



TRIP REPORT



FTA Mission to India

Delhi, Ahmedabad, Mumbai

September 20 – 30, 2007

FTA Mission to India – Delhi, Ahmedabad, Mumbai September 20 – 30, 2007

Trip Report

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13. ABSTRACT <p>This report summarizes the activities associated with the FTA Mission to India conducted in September 2007. The mission provided the U.S. delegation with the opportunity to meet with senior Indian transportation officials, and to gain first-hand knowledge of India's current plans for transportation infrastructure improvements. The tour was also designed to identify any lessons learned for the U.S. transit industry, particularly in relation to the implementation and operation of Bus Rapid Transit systems, and to identify opportunities for U.S. transit industry involvement in the development of India's transportation infrastructure. The mission itinerary included visits to Delhi, Ahmedabad, and Mumbai, attending a BRT Workshop in Ahmedabad and the India Urban Space Conference in Mumbai.</p> <p>A highlight of the mission was the formal ratification of a Memorandum of Cooperation between the United States Department of Transportation and the Ministry of Urban Development, Government of the Republic of India. The Memorandum is designed to enable the two countries to collaborate in the fields of public transportation, inter-modal transportation, intelligent transportation systems, traffic information, capacity building, and training in public transportation, in addition to other fields of mutual interest.</p>			
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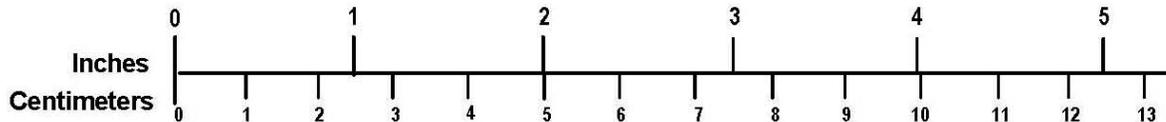
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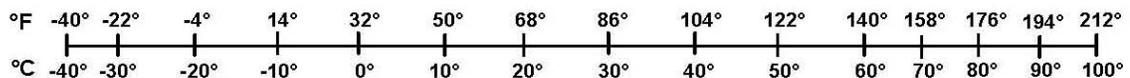
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EXECUTIVE SUMMARY

An FTA Mission to India was conducted in September 2007 to provide an opportunity to further develop the relationship between the two countries, and to achieve the formal ratification of a Memorandum of Cooperation in the field of public transportation science and technology. The mission provided the U.S. delegation with the opportunity to meet with senior Indian transportation officials, in order to gain first-hand knowledge of India's current plans for transportation infrastructure provision. The mission was also designed to identify any lessons learned for the U.S. transit industry, particularly in relation to the implementation and operation of Bus Rapid Transit Systems, and to identify opportunities for U.S. transit industry involvement in the development of India's transportation infrastructure. The mission itinerary included visits to Delhi, Ahmedabad, and Mumbai, attending a BRT Workshop in Ahmedabad and the India Urban Space Conference in Mumbai.

The 2007 FTA Mission to India was successful in achieving a number of key objectives in the development of the relationship between the two countries. The U.S. delegation was able to obtain first-hand experience of the ambitious plans for improving urban transportation infrastructure in cities throughout India, made possible by the Indian government's commitment to the National Urban Transport Policy (NUTP) and overarching Jawaharlal Nehru National Urban Renewal Mission (JNNURM). The ratification of the Memorandum of Cooperation sets the scene for more formalized collaboration between the U.S. Department of Transportation and the Indian Ministry of Urban Development. Overall, through meetings with senior Indian government officials and industry

representatives throughout the country, the U.S. delegation developed a network of contacts through which future collaborative efforts can be channeled.

The Indian approach to solving contemporary urban transportation problems provides important lessons for the United States. The integrated approach to achieving congestion reduction and mobility goals, as formalized in the National Urban Transport Policy, and the commitment made to Public Private Partnerships in implementing this policy, were noted as having direct applicability to similar initiatives currently underway in the United States.

The following action items have been defined in order to build upon the achievements of the 2007 mission:

- Identify specific personnel at the USDOT and Ministry of Urban Development to be responsible for *“determining the particular directions of cooperation and for ensuring the effectiveness of exchange”* (MOC, 2007).
- Develop areas of interest and seek partner organizations in the U.S. and India to begin the collaborative efforts defined under the Memorandum of Cooperation.
- Identify future activities, projects, and trips that would support the implementation of the Memorandum of Cooperation.
- Continue to facilitate the dialogue between public and private sector officials in both countries in order to identify business opportunities of mutual benefit.

1. INTRODUCTION

1.1 Background

In the last week of May and early June, 2007, a delegation of Indian urban transportation officials led by India's Urban Development Minister, Mr. S. Jaipal Reddy, visited U.S. transit agencies in California and New York, and also met with U.S. transportation officials in Washington, DC. The success of this tour stimulated interest within both countries to further develop the relationship through a reciprocal tour of India by a U.S. delegation, and through the development of a formal bilateral working agreement, permitting knowledge transfer and the mutual sharing of expertise in the urban transportation field. It was decided to meet these objectives through the execution of an official FTA mission to India in late 2007.

A formal agreement was drafted in the form of a "Memorandum of Cooperation", and signed by US Department of Transportation Secretary Mary Peters in September 2007. Ratification required the endorsement of the Indian Minister of Urban Development, J.P Reddy, and it was decided to coordinate the 2007 mission with a formal signing ceremony. The mission was organized by the Federal Transit Administration's International Office, with the assistance of the National Bus Rapid Transit Institute at the University of South Florida.

1.2 Mission Itinerary and Objectives

The mission was designed to provide the U.S. delegation with the opportunity to meet with senior Indian transportation officials, in order to gain first-hand knowledge of India's current plans for transportation infrastructure provision. The tour was also designed to identify any lessons learned for the U.S. transit industry, particularly in relation to the implementation and operation of Bus Rapid Transit Systems, and to identify opportunities for U.S. transit industry involvement in the development of India's transportation infrastructure.

As the nation's capital, Delhi was the obvious location with which to begin the tour. Activities in Delhi focused on meetings with senior representatives of the Indian national government, the signing of the Memorandum of Cooperation, and a tour of the new Delhi subway system. The delegation then proceeded to the cities of Ahmedabad and Mumbai, taking advantage of major conference events scheduled in these locations.

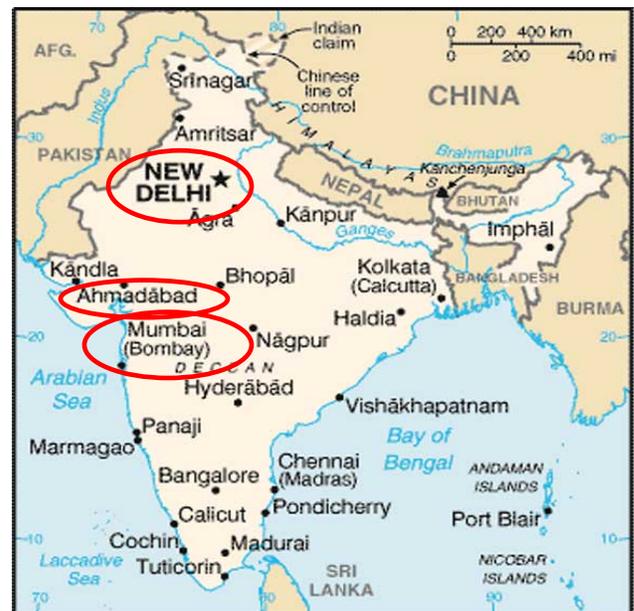


FIGURE 1.1 - Mission Itinerary

2. DELHI

2.1 Delhi Metro Rail Corporation

Delhi, Saturday, September 22, 2007

The U.S. delegation began the day with a tour of the Delhi Metro Rail system, hosted by Delhi Metro Rail Corporation. System construction is following a phased implementation approach, with the first 40 mile section of Phase I construction beginning in 1999. Phase I consists of three lines totaling 40.3 miles of trunk service, to be built at a capital cost of US\$2.5 billion. Line 1 runs east-west on a 13.7 mile elevated track between Rithala and Shahdara. Line 2 runs north-south for 6.7 miles in an underground tunnel between Vishwa Vidyalaya and the Central Secretariat. Line 3 runs 19.9 miles on elevated tracks and an underground tunnel, between Indraprastha, Barakhamba Road and Dwarka. When completed in 2010, Phase II will provide an additional 77.7 miles of service at a capital cost of US\$5 billion. The system carries approximately 600,000 passengers per day with fares ranging from 6 to 22 rupees (15 to 56 cents), which are the lowest metro fares in the world. Phases III and IV are scheduled for completion by 2021 and will provide an additional 118 miles of rail corridor.

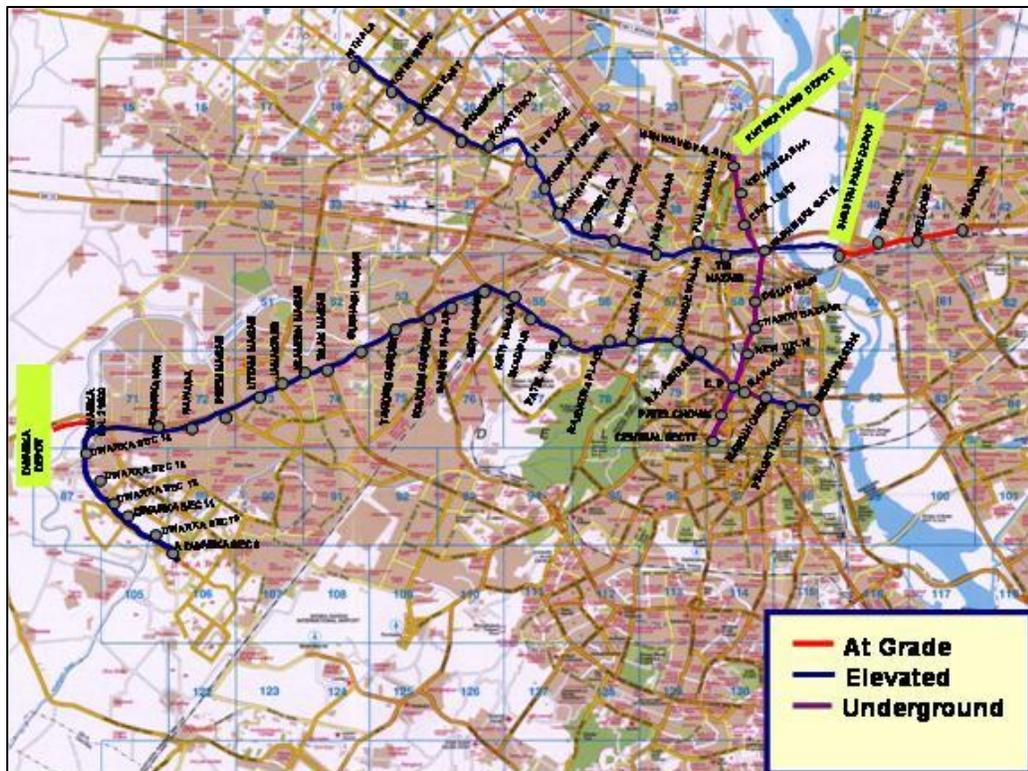


FIGURE 2.1 – Delhi Metro Phase I



FIGURE 2.2 – Delhi Metro Tour

The U.S. delegation was given a tour of the Delhi metro system. The tour featured a visit to the Central Secretariat station on Metro Line 2, and a visit to the system control center and rail car depot. Following the tour's completion, DMRC hosted a lunch meeting at their headquarters. Members of the U.S. delegation, DMRC, and affiliated consultants were given the opportunity to discuss the details of the existing metro system and the plans for future system expansion.



Figure 2.3 - Meeting with DMRC Staff

2.2 Indian Ministry of Urban Development

Delhi, Monday, September 24, 2007

The U.S. delegation attended a morning meeting at the Indian Ministry of Urban Development, hosted by M. Ramachandran, Secretary to the Government of India, Ministry of Urban Development. Senior ministry officials gave presentations on the current plans for transportation infrastructure improvements in India.

Presentation topics included a summary of India's overarching Jawaharlal Nehru National Urban Renewal Mission (JNNURM), presented by A.K Mehta, Director of the Ministry of Urban Development. The JNNURM is a major new Indian government initiative targeted at improving urban infrastructure and governance, and providing basic services to the urban poor. The initiative aims to invest Rs50,000Cr (approximately US\$12.7 billion) in 63 cities around the country over the next seven years. These federal funds are expected to be supplemented by state, local, and private funding sources. The next presentation was on India's National Urban Transport Policy, given by Sanjeev Kumar Lohia, Director, Ministry of Urban Development. In his presentation, Mr. Lohia described the various challenges facing Indian cities as a result of the rapid influx of India's massive rural population into its urban areas. Mr. Lohia then described the National Urban Transport Policy that has been designed to address these challenges. The policy takes an integrated approach to urban mobility issues, emphasizing the movement of people as opposed to vehicles through the integration of land use planning, provision of rapid transit networks (both rail-based and BRTS), non-motorized mode infrastructure, and pricing mechanisms, to ensure that future travel demand is adequately controlled. The policy is funded through the JNNURM, also seeking local and private sector match funding support.



FIGURE 2.4 – Meeting at the Ministry of Urban Development

Following the formal presentations, the U.S. delegation was given the opportunity to engage in further discussions on the various issues raised. Of particular interest was the successful implementation in Delhi of an alternative fuels mandate for public transportation vehicles, whereby all the transit vehicles in the city were successfully converted to CNG within a matter of months. Also of interest was the way in which the Delhi Metro was able to run at an operational profit from the first day of service, while keeping fares at a very low level. It was explained that a major factor in this achievement has been the leveraging of real estate value capture and advertising revenue, which together account for 30 percent of DMRC revenue.

At the conclusion of the meeting, the U.S. delegation proceeded to the offices of Mr. S. Jaipal Reddy, Minister for Urban Development, to observe the formal ratification of the Memorandum of Cooperation between the United States Department of Transportation and the Ministry of Urban Development, Government of the Republic of India.



FIGURE 2.5 – Ratification of the Memorandum of Cooperation by Mr. S.J. Reddy, Minister of Urban Development

The Memorandum is designed to enable the two countries to collaborate in the fields of public transportation, inter-modal transportation, intelligent transportation systems, traffic information, capacity building and training in public transportation and other fields of mutual interest. The agreement provides a framework for the exchange of scientific and technical information on subjects of mutual interest, exchange of specialists, delegations and scientific and technical personnel, joint organization of symposia, seminars, training programs and other meetings, joint research in urban transportation science and technology and other forums of cooperation as mutually agreed. The full Memorandum is provided in Appendix I. At the signing, Ms. Sherry E. Little and Mr. S. Jaipal Reddy both expressed their satisfaction at reaching such an important milestone, and looked forward to the future collaborative endeavors made possible by the agreement.

3. AHMEDABAD

3.1 BRT Workshop

Ahmedabad, Tuesday, September 25, 2007

The U.S. delegation arrived in Ahmedabad to attend the BRT Workshop, sponsored by the Indian Ministry of Urban Development and funded by the United Nations Development Program (UNDP). The workshop was designed to provide a forum for the Indian transportation professionals to learn about the BRT proposals in cities across the country. Thus, this provided an excellent opportunity for the delegation to gain first-hand knowledge of the status of BRT in India.



FIGURE 3.1 – Workshop on Bus Rapid Transit in India

Ms. Sherry E. Little was asked to give a keynote address at the beginning of the workshop. In the speech, she discussed the challenges facing both countries' in providing the necessary transportation infrastructure to ensure continued economic prosperity and quality of life, and the hopes she had for future bilateral collaboration. Following the introductory addresses, a series of speakers gave presentations on the various BRT projects around the country, most of which are still in the planning stages. Appendix III provides a summary of these proposals and provides a discussion of the public transportation system recently implemented in the City of Indore using an innovative Public Private Partnership approach.



3.2 Centre for Environmental Planning and Technology

Ahmedabad, Tuesday, September 25, 2007

The Centre for Environmental Planning and Technology (CEPT) was established in 1935 and accorded full university status in 2005. CEPT is composed of five faculties, each with an established school, offering courses at undergraduate, postgraduate and doctoral levels:

- Faculty of Architecture, School of Architecture
- Faculty of Design, School of Interior Design
- Faculty of Planning and Public Policy, School of Planning
- Faculty of Technology, School of Building Science and Technology
- Faculty of Management

The U.S. delegation toured the CEPT campus and were invited to a meeting with Professor H.M. Shivanand Swamy, of the School of Planning. At the meeting Professor Swamy explained in detail the activities of his department, the importance of BRT to India's National Urban Transport Policy (NUTP), and CEPT's role in the design of Ahmedabad's BRT system, which is currently under construction. One of the central objectives of the NUTP is to build individual and institutional capacity through a knowledge management system capable of serving the needs of planners, researchers, teachers and students. As part of this process, the NUTP calls for the strengthening of academic programs in urban planning and engineering, especially at the post-graduate level, so that a nucleus of qualified urban transportation professionals can be developed. It was envisioned that this process could be initiated by forming collaborative partnerships with leading academic institutions in other countries. The meeting concluded with a discussion of the possibility of developing such partnerships with organizations in the U.S., such as with the National Bus Rapid Transit Institute at the University of South Florida.



FIGURE 3.2 – Class in Progress at CEPT

3.3 Municipality of Ahmedabad¹

Ahmedabad, Wednesday, September 26, 2007

The final event scheduled in Ahmedabad was a meeting with the Mayor of Ahmedabad, Amit Shah, Deputy Municipal Commissioner, Capt. Dilipkumar J. Mahajan, and other senior city officials. The Mayor has been a prominent champion of the development of the BRT proposals in the city.

Planning for Ahmedabad's Bus Rapid Transit system, called Janmarg, started in mid-2005, and remains on schedule to start operations by mid-2008. With the Ahmedabad Municipal Corporation (AMC) responsible for implementing the system, construction started on a pilot corridor of 7.5 miles earlier this year and tenders have been awarded for construction of segregated corridors totaling an additional 15.5 miles, which should start this month. Work is also underway to create a service plan for BRT operations. Along with restructuring the existing bus services provided by Ahmedabad Municipal Transport Service (AMTS), the effort would help create an integrated public transit service. Operational efficiency of AMTS, which deteriorated dramatically during the last decade, would be improved through a route rationalization exercise and improved utilization of the current bus fleet. The AMC is also in the process of forming a special purpose agency to be responsible for BRT operations management. The masterplan for the city consists of a network of 135 miles (217 km) of BRT routes, with the major truck corridors based on a median exclusive bus lane configuration. The masterplan is designed to be implemented over three distinct phases, as illustrated in Figure 3.9.

CEPT University is the lead consultant to the AMC on the BRT project, which has partial financial support from the national Ministry of Urban Development of India, under JNNURM, and the Government of Gujarat. The Institute of Transportation and Development Policy (ITDP), which spearheaded the initial efforts to promote BRT in Ahmedabad through multiple workshops in 2004, has been providing ongoing technical support in planning and design as an advisor since August 2005. Lea Associates South Asia (LASA), which provided engineering support to CEPT University on this project, has been appointed as project management consultant for the construction of the segregated BRT corridors.

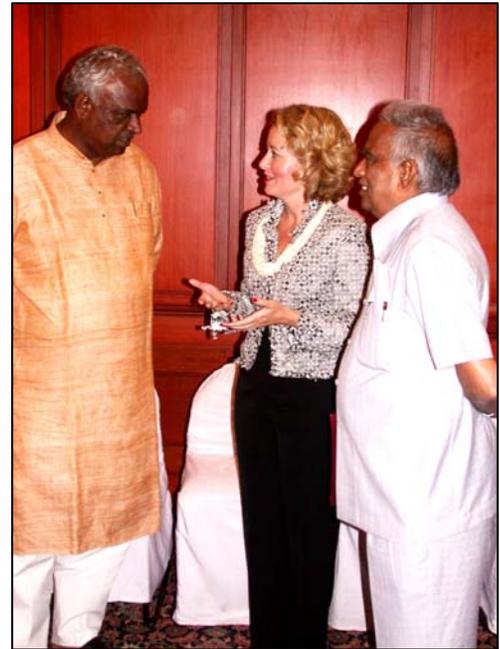


FIGURE 3.3 – Sherry Little and Venkat Pindiprolu with Mayor Amit Shah

¹ This section has been extracted from the following source: ITDP website, "Ahmedabad BRT Update", http://www.itdp.org/index.php/projects/update/ahmedabad_brt_update/. Accessed January 2008.



**FIGURE 3.4 - Ahmedabad BRT;
Corridor Under Construction and Visual Simulation of Completed Project**

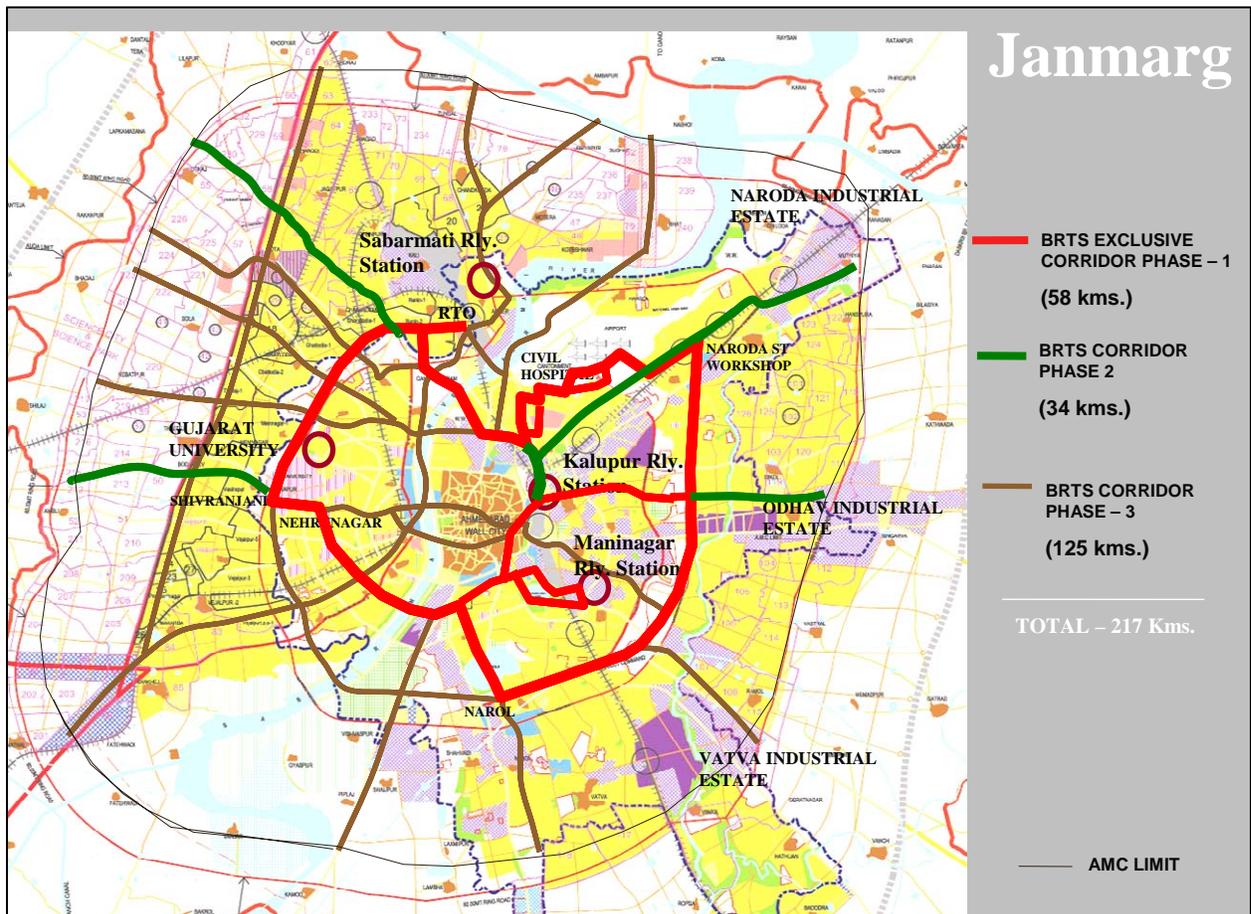


FIGURE 3.5 – Ahmedabad’s Three Phase BRT Network Implementation Strategy

4. MUMBAI

4.1 India Urban Space 2007 Conference – Transforming India’s Cities

Mumbai, Thursday, September 27, 2007

The India Urban Space 2007 conference (India USP) was held in Mumbai from September 27^h - 30th, 2007. This national level inaugural conference event was sponsored by the Indian Ministry of Urban Development with the objective of spotlighting the sweeping reforms to urban infrastructure provision currently underway in cities across the country, made possible by the Jawaharlal Nehru National Urban Renewal Mission (JNNURM). The event organizers recognized that achieving the goal of economically vibrant cities that also achieve high quality of life standards require the integration of a number of different professional disciplines. Thus, the conference agenda was structured



**FIGURE 4.1 – Sherry Little;
Television Interview at India USP 2007**

around the following urban renewal themes; urban transport, water supply, spatial planning, sewage and drainage, solid waste management, affordable housing, municipal financing, and IT governance. The U.S. delegation attended the conference on September 27th, with Ms. Sherry E. Little giving a Keynote Address on “*The Federal Role in Supporting Urban Public Transit in the U.S.*”. In her address, Ms. Little provided an overview of the various federal initiatives, including the New Starts and Small Starts programs, that provide the U.S. transit industry with the capital and operating cost assistance they need to function effectively. In concluding her presentation, Ms. Little commented on the wealth of knowledge she had gained on her visit to India, and, quoting the great Mahatma Gandhi, encouraged the conference delegates to “*be the change they wished to see*”. Following the Keynote session, Ms. Little was interviewed by local and national television networks. Other members of the U.S. delegation were also involved in the conference, with Richard Doyle moderating a session on “*Public Private Partnerships in Infrastructure*”, in which Richard Krochallis gave a presentation titled “*Public Private Partnerships in Urban Public Transport*”. In his presentation, Mr. Krochallis summarized the fundamental elements of private sector participation in public transit provision, discussing the benefits leveraged by private sector involvement, obstacles to the achievement of effective partnerships, and examples of successful collaborations. Both India and the United States see the private sector playing a central role in the achievement of urban renewal goals, with both the Indian Ministry of Urban Development and the U.S. Department of Transportation embarking on new initiatives to ensure that the conditions are favorable for such collaboration to take place.

4.2 Interactive Meeting with Mumbai Transportation Industry Representatives

Mumbai, Thursday, September 27, 2007

On September 27, the U.S. delegation attended an interactive meeting with representatives of the city's transportation industry. The meeting began with formal presentations on the various major transportation projects underway in Mumbai. The presentation from P.R.K Murthy of the Mumbai Metropolitan Region Development Authority (MMRDA) illustrated the vastness of the city which has a population of 22 million and an area of 4,355 square km. The sheer scale of the city creates significant technical and institutional challenges, requiring the cooperation of seven municipal corporations and 13 municipal councils. A Transportation Plan has been developed for the Mumbai Metro Region (MMR) that will provide the infrastructure necessary for the city to accommodate the 34 million people that are expected to inhabit the city in 2031. The plan is based on an integrated approach that includes investments in existing road infrastructure, and an enhanced rail network supported by improvements to the city's network of bus routes.



FIGURE 4.2 – Interactive Meeting in Mumbai



FIGURE 4.3 – Mumbai's Integrated Public Transit Plan

The following presentation by R.K. Jha, Project Director of Transportation Infrastructure Business Group (TIBG), Reliance Industries Ltd., focused on three of the largest infrastructure projects in the region; the Mumbai Metro System, Thane MRTS, and the Trans Harbor Metro project. Each project will cost several billion dollars to complete. Sherry Little thanked the host for the opportunity to meet with them to discuss the transportation challenges in each others' countries, and gave a presentation on the pertinent issues faced in the Ms. Little praised the integrated approach taken in Mumbai towards addressing these issues and noted the similarity to the U.S. Department of Transportation's *Congestion Initiative*, which focuses on reducing traffic congestion in urban areas through the implementation of a strategy based on the simultaneous implementation of Tolls, Transit, Technology and Telecommuting. The initiative is now underway in five U.S. cities; New York, Seattle, San Francisco, Minneapolis, and Miami.

4.3 Confederation of Indian Industry and U.S. India Business Council Workshop *Mumbai, Friday, September 28.*

On the final day of the mission, the U.S. delegation attended a workshop co-hosted by the Confederation of Indian Industry and U.S. India Business Council. The purpose of the workshop was to discuss business opportunities for the private sector in both countries. India is the world's 12th largest economy, with a GDP of \$785 billion in 2005. In terms of Public Private Partnership, India is the world's fourth largest economy, with a PPP-related GDP of \$3.8 trillion (2005). The U.S. is already India's largest trading partner with bilateral trade of \$26.8 billion in 2005, with good trade relations stemming from the fact that they are two of the world's largest democracies with similar forms of federal/state government. Looking to the future, the Indian government seeks foreign investment in the following sectors:

- power generation
- telecommunications
- ports
- roads
- petroleum exploration/processing
- mining

In terms of the current multi-million dollar investment in transportation infrastructure, opportunities for U.S. transportation industry are likely to exist in the areas of technological applications / Intelligent Transportation Systems and alternative fuel applications, as well as in related areas such as management consultancy and project financing.



FIGURE 4.4 – Ms Sherry Little Addresses the U.S India Business Workshop in Mumbai

5. CONCLUSIONS

5.1 Summary of Mission Achievements and Lessons Learned

The 2007 FTA Mission to India was successful in achieving a number of key objectives in the development of the relationship between the two countries. The U.S. delegation was able to obtain first-hand experience of the ambitious plans for improving urban transportation infrastructure in cities throughout India, made possible by the Indian government's commitment to the National Urban Transport Policy (NUTP) and overarching Jawaharlal Nehru National Urban Renewal Mission (JNNURM). As established trade partners, it has been a recognized priority of both governments to solidify this relationship through the ratification of a Memorandum of Cooperation in the field of public transportation science and technology. This important step has now been achieved, setting the scene for more formalized collaboration between the U.S. Department of Transportation and the Indian Ministry of Urban Development in the areas of public transportation, Intelligent Transportation Systems, intermodal transportation, capacity building, Bus Rapid Transit, and others. The U.S. delegation was able to discuss future opportunities for capacity building with CEPT University in Ahmedabad. Overall, through meetings with senior Indian government officials and industry representatives throughout the country, the U.S. delegation developed a network of contacts through which future collaborative efforts can be channeled.

The U.S. delegation was also exposed to a number of important lessons regarding the way in which India is approaching its urbanization challenges. The National Urban Transport Policy is an excellent example of an integrated transport strategy, combining transportation planning and land use planning and recognizing the need to provide high quality, public transportation and non-motorized mode infrastructure in conjunction with pricing measures capable of managing the ever-increasing demand for auto travel. The U.S. delegation acknowledged the applicability of this plan to both developed and developing world urban contexts, and recognized its similarity to the current USDOT Congestion Initiative, which seeks to reduce congestion through the integrated implementation of Tolling, Transit, Technology, and Telecommuting in five Urban Partner cities across the The U.S. Delegation was also impressed by the recent successes made in India in the field of Public Private Partnerships. Finding ways to effectively involve the private sector in transportation infrastructure provision and transit service operation is also the subject of a current U.S. initiative led by the Federal Highway Administration. The "Indore Model" for public transportation service provision shows that high levels of fiscal efficiency and service quality can be achieved in return for relatively small levels of public sector investment.

5.2 Action Items

In summary, the following action items have been defined to ensure that the achievements made during the 2007 mission are capitalized upon:

- Identify specific personnel at the USDOT and Ministry of Urban Development to be responsible for “*determining the particular directions of cooperation and for ensuring the effectiveness of exchange*” (MOC, 2007).
- Develop areas of interest and seek partner organizations in the U.S. and India to begin the collaborative efforts defined under the Memorandum of Cooperation.
- Identify future activities, projects, and trips that would support the implementation of the Memorandum of Cooperation.
- Continue to facilitate the dialogue between public and private sector officials in both countries in order to identify business opportunities of mutual benefit.

APPENDIX I – THE MEMORANDUM OF COOPERATION

MEMORANDUM OF COOPERATION

BETWEEN

THE DEPARTMENT OF TRANSPORTATION
OF THE UNITED STATES OF AMERICA

AND

THE MINISTRY OF URBAN DEVELOPMENT
GOVERNMENT OF THE REPUBLIC OF INDIA

ON COOPERATION

IN PUBLIC TRANSPORTATION SCIENCE AND TECHNOLOGY

The Department of Transportation of the United States of America and the Ministry of Urban Development, Government of the Republic of India (hereinafter referred to as “the Participants”):

Recognizing that new developments in the field of transportation technology can make important contributions towards promoting, encouraging, and advancing safe, economical, efficient, and environmentally sound public transportation systems: and

Desiring to promote scientific and technological cooperation and collaboration in the field of public transportation have reached agreement as follows:

Article I

The Participants intend to undertake cooperation and collaboration in public transportation science and technology on the basis of equality, reciprocity and mutual benefit.

Article II

The Participants intend that the cooperation and collaboration may include the following fields:

1. Public transportation
2. Intermodal transportation
3. Safety transportation
4. Transportation for Persons with Disabilities
5. Intelligent Transportation Systems (ITS)
6. Traffic Information Center
7. Capacity building and training in public transportation
8. Other fields of mutual interest

The Participants may identify specific projects for cooperation in public transportation science and technology within the above-mentioned fields. Identification of areas of cooperation and their implementation may be made while paying due attention to the state of art of technology regarding such projects.

Article III

The Participants may pursue cooperation through one of the following methods:

1. Exchange of scientific and technical information on subjects of mutual interest;
2. Exchange of specialists, delegations, and scientific and technical personnel;
3. Joint organization of symposia, seminars, training programs and other meetings;
4. Joint research in urban transportation science and technology; and
5. Other forums of cooperation as mutually agreed.

Article IV

With regard to the cooperative activities under this Memorandum, the Participants may allow, as appropriate, the participation of other relevant governmental agencies, researchers and organizations from all sectors of the research establishment, including universities, national laboratories, and the private sector.

Article V

In order to coordinate the cooperative activities, each Participant may designate a representative to be responsible for determining the particular directions of cooperation and for ensuring the effectiveness of exchange. The representatives of the Participants or their designated coordinators should, by correspondence, consult with each other and define the cooperative activities and other related matters. When necessary, they may meet to consider matters related to the implementation of this Memorandum.

Article VI

The cooperation is subject to the availability of funds and personnel.

Article VII

Specific cooperative projects and activities may be embodied in separate memoranda or plans between the Participants, which may cover the subject, procedures, and terms of cooperation to be undertaken, the entities involved, funding, and other appropriate matters related to the conditions of such cooperation.

Article VIII

The Participants may consult, as appropriate, in respect of any matter that may arise from, or in connection with, the Memorandum.

Article IX

Scientific and technical information of a non-proprietary nature derived from the cooperative activities conducted under the Memorandum may be made available to the public through customary channels and, in accordance with, the normal procedures of the Participants and other governmental entities involved in the cooperative activities.

Article X

Information transmitted by one Participant to the other under this Memorandum should be accurate to the best knowledge and belief of the transmitting Participant, but the transmitting Participant does not intend to warrant the suitability of such information for any particular use or application by the receiving Participant.

Article XI

The activities under this Memorandum should commence on the date of signature below. Either Participant may end its cooperation under this Memorandum at any time, but should attempt to provide sixty (60) days prior written notification to the other Participant. The Participants should endeavor to complete or continue specific activities then underway, if they so choose.

Dated in Washington,DC on
September 19, 2007
in the English language.

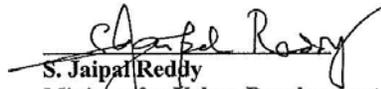
Dated in New Delhi on
24 SEP 2007
in the English language.

FOR THE DEPARTMENT OF
TRANSPORTATION OF
THE UNITED STATES OF AMERICA:

FOR THE MINISTRY OF
URBAN DEVELOPMENT
GOVERNMENT OF THE
REPUBLIC OF INDIA:



Mary E. Peters
Secretary of Transportation


S. Jaipal Reddy
Minister for Urban Development

APPENDIX II – THE U.S. DELEGATION

The team assembled for the trip consisted of:

- Ms. Sherry E. Little, Deputy Administrator, Federal Transit Administration, Washington, DC
- Mr. Richard Doyle, Regional Administrator, Region I Office of the Federal Transit Administration, Boston, MA
- Mr. Richard F. Krochalis, Regional Administrator, Region 10 Office of the Federal Transit Administration, Seattle, WA
- Mr. Ronald E. Boenau, International Mass Transportation Program, Office of Research, Demonstration and Innovation, FTA HQ, Washington, DC
- Mr. Venkat R. Pindiprolu, Team Leader, Service Innovation Team, Office of Research, Demonstration and Innovation, FTA HQ, Washington, DC
- Mr. Alasdair Cain, Senior Research Associate, National Bus Rapid Transit Institute, University of South Florida, Tampa, FL

APPENDIX III – SUMMARY OF INDIAN BRT PROJECTS

III.1 An Overview of BRT in India

Bus Rapid Transit has been identified by the Ministry of Urban Development as having a major role to play in addressing India’s transportation infrastructure needs. The Ministry wants to build rapid transit networks in all of India’s major cities, and has identified BRT as the core rapid transit mode for cities with populations under five million, with rail-based technologies earmarked for cities with populations over five million. In the cities where rail-based rapid transit is planned, BRT will play a supporting role, enhancing the coverage of the rail networks. Table III.1 below provides a summary of the different systems in the nine Indian cities that have had their BRT proposals successfully sanctioned by the Ministry of Urban Development.

TABLE III.1 – Summary Characteristics of India’s Bus Rapid Transit Systems

City	Total Length (Miles)	Sanctioned Length (Miles)	Capital Cost (sanctioned sections)		Capital Cost per mile (US\$)	Status
			IDR (Crore)	US\$ (millions)		
Pune	63.2	63.2	807.13	\$205.01	\$3,244,359	Sanctioned length funded under JNNURM and operational
Indore	54.9	7.1	98.45	\$25.01	\$3,514,929	Sanctioned length funded under JNNURM and under construction.
Bhopal	24.4	13.5	237.76	\$60.39	\$4,476,981	Sanctioned length funded under JNNURM.
Ahmedabad	134.8	36.0	493.88	\$125.45	\$3,480,966	Sanctioned length funded under JNNURM and under construction.
Jaipur	26.1	4.3	75.15	\$19.09	\$4,388,714	Sanctioned length funded under JNNURM.
Vijaywada	28.3	9.6	152.64	\$38.78	\$4,025,715	Sanctioned length funded under JNNURM.
Vizag	98.2	26.6	452.93	\$115.04	\$4,326,071	Sanctioned length funded under JNNURM.
Rajkot	39.5	18.0	111	\$28.19	\$1,564,701	Sanctioned length funded under JNNURM.
Delhi	191.4	8.8	153	\$38.86	\$4,404,630	Sanctioned length funded under GNCTD
TOTAL	660.6	187.2	2581.94	\$655.81	Average = US\$3.7M	

Table III.1 shows that in eight of the nine cities, the federal funding only covers an initial section of the total planned network of BRT routes. This is part of a phased implementation strategy that requires each city to prioritize the construction of the core system corridors, with the funding of subsequent corridors dependent on the success of the initial phase. It is expected to take 10 years or more for all phases to be completed. Initial sections of the Pune BRT system are already operational, while the others are in various stages of planning and construction. The systems are based on dedicated median or curbside bus lanes. The total sanctioned funding of US\$655.81M indicates the level of commitment that the Indian government is making to BRT. The fact that this outlay will provide almost 190 miles of rapid transit corridor illustrates the cost effectiveness of BRT, averaging US\$3.7M per mile. The capital cost per mile is very similar for each project, ranging from US\$3.2M to US\$4.5M, with the exception of Rajkot, which is significantly cheaper. BRT proposals in Mysore, Pimpri Chinchwad, and Surat are currently under appraisal.



III.2 Case Study – Indore’s Bus System²

Indore has achieved worldwide recognition for the implementation of a high quality bus transit system through an innovative Public Private Partnership arrangement that permitted rapid system introduction and extremely low levels of public sector capital investment. Two members of the U.S. delegation, Venkat Pindiprolu and Alasdair Cain, were able to visit the City of Indore prior to the commencement of the official mission itinerary. While in Indore, they met with officials from Indore City Transportation Services, Ltd (ICTSL) and local consultants, Mehta & Associates, to discuss the existing system and the plans for future BRT implementation. Mr. Pindiprolu and Mr. Cain were also able to tour the system and participate in an Indore City Council meeting, in which the BRT proposal was debated. This section summarizes the achievements made in Indore, and the plans for the future upgrading of the system to BRT.

Indore, with an area of 3,898 km², is the commercial and educational capital of Madhya Pradesh in central India. It is home to 2.72 million people (2001 Census) with a population growth greater than 50% each decade. Increased disposable income for Indore residents resulted in a substantial increase in the number of motorized vehicles, many of which are two wheelers. There are currently about 732,893 motorized vehicles in Indore. Travel by private vehicles amounts to approximately 50% of the total. This situation contributes to high traffic congestion, pollution, and soaring accident rates.

Previous to 2005, the Madhya Pradesh Road Transport Corporation (MPRTC) operated in Indore. The corporation suffered greatly from inefficiencies and a constant inability to cover its operating costs. Eventually, MPRTC’s losses, amounting to Rs7.35 billion (US\$181.48 million) by January 2005, reached an irreversible point, after which the state government was unable to continue sustaining the corporation. MPRTC was disbanded in 2005 by the Madhya Pradesh State Cabinet and replaced by a smaller company providing only inter-state and rural bus services. Once MPRTC was closed down, bus routes in Indore were opened up to private operators.

The new privately-operated public transport system was never made formal and there was no regulation from the state government. Private operators had no social obligations or requirements to comply with any quality or safety standards. After 2005, Indore was home to 550 private minibuses and 500 tempos (large three-wheeled motorcycle-based vehicles carrying up to 10 people) providing public transport, as well as around 10,000 auto-rickshaws. Only 16.4% of Indore residents were utilizing minibus services.

There was a clear need to re-establish a formal public transport system in Indore. It was under these circumstances that ICTSL was created on December 1, 2005. The idea to establish a system which was both fully privatized and strongly regulated by the city was conceived by the Collector and District Magistrate of Indore, Vivek Agrawal, now the Executive Director of ICTSL. Developing a modern mass transit system with private equity participation was partly inspired by the World Bank note, “India’s Transport Sector, The Challenges Ahead (2002)”,

² This section has been extracted from portions of the following paper:
Torres, M. (2008). *Innovative Public-Private Sector Cooperation in Urban Transport in India*. Transportation Research Board Annual Meeting CD-Rom. (Images have been added by the author).

which recommended a public transport corporation model having 30% capital investment of its own and 70% of private equity participation. Indore chose to apply this model, authorizing an initial investment of Rs2.5 million (US\$60,000) made jointly by the Indore Municipal Corporation and the Indore Development Authority to cover the venture's initial capital costs. The Indore public transport business model is unlike any other in India. ICTSL's entire business, from operations to maintenance to advertising, is outsourced. Although the company provides basic infrastructure and manages the public transport system, investment on buses and cost of operations are borne entirely by private operators. ICTSL's main sources of revenue are the monthly premium amount paid by operators for the right to operate a certain number of routes, share from advertising revenue, and share of revenue generated through passes. ICTSL plans, manages, controls, and monitors the system. It also identifies demand, designs the service network, fixes fares, allocates routes to competitively procured contractors, sets and enforces standards, ensures adherence to state and city legislation, and monitors quality of services. ICTSL management is entrusted to a Board of Directors with six members, all of whom are government officials. All contract operators are invited to board meetings and consulted on issues before decision making. The Superintendent of Police is a special invitee to ICTSL board meetings.

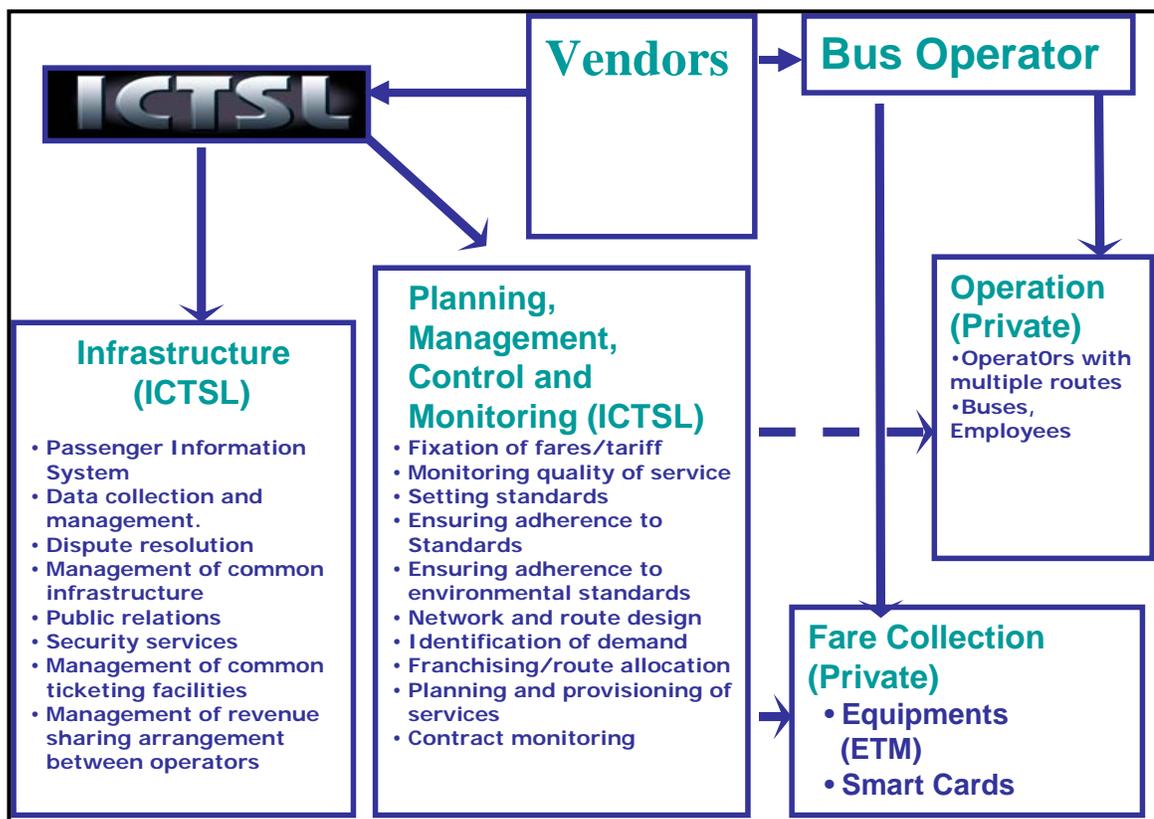


FIGURE III.1 - Business Model for Public-Private Partnership in Indore

Despite being new in India, similar PPP models exist throughout the world. ICTSL is an approach fully based on a competitive environment. Although the bus fleet was small enough to

be operated by a single operator, ICTSL set up its business on a platform for healthy competition. It attracted several small bidders for bus operations and managed to keep them engaged. In this way, small entrepreneurs grow with the market and quality of service is guaranteed. ICTSL also requests bids from businesses providing passes, offering maintenance services, selling GPS/PIS technology and support, and buying advertising space. The model adopted by ICTSL achieves three main goals:

1. Creates an attractive business by easing market entry barriers,
2. Establishes incentives to keep bidders engaged, and
3. Ensures collaboration among operators.

Attractiveness to Bidders: Easing Market Entry Barriers

ICTSL eased all market entry barriers in order to attract bids from operators of every size. ICTSL took the following steps to reduce the potential risk for operators and ensure guaranteed success:

Provision of Basic Infrastructure:

The Indore municipality is responsible for the maintenance and expansion of all transport infrastructures. It ensures that the road network is well maintained. It also provides modern, modular bus stops with LED “next bus arrival” displays self-financed through advertising revenue collected by the contractors covering the respective stops. The entire bus fleet operated by ICTSL utilizes a single depot, which the company operates and maintains. Security and management of common ticketing facilities are also provided by ICTSL. Although operators pay a monthly premium for the right to operate a number of routes, they are not charged any tax for the use of infrastructure. The provision of this infrastructure at a fixed cost to the operator frees them from responsibilities related to these expensive, but essential, components.

Financing Options and Standard Quality of Buses:

Acquisition of the bus fleet is part of the operator’s capital costs. ICTSL requires that all operators buy the same type of bus: a TATA Starbus. The Starbus is a two door, relatively low-floor with two doors for added convenience and efficiency. Although this locally designed and manufactured bus is not cheap, it is still affordable. In order to assist operators with bus acquisition, ICTSL made special financing arrangements with a bank, and escrow accounts were created among the bank, the company, and the operators.

Common Maintenance Services:

ICTSL hired TATA Motors as the main maintenance provider for the ICTSL fleet and provided the space for a maintenance workshop. Although operators are required to use TATA’s services and pay for the maintenance of their own buses, having a set maintenance provider frees operators from assuming the capital costs engendered by this service.

Provision of Basic Technology: ICTSL obtained Online GPS based bus tracking systems (OLBTS) and Passenger Information Systems (PIS). All ICTSL buses are equipped with a GPS tracking device providing the control room with real time data on the progress of the buses. The control room can contact drivers through a two-way cell phone mechanism to ensure adherence

to schedules and itineraries and take care of emergencies. It also collects and maintains data on running times, total kilometers traveled, and delays, in order to make constant adjustments for service improvements. The system of combined OLBTS and PIS technologies is both advanced and innovative. A common monitoring and control system benefits ICTSL by ensuring high quality of service and better coordination and analysis of the whole system. It also provides operators with a state of the art technology for monitoring of operations at no capital cost.

Standardization of Staff Wages and Training:

ICTSL enrolled the specialized services of experts to provide the operators' staff with training in service and soft skills. TATA Motor's engineers trained drivers on technical aspects, while the Indore Traffic Police trained them in driving styles and traffic rules. This measure relieved the operators from outsourcing this costly and important activity themselves, and ensured quality throughout the system. In order to avoid the negative effects of competition among operators for highly qualified drivers and conductors, ICTSL assigned a set minimum wage to be paid by all operators to their staff. This mechanism eliminates the possibility for more financially endowed operators to offer higher wages, ensures that wages are kept fair, and keeps staff turnover low for operators. The conditions indicated above reduced risk for potential operators and kept several bidders engaged. The company now contracts five operators to operate 89 buses. As ICTSL provides practically all the capital costs, expenses for operators are reduced to operating costs and a monthly premium for the right of operation.

Incentives for Operators: Why Engage?

Although many of the business risks are managed by ICTSL, this model has not yet been proven to work anywhere in India for an extended period of time. Why is it worthwhile for operators to engage in such a venture? ICTSL provides built-in incentives to allay the operators' fears, as well as an attractive business:

Longer term, Small Contracts:

ICTSL hires operators with long term contracts. These contracts are "5+1+1", meaning they are fixed for the first five years and may be extended for one or two more years based on performance. Long contract terms assure operators that if they are successful, they will be in business for an extended period of time. It also allows operators to lease or buy buses, which are their highest capital cost, on long term contracts. In addition, the whole system is parceled out in small pieces. This means that small operators are able to compete, and capital costs are kept low.

Exclusivity of Routes:

ICTSL net-cost (operators take fare revenue risk) contracts give operators exclusivity over their routes. Thus, operators bid based on expected passenger revenue, and are guaranteed income. Operators can calculate passenger revenues for routes and bid for the ones they wish to operate based on a certain amount of revenue expected.

Revenue Sources for Operators:

Operators are entitled to the full share of farebox revenue and 80% of revenue generated by riders holding passes. They also collect 60% of all revenue coming from on-bus advertising. Currently, the mainstay of revenue generation is daily fare collection: during 2006, Rs. 63.31 million (US\$1.54 million) was collected in passenger fares, fully covering operating costs and

Equated Monthly Installments (EMI). This financial model ensures sizable returns for operators assuming that the routes they bid on produce a net gain overall.

Rewards for Efficiency and increased customer satisfaction:

Operators are provided with incentives for self-improvement in both efficiency and quality of service. By improving in these areas, operators are increasing their gains and providing ICTSL with outstanding performance. First, there is an innate pay-off for improved efficiency. If operations are managed and performed more efficiently, operator's profit margin increases accordingly. This encourages operators to optimize their maintenance schedules in order to minimize downtime and encourage their drivers to work on areas where operations can be performed more efficiently. There is also a pay-off for increased customer satisfaction. Since operators earn all farebox revenue and a significant percentage of revenue from passes, increasing their customer base is essential for increasing their profit. The higher the quality of operators' services, the higher their ridership is likely to be, and the more their profit margin increases.

Engaging Several Operators and Ensuring Collaboration Amongst Them

Having numerous bus operators in the system keeps internal competition alive, but also creates complications. In order for the whole system to work successfully, operators need to work together. ICTSL must ensure that negative impacts of unregulated competition among operators are avoided.

Advantages to having more than one bidder:

There are several advantages to having more than one bidder. Most importantly, the internal competition engendered by this arrangement leads to higher levels of performance. Higher performance is achieved through ensuring good maintenance of buses and providing quality service. Thus, operators have adequate incentives to perform. Operators also see value in keeping their buses clean in order to acquire revenue from on bus advertising. ICTSL tendered advertising for FY07 at a rate of Rs.25,000 (US\$617.28) per bus per month. For that contract, ICTSL distributes the rights to advertising among operators based on quality of their buses. Naturally, the best-looking buses will be chosen to carry the advertisements, and it will be the operators of those buses who retrieve advertising revenue.

Ensuring Collaboration:

Advertising: Interestingly enough, while advertising promotes internal competition among operators it also promotes an incentive to collaborate. Advertisers are unable to distinguish among operators' buses, as all buses are the same model. Their decision to advertise on ICTSL buses is based on whether the buses they see on the street are clean and attractive enough to carry their company's message. Thus, there is a commonly shared responsibility among operators to make the entire ICTSL bus fleet attractive for advertisers, and an added incentive for their own buses to be even more attractive.

Operating the same buses: The incentive to keep buses well maintained and quality of service high goes farther than gaining advertising revenue. Customers are also unable to distinguish operators' buses. If one operator underperforms, its downfall may mean the downfall of the

remaining operators. Given the high percentage of income made from farebox revenue, maintaining overall quality is as much in the interest of ICTSL as it is for all operators.

Sharing basic infrastructure and services: Operators also share services and infrastructure. This arrangement encourages their cooperation. Operators share a common parking area. Sharing the same space and being under the constant scrutiny of peers creates innate pressure to park vehicles carefully and in an orderly manner which saves space. Second, there is a common interest to contribute to the improvement of shared services. This includes maintenance, one of the areas bearing highest operating costs. It is therefore in the interest of all operators to contribute to the solution of common maintenance problems, or to exert pressure on Tata Motors to perform better and deliver faster. Monitoring of operations is also a shared service. Therefore, operators will want to encourage their drivers to pay attention to malfunctions and potential improvements in the GPS system on buses.

Indore Today: Results

ICTSL began operations in January 26, 2006. Although it is yet to be seen whether or not this business model works for a much larger network and fleet, so far it has been remarkably successful. ICTSL began operating 37 buses and now increased its fleet to 89 buses. The over-all system is currently carrying 80,000 commuters a day on 22 routes. It is not possible to make before-after comparisons because none is relevant or available for the “before” situation. The Indore model has been praised and held as an innovative business model for urban public transport in India. The cities of Bhopal, Gwalior, Jabalpur, Udaipur and Kota are all replicating this model. ICTSL is now undergoing an aggressive expansion process, whereby it will implement a Bus Rapid Transit System including 41km of dedicated bus lanes operated under the same conditions and fully integrated with the current standard bus system.

ICTSL provides an adequate, competitive environment which promotes good quality service while avoiding negative effects of competition. It achieved the full separation between operations and policy, providing an effective and adequate overseeing entity and setting up a system that promotes efficiency and high quality service. ICTSL functions in accordance with NUTP’s incentives to promote private participation. The most interesting thing about Indore’s system is that unregulated private services are still operating in the same corridors that those contracted for by ITCL. This means that ITCSL is a fully competitive business model both internally and externally, and therefore incentives for performance are not only among its operators but also between itself and the existing unregulated private services.

In summary, the success of the “Indore Business Model” provides an important illustration of why the Government of India has placed Public Private Partnerships at the core of its National Urban Transport Policy. The institutional arrangements defined in Indore are now being assessed for applicability to other Indian cities, and it is hoped that the model may become a template for bus service implementation across the country.

III.3 Indore's BRT Proposal³

BRT Corridor Identification

Indore is now embarking on a BRT proposal for the city that aims to build on the achievements of ICTSL. The plan consists of 88.4km (54.9 miles) of median-based segregated runningways, linking the city's major activity centers (see Figure III.2).

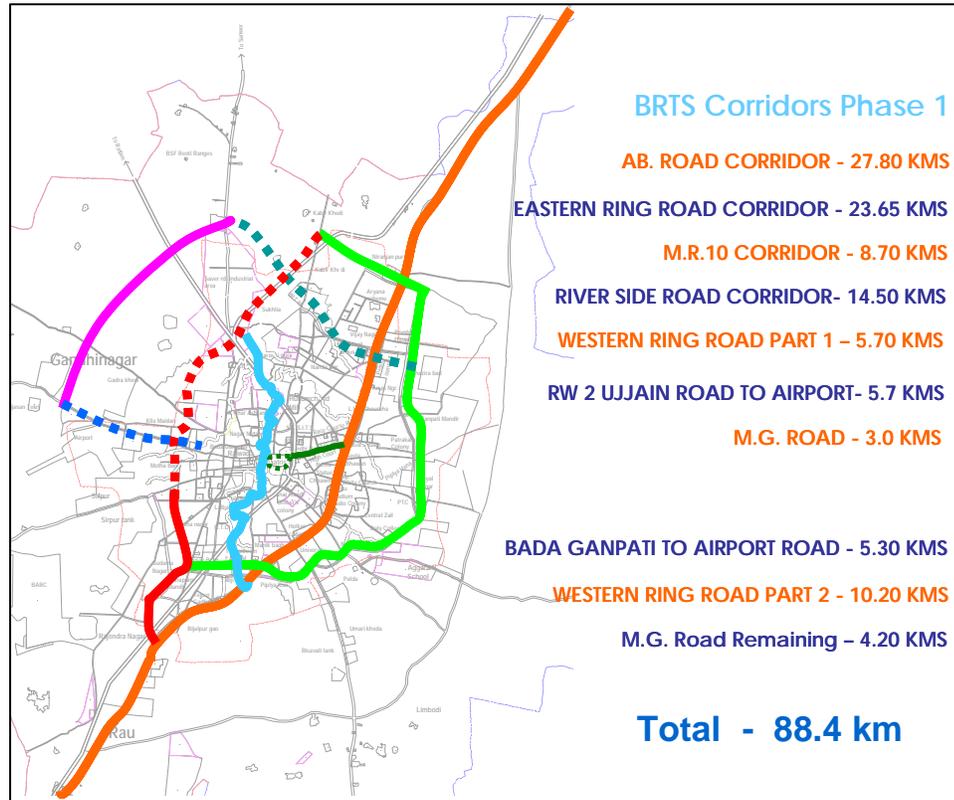


FIGURE III.2 - Indore's Proposed Network of BRT Routes

The proposal has been separated into two phases, Phase 1 and Phase 1A. Phase 1 consists of the A.B. road corridor, the Eastern Ring Road corridor, and the River Side Road corridor. Phase 1A consists of the M.R. 10 corridor, the Western Ring Road Corridor, the M.G. Road Corridor, and the feeder roads.

Road-Space Reallocation

The BRT project is the centerpiece of a wide-reaching mobility and urban renewal program that aims to revitalize the city through the re-allocation of road space on the corridors identified for BRT service. The city's wide corridors are currently characterized by relatively narrow sealed

³ The section is based on the following paper:
Mehta & Associates. (2006). *DPR on Indore Bus Rapid Transit System under JNNURM*. Indore City Transportation Services, Ltd. Indore.

thoroughfares bordered by large expanses of disused, or partially used, ground on which some illegally erected structures have been built over time. These narrow thoroughfares currently carry large volumes of fast and slow moving vehicular traffic in a highly congested and dangerous manner. This will be replaced by exclusive median bus lanes for the BRT system, bounded on either side by general purpose lanes, followed by the cycle lanes and pedestrian walkways. Thus, the different types of traffic are separated, permitting efficient and safe mobility. The type of road-space reallocation treatment will depend on the amount of cross-section width available, as shown in Figure III.3. Imminent domain has been secured on the Phase I corridors, and construction is now underway.

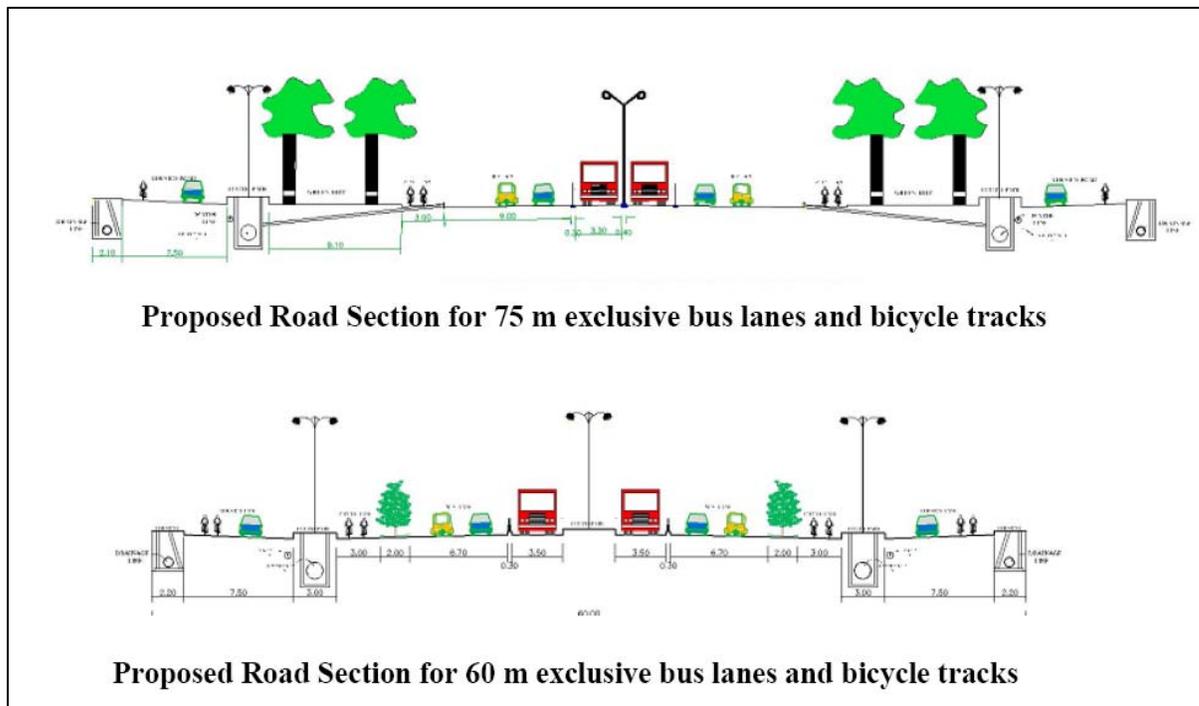


FIGURE III.3 – BRT-Based Road-Space Reallocation in Indore

A total of 201 bus station locations have been selected along the BRT corridors. The system will make use of low floor buses, making it more convenient for people to board and alight, and reducing station dwell times. The stations and buses will be designed to permit level boarding.

Project Costs and Finance Mechanisms

The plan is projected to cost a total of Rs. 868.15 Cr. (\$216M), divided into Phase I (Rs. 492.06 Cr., US\$123M) And Phase 1A (Rs. 376.09 Cr., US\$93M). This revenue will be obtained from three primary sources:

- Central Government grant through JNNURM Scheme (50%) - Rs. 434.07 Cr. (US\$108M)
- State Government Grant through JNNURM Scheme (20%) - Rs. 173.63 Cr. (US\$43M)
- Contributions from ICTSL and other local agencies (30%) - Rs. 260.45 Cr. (US\$65M)

ICTSL intends to generate its share of revenue through Public Private Partnership arrangements with bus operators, advertising agencies, and ticket vendors.



FIGURE III.4 – Visual Simulation of Indore River Side Road BRT Corridor



FIGURE III.5 – Visual Simulation of BRT on Typical Arterial Street