Social cost benefit analysis of Delhi metro

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Presentation and interpretation by Vikram

Analyst will rely on project documents

Table 2: Sources of Funding

Cost Financed By	Phase I	Phase II
1) Equity (50% each by GOI & GNCTD)	30%	30%
2) Long Term Debt (OECF, Japan) @ 3% p.a. or less	60%	56%
(with a 10 year moratorium period and 10 year repayment period)		
3) Revenues From Property Development	7%	5%+ 5% (internal resources)
4) Subordinate Debt	3%	4%

Source: RITES (1995a)

Table 3: Cost Estimate of DM (Phase I)

(Rs. Million)

Items	Foreign Exchange	Local Cost	Total
Civil works	0	31327	31327
Electrical works	0	6970	6970
Signaling and telecommunication	2574	1930	4504
Rolling stock	4596	6403	10999
Land	0	3339	3339
General establishment and consultancy charges	322	4779	5101
Contingencies	230	1593	1823

Source: RITES (1995a)

Year	Capital Cost
1995	2574
1996	3937
1997	6036
1998	8625
1999	9498
2000	10110
2001	9069
2002	7353

Estimates / structured imagining?

Table 7:Estimates of Daily Passenger Trips by Metro (in lakhs)

Year	Daily Passenger Trips
2002	12.63
2003	20.15
2004	23.86
2005	31.85
2006	33.17
2007	34.55
2008	35.97
2009	37.46
2010	39.01
2011	40.63
2012	41.81
2013	43.03

Year	Revenue
2005	15052
2006	17152
2007	19407
2008	21826
2009	24421
2010	33762
2011	37112
2012	41057
2013	44511
2014	50847
2015	49633

Economic agents affected by the metro

- Government
- Passengers
- General public
- Private transporters
- Unskilled labour

Government

- Fare box revenues
- Property revenues etc.

- Revenue loss due to displaced public buses
- Operation and maintenance cost
- Saving road and costs of buses

- Net benefits 2011-12 Rs 32 billion 2004 prices

Passengers

- Metro fares Rs 35 billion, displaced public bus revenue Rs 10 billion
- Time saving those who travel and those on road also (decongestion). Estimate: Rs 22 billion
- Net gain: Rs 22 billion

Private transporters

- Lose revenue, gain savings in cost,
- Net loss Rs 29 billion

Unskilled labour

- Difference project wage and wage otherwise
- Benefit: Rs 0.3 billion

General public

- Investment, foreign exchange, environment

- Pollution benefits Rs 6.9 billion
- Net benefits: Rs 14 billion

Net present economic benefits

- Benefits estimated 1995-2041
- Rs 232 billion to Rs 432 billion

Income distributional weights

- Govt of India: 1
- General public: 1
- Passengers: 0.34
- Private transporters: 0.13
- Unskilled labour: 1.87

Methods

- Costs: investment, O&M: rites
- Fare box revenue (projections) rites
- Diverted traffic: rites
- Savings in fuel: rites
- Pollution: reduction in pollution level estimated, and cost of abatement, or cost of health (previous studies by Professor Murty)
- Time saving of passengers amount and value: rites

In the light of the developments in the causal inference literature

- A cost benefit analysis can be viewed as a bundle of causal claims
- Outcome with project – outcome without project
- Because of huge informational demands, use some study which is broadly descriptive or predictive rather than rigorously counterfactual (not possible here)
- P.20 Number of persons killed in road accidents in a year = 49 * Number of vehicles affected in lakhs + 750, “R sq = 0.89”

Dinesh Mohan: critique (EPW)

- The original feasibility study for developing a metro system for Delhi justified the economic feasibility of the system projecting a daily ridership of 3.1 million passengers by 2005 [RITES 1995].
- then in 2005 further reduced to 1.5 million a day.
- Mohan: The system is actually operating at around 0.6 million passengers per day at the end of 2007, less than 20 per cent of projected capacity. (1.65 million per day in 2011; Seoul much more).

Were the passenger trip projections optimistic?

- Can “data science” help?

Another view

- Need metro + buses in a modern megapolis: hard to integrate historically evolved bus services with more modern metro services: turf wars, different organizational cultures, different ultimate political masters at times etc. Cities not really empowered.
- Only metro can compete with cars?
- Quality of metro ride much better than bus

Other ways

- Cost-effectiveness is relatively straight forward. Compare costs of providing some outcome between 2 or more options: for example, passenger kms by bus or metro.
- Multi-criteria analysis: rank alternatives according to multiple criteria: bus or metro by cost, convenience to passenger, safety etc.