Urban Transport Planning: Lessons from the Proposed Pune Metro Rail

ASHOK SREENIVAS

This article critically analyses the decision-making systems behind the proposed Pune metro rail system and its detailed project report, exposing several weaknesses in both. The decision-making system is seen to be ad hoc, and not sufficiently transparent or participative. The DPR suffers from serious methodological and analytical errors, and has exaggerated the benefits from the proposed project. This analysis, along with the experience from other cities, suggests that cities are increasingly seeking single large, big-budget solutions to their urban transport problems without exploring the many simpler, cheaper and more effective options available.

In early 2010, the Pune Municipal Corporation (PMC) approved a proposal to build a metro rail system in the city based on a detailed project report (DPR) prepared by the Delhi Metro Rail Corporation (DMRC 2009). This decision was taken despite concerns raised by many citizen groups and experts about various issues such as the choice of gauge and its impact on system cost, throughput, etc, financial burden-sharing by the citizens of Pune, impact of an overground metro on the city’s heritage and skyline, impact of the proposed routes on buildings in the city and impact of the proposed floor area ratio (FAR) increase. In this article, we critically analyse both the decision-making process behind the approval of the metro rail proposal and the proposal itself. The analysis also leads to broader questions regarding planning and governance of urban transport in the country.

The proposal initially approved by the PMC was for two corridors of metro rail. Subsequently, due to a delay in arriving at an agreement with neighbouring Pimpri-Chinchwad regarding corridor I, the PMC decided to proceed with corridor II which is entirely within its jurisdiction.

Table 1 gives an overview of the proposed metro rail system. The capital costs are not inclusive of any taxes and are based on September 2008 prices, amounting to around Rs 226 crore per km. The proposed peak hour headways for the corridors are about 3.5 to 4.5 minutes for corridor I, and 8 to 12 minutes for corridor II. The ridership estimates are based on dense (or super-crush) loading of eight persons per sq m. The DPR predicts that at this ridership and cost, the proposed metro rail will have a positive socio-economic impact on Pune.

### Table 1: Details of the Proposed Metro Rail System

<table>
<thead>
<tr>
<th>Corridor</th>
<th>Length (Km)</th>
<th>Overground Stretch (Km)</th>
<th>Estimated Cost (Rs cr)</th>
<th>Expected Daily Ridership</th>
</tr>
</thead>
<tbody>
<tr>
<td>I: PCMC-Swargate</td>
<td>16.5</td>
<td>11.5</td>
<td>4,911</td>
<td>34,838</td>
</tr>
<tr>
<td>II: Vanaz-Ramwadi</td>
<td>15</td>
<td>15</td>
<td>2,217</td>
<td>13,630</td>
</tr>
</tbody>
</table>

Source: DMRC 2009.

1 Decision-Making Processes

We reconstructed the timeline of various events that led to the approval of the metro rail proposal by the General Body of the PMC, based on answers to a set of questions under the Right to Information Act. An analysis of these replies suggests that the DPR was commissioned without sufficient justification, the terms of reference for the DPR were weak and there were weaknesses in the PMC’s governance processes and engagement with citizens.

1.1 Ad hocism

The PMC commissioned the DMRC to prepare a DPR for a metro rail based on the views expressed at two meetings involving city members of legislative assembly (MLAs) in June and September 2006, and a previous study by the Rail India Technical and Engineering Services (RITES 2001). But the scope of the task given to RITES for its report was only to forecast the demand for a high capacity mass transport network and identify suitable corridors for it. Thus, the RITES report was also commissioned presuming the need for a high capacity network rather than to evaluate whether one was needed. The only other justification cited by the DMRC is a guideline from the Ministry of Urban Development (MUD) that all cities with a population of over three million should consider metro rails. However, this guideline itself is questionable as the need for a metro rail is not dependent only on the city’s population but also on the city form, presence of a central business district, etc (Mohan 2008).

The terms of reference given to DMRC for the DPR only asked it to identify about 30 km of suitable corridors for a metro rail system. This is despite MUD’s guidelines for mass transit DPRs, clearly stating that such DPRs should be part of an integrated, comprehensive plan, provide an analysis of alternatives, details of stakeholder consultations and details of feeder networks, parking and para-transit facilities. Further, the 30 km figure mentioned in

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the terms of reference also appears to be without basis as even the earlier RITES report had suggested an initial phase of only 22.5 km.

Therefore, it may be said that the DPR for Pune's metro rail was commissioned based on some ad hoc recommendations and without any previous comprehensive multimodal study of Pune's transport justifying the need for a metro rail. Moreover, its terms of reference did not comply with the guidelines of MoUD and consequently the report submitted by the DMRC did not consider alternatives, feeder services, etc.

1.2 Governance Processes
The governance processes adopted during the decision-making for Pune's metro rail also raise some serious questions:

(i) The PMC put up the metro rail DPR on its website soon after it was received. However, it did not actively seek public inputs and initiate a public debate about this. In fact, the appendix to the letter from the PMC to the Government of Maharashtra requesting approval for implementing corridor II mentions that since the DMRC are proven experts regarding metro rail, their report needed no critical review by an independent committee.5

(ii) Six months after the DPR was submitted, the Standing Committee of the PMC approved it in just one day based on a request from the municipal commissioner. Some members of the Standing Committee admitted later at a public meeting that they approved the DPR without even reading it, “believing” it was in the city’s best interests.

(iii) The PMC organised a “public hearing” in June 2010 – which was very unstructured and disorganised – to understand citizens’ grievances about the proposed metro rail. The PMC’s request to the Government of Maharashtra seeking permission to proceed with corridor II claimed that grievances raised at the hearing had been addressed satisfactorily.6 However, as the following examples from the appendix to the request show, the answers were rather unsatisfactory.

(i) It states that previous studies like the Comprehension Mobility Plan (CMP) were conducted to finalise routes for the metro rail and that the metro rail was suggested in the CMP, even though the latter was commissioned after the metro rail DPR. Indeed, the metro rail DPR does not even mention the CMP, while the CMP refers to the DPR, clearly pointing to their relative chronology.

(ii) It states that the viability of the project would be ensured by private funders who may fund 50% of the project cost. Such a statement coming from a public authority such as the PMC is of grave concern and displays a lack of understanding of the distinction between financial viability of a project and its social desirability.7

(iii) It states that fare box revenues will not be sufficient for a reasonable return on investment,8 investors would necessarily depend on some form of government support in the form of viability gap funding, higher taxes, free or subsidised land concessions, etc – all of which would be paid by citizens.

1.3 The metro rail project is recommended by the government of Maharashtra and its implementation starts from the government of Maharashtra.

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(iv) It states that the plan prepared by the DMRC is a comprehensive transport plan though PMC’s own terms of reference to DMRC clearly state that its job was only to identify approximately 30 km of metro rail along feasible corridors.

(4) The PMC agreed to extend the proposed corridor II to the current airport and Kharadi subject to demand, finance etc. These extensions seem arbitrary as there are no studies to justify them, particularly when a new airport has also been proposed for Pune.

(5) The PMC approved an FAR increase by four, stating that it was required to increase metro rail ridership and raise finances for it. However, the DPR predicts a dense load of eight persons per sq m with the current land use pattern, suggesting that corridor densification is not required for the desired ridership. If anything, the increased FAR would only increase congestion along these corridors. As the DPR states that only 6% of total revenue is expected from property development,10 the FAR increase is not critical to finance the metro rail. This raises doubts about the true motives for the proposed FAR increase.

2 Pune Metro DPR: A Critique

In addition to ad hoc decision-making, weak governance and inadequate public engagement by the PMC, our analysis also identifies serious shortcomings with the DPR submitted by the DMRC (2009). These include methodological errors and huge overestimation of the benefits from the metro rail which are then used to demonstrate that it has a positive social impact.11

2.1 Methodological Problems

The following are the methodological problems in the DPR submitted by the DMRC:

(i) The DMRC commissioned a report from IIT Bombay to project ridership along potential metro rail corridors (IIT Bombay 2008). To do this, the institute used a “stated preference survey” asking citizens for their preferred mode of public transport from among various alternatives. Such surveys need to be carefully designed as they can introduce a bias in the respondents’ answers. The IIT survey used a leaflet which stated that the Pune metro will provide “cost of travel comparable to bus fare, trains will run at convenient frequency of three minutes during peak hours and comfortable sitting in A/C environment”. None of these claims holds true in the DPR.12 Therefore, the ridership figures were estimated from a deeply flawed consumer survey, which advertised a service that was very different from the service that was actually designed.

(2) The commuter survey also asked respondents to choose between the proposed metro rail and current frequencies and capacities of existing modes. This ignores the possibility that frequencies and performances of both the existing bus system and suburban rail system can be significantly improved at a fraction of the cost and time required for the metro rail. In other words, the metro travel demand was forecasted by comparing an ideal yet-to-be-implemented metro rail with the current state of other neglected and under-funded public transport services.

(3) Public transport modes such as the metro rail are considered desirable because they can wean people away from their private vehicles. For this, various public transport modes must complement rather than compete with each other. However, the DPR is silent about integrating the metro rail with other public transport modes. In fact, the two proposed corridors compete with the proposed bus rapid transit (BRT) and existing suburban rail along their entire length.13

In addition to these methodological errors, the report also contains many data anomalies and inconsistencies which raise more questions about the quality of the DPR.

2.2 Cost-Benefit Analysis

One of the key justifications given by the DPR for its proposal is a cost-benefit analysis which shows that the socio-economic benefit of the project outweighs its costs.14 The costs considered in the DPR are the capital and operational costs, while societal benefits are said to arise from various categories such as savings in time, fuel, vehicle and infrastructure maintenance cost. It is questionable how much productive use can be made of the few minutes saved per trip by a person, and whether items such as reduced vehicle maintenance costs should even be considered. Moreover, the costs considered in the DPR do not include the cost of capital.

Even if we overlook these discrepancies, the cost-benefit analysis given in the DPR is flawed. The DPR estimates total benefits to society from the metro rail in three horizon years – 2011, 2021 and 2031. We show that the benefit claimed for 2011 is vastly overestimated – the same analysis also applies to the other years. We analyse the three categories (time savings, vehicle maintenance savings and fuel savings) with the largest claimed benefits and provide alternative estimates using data from the DPR itself such as trip length distribution and metro rail ridership, augmented with a set of conservative assumptions such as fuel cost of Rs 60 per litre, average mileage of 45 km/litre and annual maintenance cost of Rs 3,000 for two-wheelers; and 10 km/litre and Rs 15,000 respectively for cars.15 Other assumptions made are explained at appropriate locations below.

2.2.1 Time Savings

According to the DPR, the most significant reported benefit accrues from the value of time saved by shifting to metro rail from other modes. Each metro rail trip is estimated to save 45 minutes in 2011 and the claimed money-equivalent savings of the aggregate annual time saved adds up to 56% (Rs 524 crore) of the total claimed annual benefit (Rs 934 crore). This includes not only time saved in travel but also the walking and waiting time for one’s transport and money/time equivalent of factors such as travel comfort.

Many reports, including a study commissioned by the DMRC, state that average peak hour road speed in Pune is about 20–25 kmph, while the speed of the proposed metro rail is 33 kmph (WSA 2008a and 2008b; IITB 2008; DMRC 2009). The DPR also states16 that 75% of the journeys are less than nine km. Assuming an average speed of 20 kmph for other modes, 75% of the journeys would take a maximum of 27 minutes by other modes and 16 minutes by metro rail. Therefore, the travel time saving is just 11 minutes for 75% of the journeys.

Metro rail users who have shifted from two-wheelers or cars would not save any time in walking to the metro rail station
Weekly -

- 17

- 30

- pay a penalty of 15 minutes per trip (10

- conservatively assume that all bus users

- able to buses at peak hour. Even if we

- eight persons per sq m which is compara

- metro rail is designed for dense loads of

- a bus system can easily match and (b) the

- only four and eight minutes in 2031, which

- questionable because (a) peak hour head

- waiting time and discomfort factors are

- than metro rail stations. Even the higher

- are likely to be closer to homes and offices

- saving due to higher waiting time and dis

- could perhaps have some time-equivalent

- ridership estimated for the metro rail is

- based on dense loads of eight persons per

- sq m, they would also not gain anything

- from added travel comfort. Therefore, the

- maximum saving for all such metro rail

- users would be at most 11 minutes over

- 75% of the journeys, with actual savings

- even lower due to reduced time savings

- and comfort.

- Users who have shifted from buses

- could perhaps have some time-equivalent

- saving due to higher waiting time and dis

- comfort factors, though their walking

- time is likely to increase since bus stops

- are likely to be closer to homes and offices

- than metro rail stations. Even the higher

- waiting time and discomfort factors are

- questionable because (a) peak hour head-

- way of the proposed metro rail corridors is

- only four and eight minutes in 2031, which

- a bus system can easily match and (b) the

- metro rail is designed for dense loads of

- eight persons per sq m which is compara-

- ble to buses at peak hour. Even if we

- conservatively assume that all bus users

- pay a penalty of 15 minutes per trip (10

- minutes for waiting and five minutes for

- discomfort), 75% of bus users switching to

- metro rail would have a time-equivalent

- saving of only 26 minutes as their jour-

- neys would be less than nine km.

- This suggests that the time-savings

- component presented in the DPR is vastly

- overstated. A detailed analysis (see Sec-

- tion 2.2.4) shows that even if all the metro

- rail trips are by users who switched from

- buses (thus providing maximum time sav-

- ings), the total time savings in 2011 comes

- only to Rs 273 crore or just 52% of the

- claimed benefit of Rs 524 crore savings.

- 2.2.2 Fuel Savings

- The DPR estimates Rs 123 crore in fuel sav-

- ings in 2011 by considering a modal shift to

- metro rail from other modes. This does not

- account for behavioural changes such as in-

- duced travel and longer commutes that

- may result because of the introduction of a

- metro rail system. Even if one ignores such

- oversights, the claimed benefits in this cat-

- egory are still overestimated.

- Based on the assumed fuel efficiencies

- for two-wheelers and cars, and actual bus

- fares projected for 2011, our estimates

- show that fuel savings are only to the tune

- of Rs 37 crore (30% of claimed benefit)

- under a reasonable scenario of 35% of

- metro rail users switching over from

- buses, 40% from two-wheelers and 25% 

- from cars. It is only in a scenario where

- about 65% of the metro rail users switch

- from cars (thus providing the greatest fuel

- savings), that the estimated fuel saving

- come close to the claimed saving. But note

- that such a metro rail usage pattern would

- greatly reduce time savings.

- 2.2.3 Vehicle Savings

- The second highest category of claimed

- savings (Rs 161 crore in 2011) comes from

- savings in vehicle maintenance costs. Using

- our assumption of a 50% reduction in

- vehicle maintenance cost of persons

- switching to the metro rail from their

- vehicles, the estimated saving in this cat-

- egory is only Rs 60 crore in 2011 (37% of

- the claimed benefit) when 35% of metro

- rail users come from buses, 40% from two-

- wheelers and 25% from cars. The claimed

- savings become possible only when about

- 85% of metro rail users have shifted from

- cars. Note once again that such a large shift

- from cars greatly decreases time savings.

- 2.2.4 Benefit Comparison

- We now consider different possible rider-

- ship scenarios for the proposed metro rail 

- and estimate likely benefits in 2011 and 

- compare them against the benefits

- claimed by the DPR. Each scenario rep-

- presents a particular combination of shifts 

- from buses, two-wheelers and cars to me-

- tro rail and benefits under these scenari-

- os are calculated using the DPR’s methodo-

- logy in spite of our reservations about it.

- Figure 1 presents the benefit under dif-

- ferent scenarios. The DMRC scenario 

- represents the benefit claimed in the DPR,

- while scenario x-y-z represents x% of metro 

- rail users coming from buses, y% from two-

- wheelers and z% from cars. The 0-0-100

- and 100-0-0 scenarios represent the ex-

- treme cases where all metro rail users come

- from either cars or buses respectively, and

- correspond to the maximum overall esti-

- mated benefit and maximum benefit from

- time saved. This is followed by six scenari-

- os, each representing a “reasonable” modal

- shift. As can be seen, the estimated benefit

- in each of the scenarios is considerably lower
than claimed in the DPR. The highest estimated benefit is in the extremely unrealistic 0-0-100 scenario which is also 36% lower than claimed. The estimated savings in all other scenarios (including the 100-0-0 scenario) is only about 40% of the claimed savings, thus establishing that the benefits claimed in the DPR are highly exaggerated.

2.2.5 Desirability of the Metro

Based on the presented cost and benefit flows, the DPR concludes that the proposed project has an overall socio-economic return of about 5% at a 12% discount rate, and hence is good for the city. We calculate the socio-economic net present value (NPV) of the metro rail (also at 12% discount rate) using our benefit estimates and the costs given in the DPR under different scenarios (Figure 2, p 30). As can be seen, the proposed metro rail has a negative socio-economic NPV in all the scenarios according to our estimates, despite our conservative assumptions. We have also not considered issues such as not achieving the projected ridership as seems likely (Mohan 2008). This raises serious questions about the DPR and whether the proposed metro rail is desirable at all for Pune.

Given the serious flaws in the DPR suggested by our analysis, it should be critically reviewed by the state as well as the central government. In addition, the Delhi metro’s under-achievement of ridership and questions asked about its accountability and governance by the Comptroller and Auditor General strongly indicate that DMRC project reports must not be accepted on faith by city administrations (CAG 2008).

3 Lessons for Transport Planning

The problems highlighted above are not unique to Pune but indicative of broader concerns regarding urban transport planning and governance in the country. There appears to be a worrying fascination for expensive “big-ticket” projects which are seen as silver bullets that will address the mobility problems of a city. Thus, cities such as Kochi, Chandigarh, Ludhiana and Thiruvananthapuram are actively considering metro rail, though the estimated population in 2010 of Ludhiana, the largest of these cities, will be only 2.2 million – well below even the arbitrary criterion of three million apparently laid down by the M OUD. This fascination for large projects leads to total neglect of other smaller, cheaper, easier-to-implement and often more critical modes of transport such as walking, cycling and bus systems. For example, PM PML, the bus system which today serves over a million commuters (50% more than the combined 2031 ridership of the proposed metro rail corridors), has not had a full-time CMD for over a year now and it does not have space for its depots (Kulkarni 2010), and pedestrian and cycling infrastructure continues to crumble (Times of India 2010; Umbrakjar 2010). Similarly, Kochi’s suburban rail and ferry services serving all islands languish for lack of Rs 200 crore investment, even as a metro rail for one route is proposed at a cost of about Rs 4,400 crore (Parisor 2010). This trend of promoting big budget projects without clear accountability for measurable improvements in delivered transport services at minimal cost needs to be urgently reversed.

Decision-making in most urban local bodies (ULBs) continues to be non-transparent and non-participative, as shown by the experience of Pune and Hyderabad (Ramachandraiah 2009), resulting in projects being finalised without the citizens having any say in them. To make matters worse, most ULBs lack the capability to plan, analyse, and manage complex projects, which results in faulty project proposals being accepted. Decision-making also often tends to be ad hoc rather than scientific, as exemplified by the arbitrary extension of corridor 11 of the Pune metro rail and by periodic proposals for schemes such as skybus or monorail (Indian Express 2010). Similarly, there are also no clear criteria for when metro rails should be over or underground, with decisions seemingly made based on situational expediences.

Despite guidelines to the contrary from the M OUD, transport planning in most Indian cities is done in separate project silos with different modes being treated independently rather than as parts of a single integrated solution. Ideally, transport planning must also be integrated with land use planning and agencies such as Urban Metropolitan Transport Authorities must be set up to address transport planning across municipal jurisdictions. However, given the current “departmental” nature of the ULBs and their lack of suitable capacity and manpower, the possibility of such organisations becoming effective soon seems remote.

4 Conclusions

Indian cities, with the help of DMRC, are planning to invest about Rs 2 trillion in metro rail systems. But our analysis shows that the DPR prepared by DMRC for Pune has many serious analytical and methodological flaws, making the proposal highly questionable. Therefore, there is an urgent need to revisit all proposed metro rail projects and critically review them. An independent expert group should conduct the review based on clear, objective criteria and examine all aspects such as their justification, governance, accountability, viability and integration with other modes, and the review findings should be publicly debated.

India is urbanising rapidly but its urban governance institutions, systems and capacities have not kept pace. This has given rise to the problems highlighted in this article, resulting in big, expensive projects that often do not deliver the promised benefits and neglect of cheaper, quicker alternatives that may be more beneficial. The ULBs must be reformed to make them transparent and directly accountable to citizens, and undertake integrated, comprehensive, least-cost planning considering supply and demand side options. Otherwise, it is very likely that there would be large investments in urban transport projects with very little benefits, and our cities will grow increasingly grid-locked and unlivable. In turn, this could well put the brakes on the country’s much-touted economic growth story.

NOTES

1. Letters, questions and petitions submitted to the PMC in 2010 by citizen groups such as the Pune Metro Jagruti Abhiyan and Pune Technical Coalition. Also see proceedings of a national round-table “The City and the Metro” organised by Parisar, 20-21 July 2010.
2. Response from the DMRC to PMC regarding questions raised by the author in a letter dated 20 May 2009.
3. The guidelines were released in November 2006 – two months before the contract between the DMRC and PMC was signed.
4. A Comprehensive Mobility Plan (CMP) for Pune was presented in 2008 (WSA 2008a), well after
In the meantime, the metro rail DPR was commissioned in 2007. Hence the CMP cannot be used to justify commissioning the metro rail DPR.

3 Letter dated 28 June 2010 from the PMC to the government of Maharashtra requesting approval of corridor II of the proposed Pune metro.

4 See previous endnote.

5 Indeed, the infamous Dabhol power project (Enron) was also deemed viable by its promoters but at a great cost to citizens!

6 For example, it is estimated that only about 60% of the Delhi metro's revenues come from the fare box.

7 Only recently, R N Joshi has been appointed a full-time CMD. See Indian Express (2011).

8 See Table 12.4 of the DPR.

9 We had written to the DMRC on 15 October 2010 requesting clarification on many of the points listed but received no response from them until the time of writing this article (10 December 2010).

10 The fare table given in the DPR indicates that metro rail fares are higher than bus fares for over 80% of the trips. Corridor II (to be implemented by the PMC) has a peak hour frequency of eight minutes even in 2031, while even corridor I has a peak hour frequency of only four minutes in 2031. The ridership figures in the DPR were based on dense loads of eight persons/m and not comfortable seating in A/C.

11 Corridor I recommended by the DPR completely overlaps with BRT routes 2, 2A and 5A as given in the BRT DPR. However, DMRC claims that the overlap is only for “small lengths” (see endnote 2).

12 The fare table in the DPR indicates that bus fares are mostly lower than metro rail fares.

13 Eleven minutes as saved by car and two-wheeler users and 15 minutes additional penalty for buses.

14 In the absence of a response from the DMRC for an explanation of this figure, we assume that the claimed benefit in this category is the sum of fuel costs saved by commuters using the metro instead of their own vehicles, and saved fare box costs for those shifting from buses.

15 Further, we assume that the vehicle maintenance cost of users who would have used a two-wheeler or car in the absence of the metro rail will reduce by 50%.

16 See Table 12.6 of the DPR.

17 See Chapter 13 of DMRC (2009), in particular 13.7 lists the benefits of the project.

REFERENCES


Indian Express (2010): “Civic Body Nod for 30-km Inner Ring Road, 52 km Monorail”, Pune edition, 15 April.


The proposals should reach the Institute, along with duly completed prescribed application form, on or before June 30, 2011. Please visit our website www.isec.ac.in for more details in this regard and for downloadable application form. The proposals should be sent to the Registrar, Institute for Social and Economic Change (ISEC), Dr V K R V Rao Road, Nagarabhavi Post, Bangalore – 560072, India, in a cover with a superscription as “RESEARCH PROPOSAL FOR PROFESSOR P R BRAHMANANDA ENDOWMENT RESEARCH GRANT FOR THE YEAR 2011”.

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