Unravelling myths about subsidies in urban transport: a case study of Pune

Ashok Sreenivas, Girish Sant
Prayas Energy Group

1. Introduction

This paper challenges the popular perception that urban public transport, especially bus services in the country are subsidized while cars and 2-wheelers are not. It demonstrates through a case study of urban transport in Pune, that a bus user is much less subsidized than a car user or a two-wheeler user when all costs imposed by transport modes are considered. In the process, it also examines some issues regarding municipal budgeting in our cities.

2. Costs imposed by urban transport

Costs imposed by transport have been well studied in research [Lindberg 2002, Sen 2005, Shoup 2005, VTPI-TCA 2007]. For example, Litman lists 20 different costs in [VTPI-TCA 2007]. These include vehicle ownership, operation, road land value, road construction and maintenance cost, congestion caused etc. Some of these costs are *internal* in that they affect only the user of the service without any impact on rest of society, while many are *external* – i.e. imposed by the user on the rest of society [Lindberg 2002, Sen 2005]. Thus, while the cost of owning a vehicle is internal, costs such as air pollution, congestion and safety risk are external as the rest of society is also affected by them – often more than the owner of the vehicle. Moreover, external costs differ across modes. For example, air pollution costs imposed by a car differ from that imposed by a bus. For this paper, we define 'subsidy' given to a mode as the sum of the external costs imposed (and unpaid) by the mode, plus any explicit subsidy to the mode. Considering such externalities – which are typically ignored – drastically changes our understanding of subsidies.

3. Methodology

Our primary interest is in exposing the *relative* subsidies enjoyed by the three modes rather than the actual values. Therefore, we do a simple, approximate analysis to estimate some of the external costs that are usually not considered and arrive at roughly indicative numbers. Computing precise numbers requires more complex modelling [Sen 2005] beyond the scope of this paper. We focus only on three modes of passenger transport, namely public transport buses, 2-wheelers and cars. Moreover, we consider just the two external costs given below.

1. **Land cost:** Since land is a very precious urban resource, its opportunity cost is one of the costs of providing transport services[1]. For our purposes, we assume that road space is leased for transport services at a nominal rate of 3% p.a[2]. We consider land used in two ways:
    a. **Road land cost:** This estimates the opportunity cost of land used to build roads. This cost is divided among different modes according to the amount of space they occupy at peak hours, since the amount of road space required is dictated by peak hour traffic. The relative road space occupied by each mode is obtained by multiplying its *passenger car unit* (PCU) number[3] with the share of vehicles of that mode in the total number of vehicles on road at peak time.

[1] For example, could the space have been better used for, say, a primary school or a public hospital?
[2] The figure of 3% is chosen to reflect a nominal lease rate of a non-depreciating asset.
[3] The PCU number of a mode reflects the road space required for a vehicle of that mode, considering the road space requirement of a car to be one.

b. **Depot land cost:** This is the cost of land given by the city to be used as bus depots. This cost is allocated only to the bus service.

2. **Road construction cost:** This covers the cost of building and maintaining roads. For simplicity, this cost is also divided among modes according to the space they occupy at peak hour, and ignores other factors such as the weight of the vehicles, their speed, the distance travelled etc.

In addition to the two implicit subsidies considered above, we also consider the explicit subsidy given to the bus service. Therefore, the total subsidy (Rs. Lakhs / day) availed by buses is the sum of the explicit subsidy, the depot land cost and their share of road land cost and road construction cost. The total subsidy availed by cars and 2-wheelers is the sum of their share of road land cost and road construction cost.

The percentage of passenger-km travelled by a mode is calculated from the available data about the percentage of vehicle-km travelled by the mode and its average occupancy. The subsidy per passenger-km for a mode relative to buses is obtained by dividing the total subsidy availed by a mode by its percentage of passenger-km, and scaling it relative to the subsidy received by buses.

Users (of both private and public transport) pay only a small fraction of these costs as price through a one-time vehicle registration tax, octroi on fuel, parking fees where applicable and (part of the) bus ticket fare[4]. The price paid being a small percentage of the total cost, it is appropriate to treat the entire cost considered here as a subsidy.

4. Subsidy calculations

4.1 Costs

1. **Road land cost:** Pune has 10.4 sq km of land under roads [ESRPune 2007]. Valuing commercial land in Pune at a conservative Rs. 20,000 per sq m, the total road land cost for Pune is Rs. 171 lakhs / day.
2. **Road construction cost:** We consider the average of the amount explicitly spent / allotted on road works in the last three years by the Pune Municipal Corporation [PMCBudget 2008-09][5]. This comes to an average of Rs. 566 crores per year or Rs. 155 lakhs / day.
3. **Depot land cost:** About 7 acres of land are being used by Pune's bus service (PMPML) for their depots. So, the depot land cost is Rs. 0.52 lakhs per day.
4. **Explicit subsidy:** The explicit amount allocated for PMPML is Rs. 25 crores or Rs. 6.85 lakhs / day [PMCBudget 2008-09].

4.2 Vehicle data

Table 1 calculates the relative road space occupied by different modes using data from [PuneCDP 2006]. This data is based on detailed survey carried out in Pune in 2005. The PCU numbers are standard in transportation literature[6].

[4] Other prices paid by users such as fuel, insurance etc. are internal, i.e. they do not compensate for the external costs imposed. Hence they are not considered.

[5] Note that this *does not* include many other road related expenses such as road lighting, signals, speed breakers etc. all of which may contribute another Rs. 150 crores.

[6] We assume that all the 'other' vehicles have a PCU of 3, to minimize the road space share occupied (and therefore subsidy enjoyed) by cars, 2-wheelers and buses.

	% of total vehicles on road at peak hours	PCU	% space occupied at peak hour
Cars	17%	1.00	22%
2-wheelers	71%	0.50	46%
Bus	2%	3.00	8%
Auto-rickshaw	6%	1.00	8%
Others	4%	3.00	16%

Table 1: Relative road space occupied by different modes

Table 2 presents each mode's share of passenger-km, calculated from its share of total vehicle km [PuneCDP 2006]. For simplicity, we assume that 'other vehicles' do not carry any passengers, since our interest is in the other three modes.

	Average occupancy	% of total vehicle km	Passenger-km %
Cars	1.2[7]	30%	13%
2-wheelers	1.2[8]	55%	24%
Bus	25[9]	6%	56%
Auto-rickshaw	2	9%	7%
Others	0	0%	0%

Table 2: Relative passenger-km traveled by different modes

4.3 Analysis findings

Using the data for Pune as give above, total subsidies per day and relative subsidy per passenger-km can be calculated for each mode. Figure 1 presents the overall subsidy enjoyed for each mode, and Figure 2 presents the relative subsidy per passenger-km for them. The following observations can be made from this:

1. Using just the external costs considered here, the total subsidy per day amounts to Rs. 333 lakhs, out of which explicit subsidies account for less than Rs. 7 lakhs a day – only 2%, while the remaining 98% is an implicit subsidy.
2. Comparing total subsidy across modes, buses are subsidized about Rs. 33 lakhs per day, while cars are subsidized Rs. 72 lakhs and 2-wheelers Rs. 151 lakhs. That is, 2-wheelers as a mode receive 4.6 times the subsidy buses get, while cars get 2.2 times. However, note that two-wheelers also carry about twice as many passenger-km as cars, as reflected in the per passenger-km subsidy analysis below.
3. Comparing on a per passenger-km basis, two-wheelers are subsidised 10.4 times a bus, cars are subsidised 9.2 times. It is slightly counter-intuitive that two-wheelers are subsidized more per passenger-km than cars. We believe this is because both the costs we consider are determined by the share of the mode in peak-hour traffic and it is likely that cars use roads more in off-peak hours (such as the cars ferrying BPO employees). Further, the data we use is from 2005 and the number of cars on road (at peak and non-peak hours) has grown faster than the number of two-wheelers since then. Therefore, it is likely that even for these two costs, cars are more subsidized if one could use current data. Moreover, if one considered only the peak hour passenger-km by different modes, cars would be more subsidized than two-wheelers and buses would be far less subsidised

[7] [Badami 2004]
[8] Considered equal to a car, though it would be lower.
[9] Pune buses have a load factor of 51% [PuneCDP 2006]. So, 25 is a conservative estimate of occupancy per bus.

than seen here. This is because bus occupancy at peak hours is more than 100% rather than the 50% considered here while car and 2-wheeler occupancy would be pretty similar, and peak hour passenger-km by 2-wheelers would be considerably more than cars.

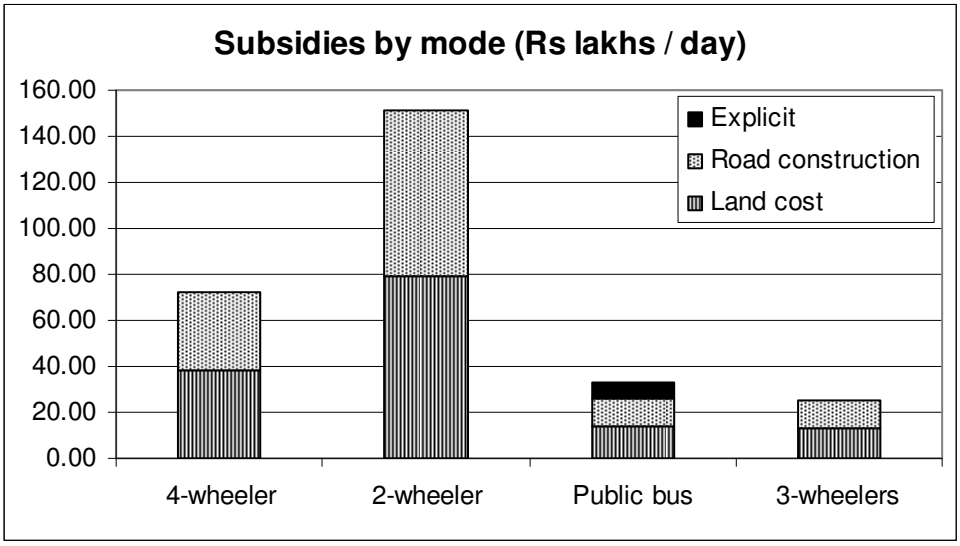

Figure 1: Total subsidy by mode

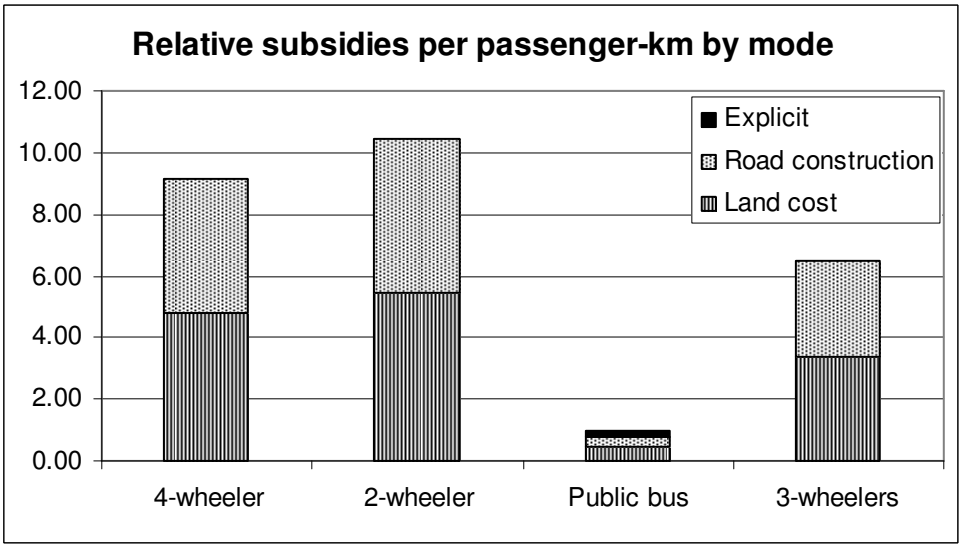

Figure 2: Relative subsidy per passenger-km by mode

5. Discussion

The most obvious conclusion is that public transport buses are far less subsidized than private motorized transport, both absolutely and per passenger-km. This is highly regressive considering that car and 2-wheeler users are generally more affluent than bus users [Badami 2004, UrbanPovertyTransportMumbai 2005].

Moreover, 98% of the subsidies considered are implicit. While the entire subsidy to cars and 2-wheelers is implicit, only 80% of the subsidy to buses is implicit. This explains the popular perception that public transport is subsidized while private transport is not, because the only small visible element of the subsidy applies to buses while the much larger hidden subsidy is consumed mainly by cars and 2-wheelers.

5.1 Other costs

We briefly examine whether considering other costs paid by users of cars, 2-wheelers and buses change the analysis conclusions significantly. A more detailed analysis is beyond the scope of this paper. Some external costs not considered by us are:

- **Other road related expenses:** The above analysis considers only the amount budgeted towards construction and maintenance of roads, and does not consider other costs such as operational expenses, expenses for signals, street furniture, and other special expenses such as JNNURM etc. discussed in the following sections. For the year 2008-09, these unconsidered expenses are about 1.5 times the considered expenses!
- **Air pollution:** Cars and 2-wheelers impose a greater air pollution cost than buses, both overall and per passenger-km. This cost includes cost of healthcare due to respiratory illnesses, cost of lost productivity due to illnesses etc.
- **Congestion:** Cars and 2-wheelers impose a far greater congestion cost in terms of lost time and productivity, than buses [Singh 2005].

Relative space occupied by cars, buses and pedestrians / cyclists

- **Fuel consumption:** Per passenger-km, the fuel consumed by a bus is 30% of a 2-wheeler and 10% of a car. Therefore cars and 2-wheelers threaten our energy security much more than buses especially in the era of $130 dollars a barrel crude oil.
- **On-street parking:** Cars and two-wheelers also use a lot of precious urban land for free or extremely cheap on-street parking. Apart from the land cost, such parking also imposes additional congestion costs.

Parked vehicles using up land space and causing congestion

- **Accidents:** Cars and two-wheelers are also responsible for much greater numbers of fatalities [Mohan-EPW 1999] and injuries per passenger-km than buses. Typically, these costs are almost never borne by users of the car or two-wheeler, imposing further costs on society.
- **Impact on non-motorized transport:** Road infra-structure (used largely by cars and two-wheelers) often marginalizes non-motorized modes such as walking and cycling, which are both the cleanest and most used by the poorest sections of society. This is in spite of the fact that 37% of the total trips undertaken are on foot and 18% are by bicycle [PuneCDP 2006].


Marginalized and vulnerable pedestrians and cyclists in motorized traffic

So, considering all other external costs will only increase the subsidies to cars and 2-wheelers vis-à-vis buses.

5.2 JNNURM and other special expenses

Pune's budget for 2008-09 allocates about Rs. 425 crores for projects under the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) and a proposed special purpose vehicle (SPV) for "public transport and special projects". These are not included in our calculations due to difficulties in distributing this amount across modes. However, as with the other costs, it seems likely that the implicit subsidies to cars and 2-wheelers will only increase if these expenses are considered. For example:

- The proposed SPV lists about 40 items (with no budgetary break-up!) out of which as many as 36 items are exclusively related to building roads, flyovers and tunnels while only 4 are related to public transport. As seen earlier, such road infra-structure is more beneficial to cars and 2-wheelers than buses. Moreover, flyovers and elevated roads – which form 22 of the 40 items – are used almost exclusively by cars and 2-wheelers rather than buses.
- The total cost of JNNURM approved Bus Rapid Transit (BRT) phase I project is Rs. 476 crores[10]. Of this, Rs. 259 crores or 54% is meant for building a river-side road, presumably for all modes of transport, thus further increasing the implicit subsidies to cars and 2-wheelers.
- The BRT expense on other roads will also not affect the overall analysis much for two reasons. Firstly, even upon completion the proposed BRT network will occupy less than 10% of Pune's road length. Secondly, even on BRT roads, the infra-structure built benefits all modes since it aims to streamline traffic by separating modes.

[10] This is not the amount budgeted to be spent in the current year, which is only Rs. 300 crores.

5.3 Municipal budget analysis[11]

A detailed scrutiny of Pune's municipal budget [PMCBudget 2008-09] for 2008-09 throws up some other interesting observations and priorities, as described below. Note that the discussion in this section does *not* include any cost of land, since it only analyzes the budgeted expenditure under different heads for 2008-09.

1. The total road related expenditure is not easy to find in the budget document as it is distributed under several heads such as capital expenses for road construction and maintenance, operational expenses (salaries etc.), expenses for signals, street furniture, junction improvement etc., road lighting, JNNURM projects and the proposed SPV. All these expenses together amount to about Rs. 688 crores, or about 36% of the overall budget!
2. The total proposed outlay for primary education, secondary education, public healthcare and public hospitals combined is about Rs. 210 crores, which is about one-third the total outlay towards road related expenditure. Viewed another way, cars and 2-wheelers get an annual subsidy of Rs. 472 crores from total road related expenditure – more than twice the outlay towards all those social services together![12]
3. The total budgeted expenditure towards public health (including hospitals etc.) is Rs. 59 crores, which is less than 10% of the total amount budgeted towards road related expenses and just 1.3 times the amount allocated for relatively unimportant items such as junction improvement, speed-breakers, signals and signages. Given this, one wonders how justified it is to privatise public hospitals citing lack of budgetary support.
4. It is strange that 36 of the 40 items listed under an SPV to improve public transport are aimed at improving road infra-structure that will benefit at cars and 2-wheelers more than public transport. Moreover, while the 36 road improvement projects are thought out in detail (eg., fly-over near Mundhwa, tunnel work from Senapati Bapat road to Paud road etc.), the 4 public transport items are mentioned only vaguely (eg., just 'metro railway', 'mono railway' and 'water transport').
5. Similar doubts also arise over the JNNURM budget. Though JNNURM funds for transport projects are meant mainly for public transport improvement, a significant chunk of it is allocated to build a new riverside road presumably meant for all modes of transport.

6. Rational pricing of transport and its impacts

It is widely accepted that public transport requires lesser infrastructure, consumes less fuel and causes less congestion, pollution and accidents than private motorized transport. This is also reflected in documents of the Indian government such as [NUTP 2006, 11th Plan Report, ClimateActionPlan 2008]. Moreover, since public transport is often the only means of transport accessible to the poorer sections of society, there is also a socio-economic justification for subsidizing it.

However, our study shows that the average car and 2-wheeler user is subsidized more than the average bus user through under-priced or free 'infra-structure'. Such under-pricing only increases the demand for cars and 2-wheelers as they do not bear the full cost of the service and goes against the spirit of [NUTP 2006, 11th Plan Report].

It is interesting to contrast the existing urban transport pricing situation with the electricity sector. The National Electricity Act and electricity reforms insisted on cost-based pricing in order to expose all the costs involved in electricity supply [E-Act 2004] in spite of the fact that this would affect the poorer sections of society the most. However, the urban transport sector seems to ignore cost-based pricing though the beneficiaries are the better-off sections of society.

---

[11] An earlier version of this paper had compared expenditures under different heads for only the capital expenditure, while the current version considers all expenditure towards a sector. The qualitative conclusions of the two versions remain identical despite this change.

[12] In comparison, the corresponding subsidy for buses in 2008-09 will be just Rs. 54 crores.

If urban transport planning were to minimise the total (external + internal) societal cost, it would have the following advantages:

- It would correct the regressive subsidies that exist today and make it fairer for the poorer sections of society.
- It would make more funds available for public transport.
- It would encourage greater use of public transport.
- It would provide the commuter a greater choice based on the true cost of each mode.
- It would also decrease the internal cost borne by each commuter, since there would be lesser need to invest in buying and running a vehicle.
- It would greatly reduce the need for infra-structure expenses by the city.

This is not to say that public transport systems in India do not need improvement. In fact, they need drastic and urgent improvement. However, the ills of our public transport systems and their governance are separate topics, beyond the scope of this paper.

But what is amply clear is that cars and 2-wheelers getting greater subsidies than bus users cannot be justified on any economic, social, environmental or policy grounds. Therefore, there is an urgent need for correction in the structure of urban transport pricing in Indian cities. Different cities around the world have adopted different ways of addressing the hidden subsidies to private motorized transport. For example, London and Stockholm have introduced congestion charging. Singapore has severe restrictions on ownership and usage of cars, while Bogotá restricts their use on different days. Other pricing options available include road usage charges, fuel cess, greater vehicle taxes, unsubsidized parking etc. Each Indian city can and must choose the solution best suited to its local context from the available bouquet of options. As a first step, the city administration must explicate all such hidden subsidies and place them in the public domain. Thereafter, a transparent and participative process can help identify the best solution. This will not only send the right signals to transport users but also improve the city's economic, social and environmental health. In other words, rationalising the pricing can start off a virtuous cycle, which would be in the larger public-interest.

7. Conclusions

This paper exposes the hidden subsidies enjoyed by users of cars and two-wheelers, thus marginalizing the needier sections. Since such a subsidy structure defies all rationale, there is an urgent need for reform in urban transport pricing in our cities. Rational pricing of urban transport can not only move people away from private modes to more desirable public modes but also help improve access and mobility of the poorer sections of society and provide more funds for other social expenses.

The analysis in this paper also highlights some misplaced priorities and a certain lack of transparency in municipal budgets. For example, Pune's budget allocates only about 10% the amount spent on road-related items to public healthcare, and proposes a special purpose vehicle ostensibly to improve public transport but actually containing a large number of road improvement projects that will primarily benefit private motorized vehicles. This highlights the need for greater transparency and public participation in municipal budget preparation, as this will help in allocating funds according to public needs and priorities, and help citizens better understand how their money is being spent.

8. Acknowledgements

This paper has been greatly improved by inputs and comments from Ashok Datar, Shantanu Dixit, Sharadini Rath, Sriraman Siva and Sudhir Chella Rajan.

9. References

[VTPI-TCA 2007] *Transportation Cost and Benefit Analysis: Techniques, Estimates and Implications*, Todd Litman, Victoria Transport Policy Institute, May 2007.

[Sen 2005] *Optimal Pricing of Urban Road Transport – An Economic Approach*, Akshaya Kumar Sen, Geetam Tiwari, V. Upadhyay, in the National Conference on Urban Transport Planning and Management, CIRT, Pune, October, 2005.

[Lindberg 2002] *Recent progress in the measurement of external costs and implications for transport pricing reforms*, Gunnar Lindberg, IMPRINT Europe Report, May 2002.

[Badami 2004] *Access and mobility for the urban poor in India: Bridging the gap between policy and needs*, M. Badami, G. Tiwari and D. Mohan, at the Forum on Urban Infrastructure and Public Service Delivery for the Urban Poor, June 2004.

[PuneCDP 2006] *Pune City Development Plan*, 2006.

[ESRPune 2007] *Environmental Status Report 2006-07*, Pune Municipal Corporation, 2007.

[PMCBudget 2008-09] *Pune Municipal Corporation budget proposal*, 2008-09.

[Shoup 2005] *The High Cost of free parking*, Donald Shoup, 2005.

[NUTP 2006] *National Urban Transport Policy,* Ministry of Urban Development, Government of India, 2006.

[11th Plan Report] *Report of the working group for the 11th Five Year Plan on Urban Transport including MRTS.*

[UrbanPovertyTransportMumbai 2005] *Urban Poverty and Transport: A case study of Mumbai*, J. Baker, R. Basu, M. Cropper, S. Lall, A. Takeuchi, World Bank Policy Research Working Paper, September 2005.

[Singh 2005] *Review of urban transportation in India,* S. K. Singh, Journal of Public Transportation, Vol. 8, No. 1, 2005.

[E-Act 2004] *National Electricity Act*, 2004.

[Mohan-EPW 1999] *Sustainable Transport Systems, Linkages between environmental issues, public transport, non-motorized transport and safety,* Economic and Political Weekly, Vol. 34, No. 25, 1999.

[ClimateActionPlan 2008] *National Action Plan on Climate Change*, Prime Minister's Council on Climate Change, Government of India, 2008.

---

29 August 2008
Prayas (Energy Group),
Athawale Corner, Karve Road, Deccan Gymkhana, Pune – 411 004
www.prayaspune.org/peg Tel.: +91-20-2542 0720

A shorter version of this paper is published in 'Economic & Political Weekly' (2nd August 2008)
http://www.epw.org.in