lifeline of Mumbai city—Mumbai Local Railway**

Mumbai is served by two zonal railways, the Western Railway (WR) and Central Railway (CR). The railway suburban services, which are in fact metropolitan services in view of the frequency and short distances between stations, carry close to six million passengers per day on some 2000 daily EMU services. Mumbai metropolitan region is a continuous and united urban area and yet the two zonal railways, Western and Central railway, operate within the area as independent agencies with separate lines, separate policies and no service integration.

The suburban railway system in Mumbai is spread over 302 route Kms and it operates on 1500 Volt DC power supply from overhead catenary. The suburban services are run by Electric Multiple Units (EMUs). 181 rakes (train sets) of mainly 9-car (coach) and some 12-car composition are utilised to run 1942 train services to carry 6.04 million passengers per day.

Two corridors (one slow and other fast) on Western Railway run northwards from Churchgate terminus parallel to the west coast upto Virar (60 Kms). Two corridors on Central Railway run from Chhatrapati Shivaji Terminus (CST) to Kalyan (54 Kms), from where it bifurcates in Kalyan-Kasara (67 Kms) in the northeast and Kalyan-Karjat-Khapoli (61 Kms) in southeast. The 5th corridor on Central Railway runs as the harbour line starting from CST to Raoli Junction (11 Kms) from where the line splits. One line goes northwest to join WR at Bandra and goes upto Andheri (11 Kms) and the other goes eastward to terminate at Panvel (39 Kms) via New Mumbai.

Believe it or not, the rakes which ferry over 60 lakh commuters on one of the world’s densest suburban railway networks were designed way back in the 1950s. Some of the rakes used on the Western and Central lines are three decades old and use an overhead 1500 V DC system of 1927 vintage. The aging rakes, which suffer from periodic faults, are incapable of handling the explosive passenger growth in the next century. Transport conditions for travellers are intolerable. Average peak hour loading of trains is in excess of 4500 passengers per train compared to a “design capacity” of about 1800 per train and “crush load capacity” of 2600 per train. Buses also tend to be overcrowded. There is, therefore, an urgent need to improve travelling conditions for public transport users to avoid encouraging a shift to private transport.

Source: <http://www.geocities.com/mumbairail/railway.html>

**Box 2: Suburban Railway System in the Indian Metros**

**1. Kolkata Metro and Suburban Railway:** The Kolkata Metro is the only underground railway system in India and currently more than 70 trains are being run every day carrying over 2 lakh passengers. It is a big relief to the daily passengers, as the road transport facility is really pathetic out there. However, the Kolkata metro needs further extension to cover the other untouched areas.

Kolkata suburban has a very well developed electronic motive utility system serving the suburbs of the metropolitan area. The headquarters of the Kolkata metro are at Metro Rail Bhawan, Jawahar Lal Nehru Road, Kolkata. The construction was begun in 1972 and finished in 1995. The metro line runs from Tollygunge to Dum Dum, about 16.5 km with 17 intermediate stations in addition to the two termini. The extension is expected to be an elevated line and will bring the total route length to about 24.5 km. The termini are on the surface while the rest of the stations are underground. The Kolkata Metro uses a 5'6" gauge, and traction is via a third rail, using 750 V DC.



## 2. Madras Rapid Transit System (MRTS)

- MRTS is a partially elevated double track suburban railway in Chennai (Madras).
- The first phase of MRTS, from *Beach* to *Thirumayilai*, was opened on October 19, 1997. It consists of eight stations covering nine km long distance.
- MRTS Phase II is an extension of MRTS Phase I, which will extend from *Thiruvanmiyur* to *Velachery*, would cover 11 km and is still under construction and scheduled for opening in the late 2005.
- MRTS Phase III—An extension from Velachery to St. Thomas Mount station would cover 5.8 kms. The Construction of phase III is expected to begin from 2004.

**3. Delhi Metro:** The project is a joint venture of the Government of India (Ministry of Urban Affairs) and the Delhi government. The need of Delhi metro was felt because of traffic burden and increase in pollution. The frequency of trains here is also optimum and subsequent improvement has been made in due course of time. There are 51 stations and unlike Kolkata, most part of this metro is opened. The ridership has been increased, as it has been considered more convenient transport mode in the fast moving life of Delhi and saves the time of the daily passengers. The ridership has been expected to increase at around 2.2 million passengers per day by 2006. This means that 2,600 less buses will run on the roads which will increase the average speed of road buses from 10.5 km/h to 14 km/hour, which in turn will benefit in saving the time of 2 million man hours and saving of fuel cost worth Rs. 5 bn per year. This will also reduce the accident rates and will improve the quality of life. Metro will reduce journey time by 50 to 75%. Thus, a rail network on the lines of the Delhi Metro is seen as commercially viable.

**4. Hyderabad Multi Model Urban Transport System:** The State Government has entered into a Memorandum of Understanding with Indian Railways for Multi Model Suburban Railway Services in the City of Hyderabad and its suburbs. The Falaknuma–Secunderabad, Secunderabad–Bollaram, Secunderabad–Lingampally, and Secunderabad–Nampally links are being taken up on priority basis. The State Government and the Indian Railways are sharing the expenditure on 50:50 basis. The first phase of the project is estimated to cost Rs. 69 cr.

Just like the light rail systems in many states, a separate urban local body needs to be formed to raise resources and implement the various light rail projects in the state. This body could be wholly or partly government owned, depending on the socio-political framework. The recent report by TOI reveals that the state and central government will bear the cost needed to put SPV on its feet for the phase II. The phase II route will include Secunderabad–Medchal–Mourhirabad (43 Km), Falaknuma–Umdanagar (20 km), and Secunderabad–Ghatkeskar (46 km). The central government will contribute 178.5 cr (i.e. approximately 50% of the total cost). With the completion of phase II, the traffic flow is being expected to increase to 1 lakh per day from 25,000 passengers per day and the income to be increased to 5 lakhs from 1 lakh of today. The new focus areas are—to increase the frequencies, aggressive advertisement of its services and to enhance the rail and bus connectivity.