9th Urban Mobility India Conference & Expo 2016

Planning Mobility for City's Sustainability

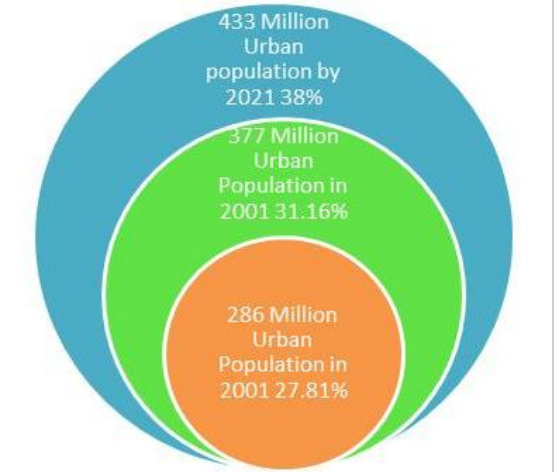
ADVANCING BUS-BASED PUBLIC TRANSPORT FOR GREEN URBAN MOBILITY IN INDIA

STRUCTURE

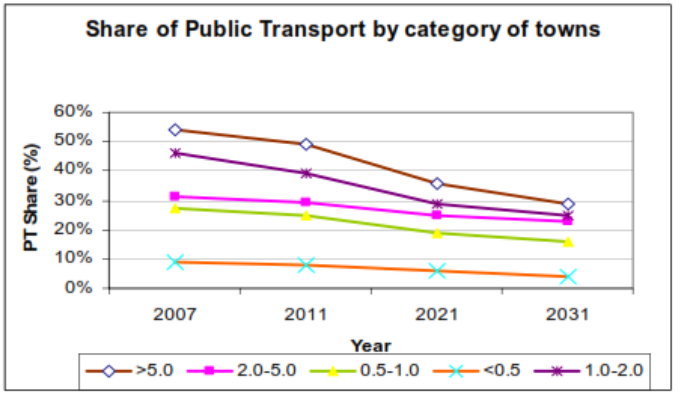
- Introduction
- Case Studies- Indian and International
- Lessons learned
- Discussion Agenda

Urban Transport Scenario in India

Rapid urbanization leads to rapid Motorisation	Public transport is inadequate	Increased air pollution
Multiple Authorities	Declining share of non-motorized transport	More Focus on Supply side
Low Investments on PT	Sheer neglect of pedestrians, cyclists	High road fatalities/injuries



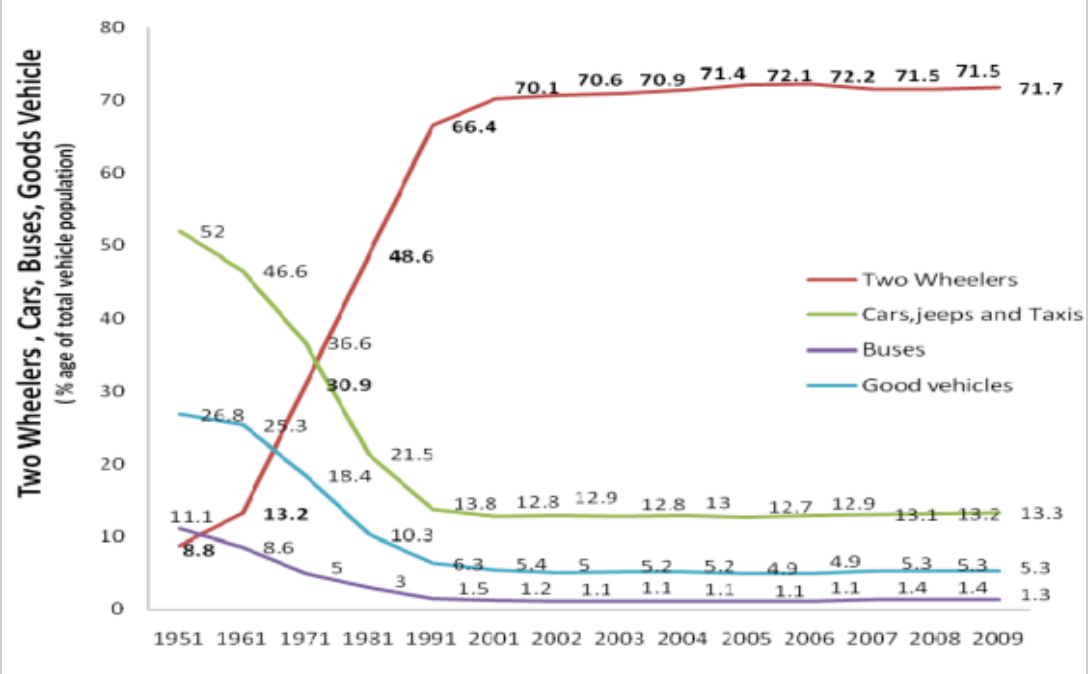
Functional responsibilities for urban transport are fragmented among central, state and local level governments where no one seems to be in charge of overall coordination.



City Bus Scenario in India

Modal Share of Public Sector Buses

Year	%
1961	32
1976	45
2012	8

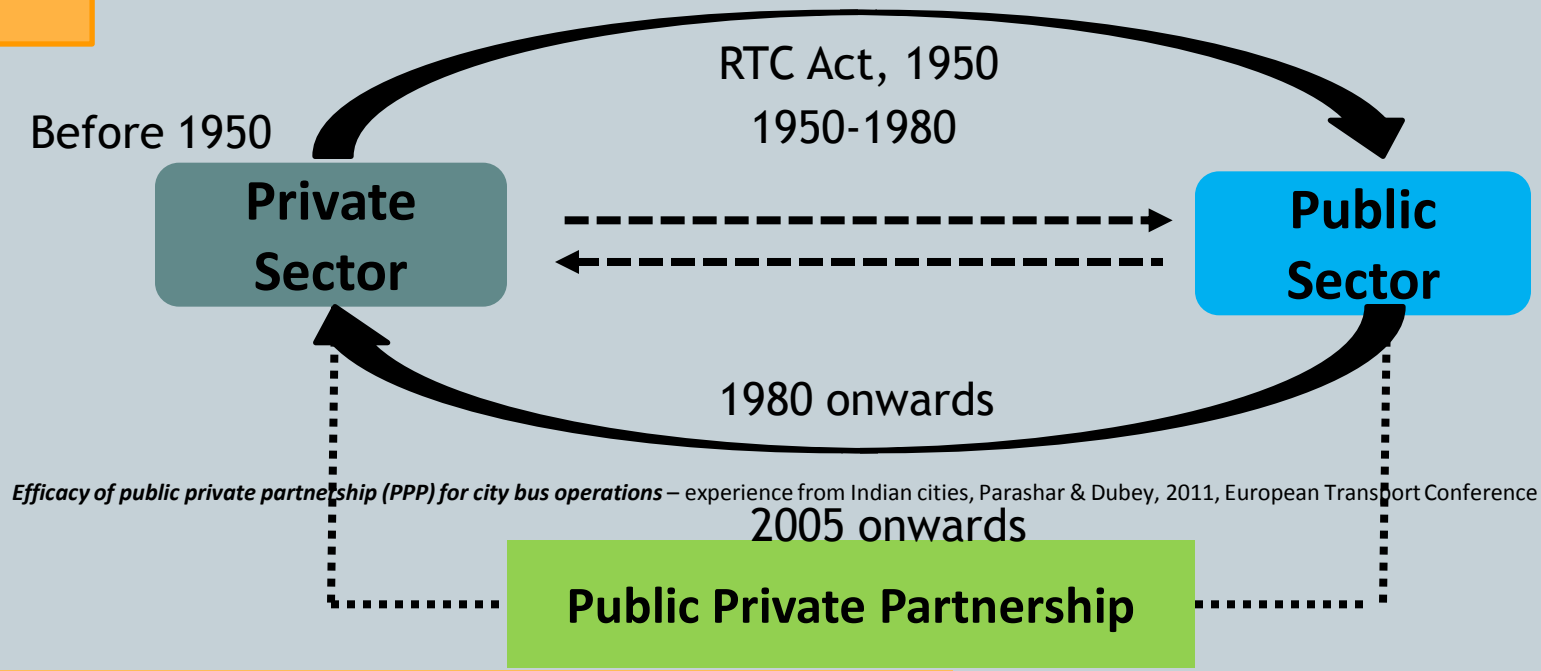


*Source : CIRT report 2015 on DPR for CERT

City Bus Scenario in India

Transport Organization	% fleet
Road Transport Corporations	75
Govt. Companies	17
Municipal Undertakings	4.5
Govt. department undertakings	3.5

City Bus Scenario in India- Evolution of PPP



Efficacy of public private partnership (PPP) for city bus operations – experience from Indian cities, Parashar & Dubey, 2011, European Transport Conference

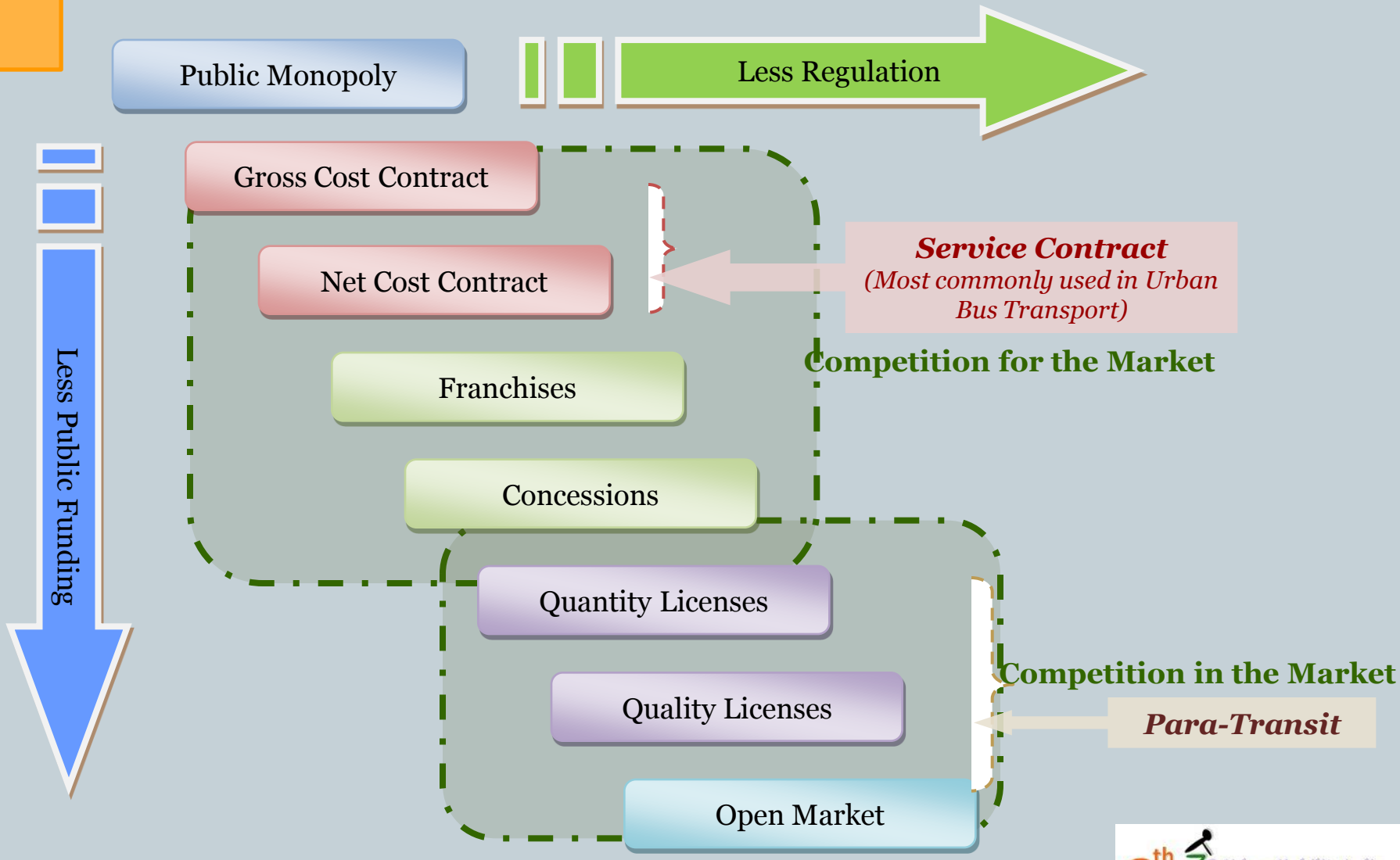
Reasons:

- 7th Five yr. Plan (1985-90)- Exclusive focus on urban transport
- Delinking of urban services from rural/inter city services of STUs
- Urban services an unviable proposition
- Loss making STUs keep showing interest in rural/inter city services

Government Initiatives

- Policy thrust towards PPP in city bus operations in 2005
- National Urban Transport Policy, 2006
- Bus-funding scheme & JnNURM

Types of PPP Contracts

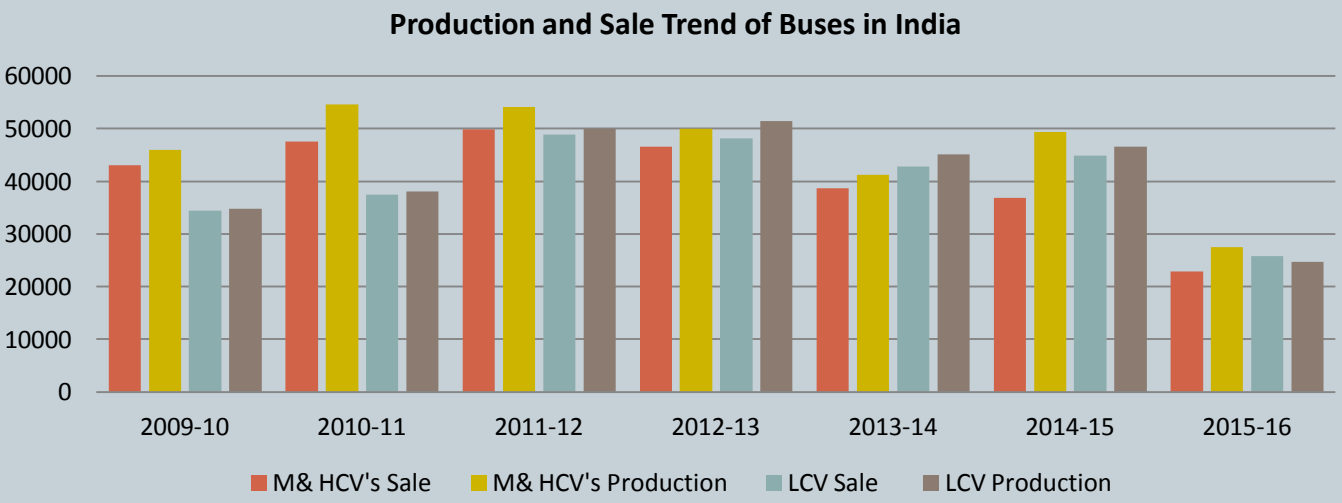


City Bus Scenario in India- Legal Framework

- **A statutory body** – formed within an MV Act, 1988.
- **Company** –Registered under the Company's Act of 1956, which gives it predefined powers for performing its roles and functions.
- **Registered Society** – under the Societies Registration Act of 1960
- **Corporation** – under the Road Transport Corporation Act of 1950

Challenges in Bus Sector in India

- **Policy -** CBS does not come in the priority of the Government while planning for cities
- **Institutional** - Multiple institutions with no common plan, agenda and program for Public Transport
- **Infrastructure** - lack of bus stops, proper depots and interchanges for the city buses
- **Industry** Few manufacturers with limited production capacity and finances



Challenges in Bus Sector in India

- **Regulatory -** No periodic fare revision system
- **Operator & Service provider –** Violation of permits and quality of service is not proper.
- **Capacity Building-** Inadequate Technical staff
- **Planning-** Lack of Comprehensive planning
- **Skewed Taxation-** Buses have more taxes than private vehicles

City Bus Scenario in India- Government Initiatives

- **Policy:**
  - NUTP 2006
  - National transport Development Policy Committee (NTDPC)
  - 12th Five year Plan
  - Urban Bus Specification (I and II)
  - Service level benchmark for Urban Transport in India
- **Program**
  - JNNURM
  - FAME India
  - Smart city
  - AMRUT
  - SUTP supported by world bank-GEF-UNDP-MOUD

City Bus Scenario in India- Outcome of Government Initiatives


BMTC 900mm Diesel


APSRTC -400mm CNG Non AC


UPSRTC 400mm Diesel Non AC


Uttarakhand 900mm Diesel


APSRTC 900mm Diesel


PMT 400mm CNG AC


Ujjain 900mm Diesel

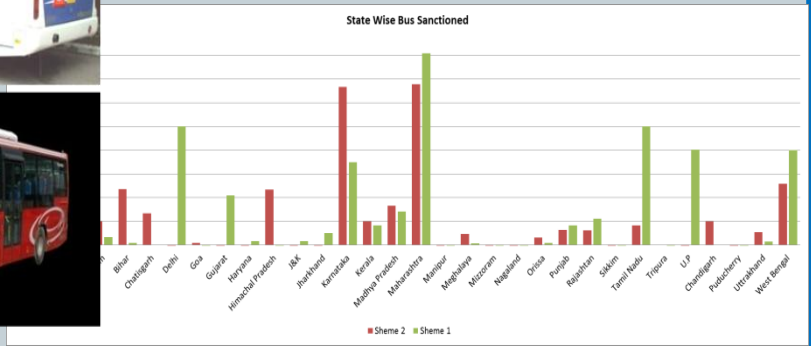

West Bengal 900mm Diesel


Nagpur 900mm Diesel


Nanded Mini Bus Diesel


BMTC 400mm AC

- Funding of buses under JNNURM
- Implementation of BRTS in 11 cities and Intelligent Transport System
- Implementation of Bus Sector reforms



Study Objectives

- **Market Assessment:** To assess the market in terms of International and Indian urban bus sector, technologies used, different institutional arrangements employed (i.e. public, private, PPP) and financial viability of different systems.

- **Investment Proposal:** to work out a proposal which shall be made indicating which bus technologies and associated infrastructure that could be adopted in India context.

International Case Studies

OLEV, Seoul, Korea: public transport system using a **"recharging road**" which is an electric vehicle using electromagnetic induction

BYD electric bus, China: BYD ebus, called K9 powered with its self-developed Iron-phosphate battery, featuring the longest drive range of 250 km (155 miles) on one single charge

Tindo, Adelaide, Australia- this vehicle is the world's first 100% solar-powered electric bus

Lessons Learnt

Factors	Adelaide, Australia	Gumi and Daejeon, South Seoul	Shenzhen, China
Policy	Promoting Green Travel	Deploying electric vehicles by 2020	Target to replace the complete fleet with electric buses by 2017
Financial support	High subsidies provided by the government		
Implementing Institution	Adelaide City Council-Mayor	KAIST	Shenzhen Municipal Transport Commission
Infrastructure	Solar based charging facilities	Shaped Magnetic Fields in Resonance	Charging stations
Environment	Environmental friendly		
O & M	PPP –Torrens Transit	KIAST	3 operators with SMTC share
Integration with other modes	Yes		
Planning	Fixed route	Fixed Route with charging infrastructure	Special areas demarcated for 3 different operators
Capital cost (includes infrastructure)	3.5 crores	3.4 crores 2.7 crores per station	2.6 crores 1.7 crores per station

Inference

- Bus Cost is high.
- Allied infrastructure is complex and expensive.
- Patented Technology – No open market.

Indian Case Studies

City	Population	Operational Model	Type of fuel used
Bangalore	8,443,675	BMTC	Diesel
Pune	31,24,458	PMPML and private	CNG & Diesel
Lucknow	30,38,996	LCTSL	Diesel
Ludhiana	16,18,879	SPV and Private	Diesel
Ahmedabad	55,77,940	ANMARG & AMTS	CNG & Diesel

Lessons Learnt

What we have

Policies/Schemes-NEMMP 2020, FAME, NGT, Bureau of Energy Efficiency, National Auto Fuel Policy 2003, Auto Fuel Vision & Policy 2025, NUTP 2006, AMRUT, Smart City Mission, MV Act,

Subsidies –regulators and manufacturers

UBS II- Bus Manufacturing guidelines

PPP- Model contract

Initiatives by cities – DTC, BMTC, Navi Mumbai, Nagpur

International **fund** – GEF 5, KfW

Capacity Building-LUTP, SUTP, UMI

Implementation of Policy at city level

Cost effective subsidy to be provided for bus and ancillary infrastructure

Coordination between authorities

Strengthening of SPV- **legal Backing**

R & D in alternative fuels

Open market for technology

Strengthening of PPP model

Comprehensive Planning & implementation

Skilled Manpower at all levels

What we need

Bus Fuel – A Comparative Picture

Parameters	Diesel	CNG	Bio fuel	Hybrid	Electric
Power Source	Diesel	CNG	Derived from organic materials	Electricity+ fuel (Diesel or CNG)	Electricity
Power Generator	IC engine	IC engine	IC engine	IC engine + battery	battery
Range (kms)	484(AC Volvo) and 560 (Tata)	260-390	NA	286-520	240
Bus Cost (INR)	20-88 lakhs	20-88 lakhs	20% higher than standard diesel buses .	> 3 crores	2.6 crores
Fuel efficiency	2.2-3.3 km/l	2-3 km/kg	3.3 miles/edge (Source: US dept of Energy 2012)	2.4 km/l	1.5 kWh /km
Life cycle of buses	8 years	8 years	NA	10 years (Source: Shenzhen Bus Company)	
Return on Investment	4 years	NA	NA	5- 7 years*	5-7 years*

Bus Fuel – A Comparative Picture

Parameters	Diesel	CNG	Bio fuel	Hybrid	Electric
Emissions	CO2, Nox and black carbon levels are higher	CO and HC levels are higher	Significant savings on CO2 emissions, PM emissions are negligible with 30%-80% reduction in NOX compared to diesel	Low (less CO2, NOX, SOX and NMHC) up to 30% lower	Zero emissions from tailpipe
Infrastructure Requirement	Existing infrastructure	New refuelling infrastructure and safety modifications	Expensive ,new infrastructure to be developed	No special infrastructure required.	Expensive , new infrastructure to be developed
Infrastructure cost	$ 8,625 / bus (Source: MTA New York City Transit)	$ 1,55,000 per bus (Source: MTA New York City Transit)	5-8 per cent higher than diesel (Source: Stockholm)		400,000 US $ per bus (Source: BYD)
Operational readiness/market response	Established market	market well developed	similar to CNG; makeover is easier.(Nagpur)	Cost is 50% more than standard diesel buses.	immature technology with high cost. (Bangalore and Delhi)

Way Forward

Central Government –Creating wider awareness and acceptance level at Political and Administrative level for promoting bus based advance technology

State Government – Priority cities need to be identified to run CBS on non conventional fuel bus technology

City authority – Comprehensive planning for Operation and Management and develop ancillary infrastructure including ITS

Manufacturers- Should undertake R&D on priority basis to switch over to new technology. Government should provide incentives

Operator- Made aware about the benefits of technology

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Discussion Agenda

1. **Integrating the private and public sector in urban public transport**

- What are models for integrating the private bus sector?

- What is effectiveness of different institutional arrangements for managing bus systems? (e.g. transport department, SPV, Municipal Corporation, Private Operator with Service-level agreements (such as DIMTS))

Discussion Agenda

2. **Integration of different transport modes (NMT, metro, LRT, bus, ferry...)**

- How to link integration with SMART city plans?
- What are the observed best practices of Bus Sector in India?
- What is role of intelligent transport systems / other IT-based innovations for improved integration like Kochi-1 app?
- How important is integrated time schedule and ticketing systems?

Discussion Agenda

3. Facilitating fuel technology policy changes

- What are the new fuel technologies and hybrid technologies?

- How can suitable innovation in fuel technology be introduced?

- What is the need of favourable initial financial support for newer technologies?

Discussion Agenda

4. Bridging the financial viability gaps

- On what basis does or should government programs subsidize bus transport?
- How to improve revenue streams and expand sources?
- What is role of UMTAs in achieving balanced sustainable financing?

Thank You!!!!!

Gross Cost – Pros and Cons

Pros	Cons
Easy bid process and contract management	Risk of revenue leakage borne by public entity
Flexibility in changing schedules based on needs	No incentive for high ridership
Flexibility in changing fares	Need effective monitoring
Flexibility in changing in services	Financial commitments of public authority can be high
Limited potential for disputes	Higher cost of staffing, monitoring operation & revenues
Better integration between modes/services	
Avoid discrimination against concession fare passengers	

Case Study – Ahmedabad, BRTS

- SPV-JanMarg contracts and monitors
- Buses procured by operator and operating on gross ***cost + incentives*** basis
- Minimum guaranteed kms committed by SPV (72,000 kms per annum)
- SPV has financial as well as manpower support from MC
- Fare revision linked with change in fuel price & WPI, periodic revision on 1st April of every year (automatic and free from political interference)
- Cost/km revision wrt change in fuel & WPI
- Incentives/penalties linked with pre-defined performance parameters
- Change in schedule, fleet size at the discretion of SPV
- System sustainability: profit

Net Cost – Pros and Cons

Pros	Cons
Risk of revenue leakage borne by operator	Risk of passenger capture techniques being adopted
Effective incentive for high ridership	Need to specify fares and other details upfront
Financial commitments of public entity are low	Complex tendering and contracting process
	Difficult to make changes (route, schedule, fleet size) during contract period
	Potential for disputes high
	Cut-corner in services for maximising the profit

Case Study - Bhopal

- SPV contracts and monitors for 8 years extendable for 2more years
- Moratorium period 4 months
- Hand holding support by UMTC
- Buses procured by SPV (funded under JnNURM) and contracted to private operator on net cost basis
- No subsidy from SPV
- Rationalization of the routes including IPT
- Exclusivity provided on routes initially but not enforced
- Automatic fare revision formula but not implemented
- System sustainability: breaking even