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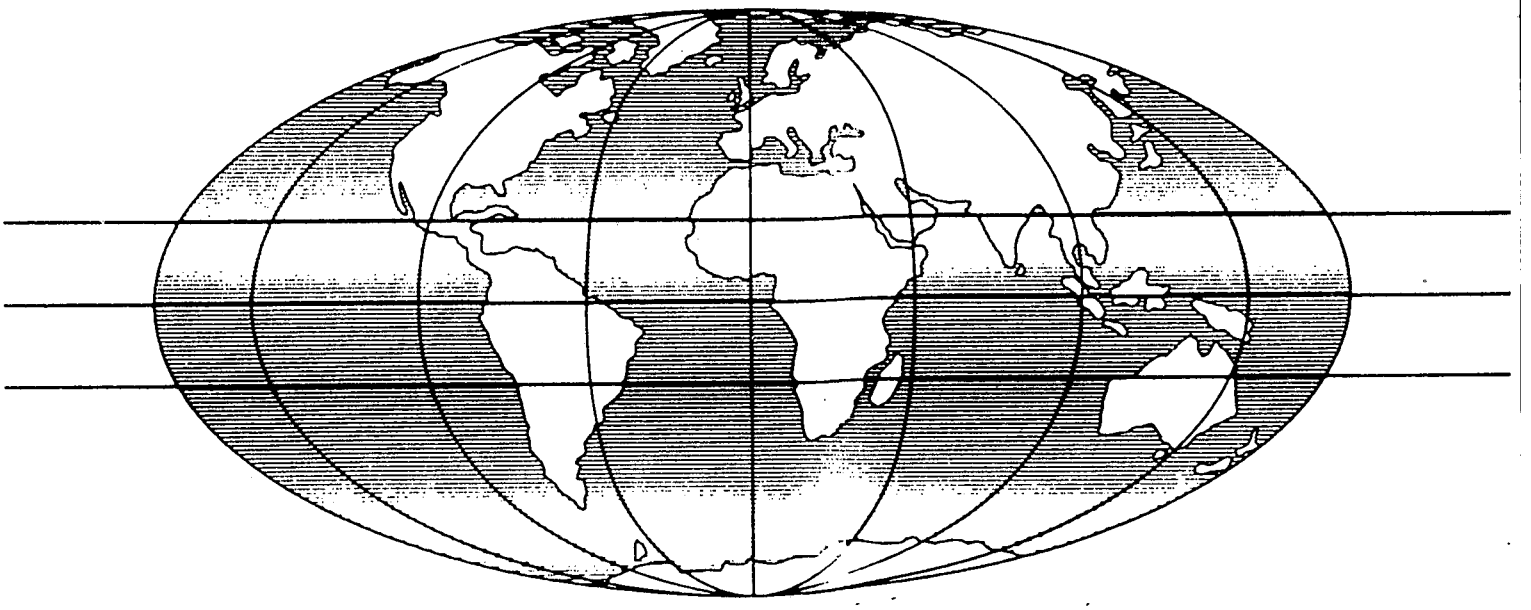

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PUBLIC TRANSPORT IN SECOND ORDER CITIES IN INDIA

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SUMMARY

The development of public transport in second order Indian cities (with a population of 0.5 to 1.0 million) has followed different paths. Some cities have adopted a more conventional approach in which State operated stage-carriage buses are the main carrier. Others have left the provision of public transport services to the activities of private enterprise, which has led to domination of the sector by intermediate public transport (minibuses and rickshaws).

This paper compares and contrasts the provision of public transport in three second order cities in India which reflect these wide differences. Performance and costs are compared in order to assess some of the relative merits of these different approaches.

Introduction

The total population of India is 685 million, almost a quarter of which live in urban settlements. While there are over 200 cities having populations in excess of 0.1 million, over one third of the urban population is concentrated in the 36 largest cities. Twelve of these cities have populations in excess of one million, the four largest (the so-called jumbo cities) having populations of more than four million, viz: Bombay, Calcutta, Delhi and Madras.

As in most Third World cities, road-based, public transport plays a key role in the movement of people in Indian cities. The development of public transport facilities has not kept pace with demand, and further has followed a varied pattern. While the four jumbo cities have comparatively well organised mass-transit systems (road and rail based), the other metropolitan centres appear to have no planned and rigid approach to the development of public transport. Some, like Bangalore, Ahmedabad and Pune, have opted for what might be termed the more conventional approach to public transport provision: standard buses operated by public undertakings are used to provide the principal road-based, mass-transit network, without any supporting rail system. These operators have a near-monopoly in the provision of stage-bus services, and are invariably dependent on some form of subsidy to maintain the level of service that they provide, fares being divorced from operational costs. Other cities, like Lucknow and Kanpur, have adopted a less rigorous approach in which the provision of public transport is left largely to the activities of private enterprise, with the minimum of regulation and supervision. Probably as a result, intermediate public transport (IPT — rickshaws and various forms of minibus) has become the dominant mode of public transport in these cities.

The same variety of development is also seen in the smaller cities of India. It is a matter of some importance for future development of both the city and its public transport system to know whether such differences confer any special benefits or costs. In a sutuation where the majority of operators of conventional public transport lose money (and hence have to be subsidised by some means) it is important to know whether there is any advantage to be gained from encouraging further development of such services in those towns and cities which currently rely on the private sector and IPT.

This paper addresses this significant issue using survey material gathered from three second-order cities (having populations in the range 0.5 to 1.0

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million) which have public transport systems representing the broad range of options which have come to be developed in India. Vadodara presents one end of the spectrum of options, having a conventional public transport system based on standard single-deck and articulated double-deck vehicles. Autorickshaws (the poor man's taxi) are used to provide supporting taxi services. At the other extreme is Patna, which has only a skeleton conventional bus service but a significant number of minibuses and auto-rickshaws providing bus-like services, and a large number of cycle-rickshaws. In between these extremes is Jaipur, which at the time of the survey (1982) had a conventional bus system, a minibus network and a taxi-like service provided by both cycle and auto-rickshaws.

A cross-sectional comparison of these public transport systems is presented in order to establish some of the merits of the alternative approaches. (Note: at the time of compiling this paper the analysis of the survey material from Patna was still in hand. The data quoted is provisional and subject to amendment).

Criteria for Comparison

A considerable debate has been generated from the basic question of what type of public transport system should be encouraged in a city. The debate is often confused because it involves two quite distinct (though dependent) issues:-

— the extent to which the public sector should be involved in the provision of a public transport system (by ownership, regulation etc).
— the technical and economic benefits of different types of vehicle.

Regulatory policy influences the type of vehicle employed in public transport provision, as well as operating costs in general. Under a deregulated system private operators flourish; they tend to invest in low-cost capital equipment (minibuses and rickshaws). They are also able to operate a given conventional bus service more cheaply than nationalised undertakings, because they are less constrained by labour laws, union pressures on wage rates, tax demands and safety standards.

Clearly in a comparison of public transport systems in different cities it is necessary to try to isolate the effect of regulatory policy on unit costs. It would be wrong to assume that because a nationalised undertaking makes large losses on a city service, that the use of conventional buses is thus automatically invalid. The economic benefits from operating large buses may outweigh the base costs (those that a private operator might incur for the same level of service) of operating the service. (Whether the additional costs incurred by State operators are worthwhile will not be considered in this paper. The argument would be that such costs may be off-set by better safety, reliability and co-ordination of services and more fulfilment of social obligations like concessions to the poor and handicapped).

The comparison of different systems is also complicated by the fact that public transport is not used in a homogeneous role. Cycle-rickshaws and the small 2-seat auto-rickshaws are used to provide a taxi-like service, giving a high degree of accessibility at relatively high cost. Minibuses (including the larger 6-seat auto-rickshaws) and conventional buses are essentially used to provide stage-carriage services, where costs per unit of output are lower, though journey lengths are likely to be longer, and accessibility poorer. The trade-off between time (of travelling) and cost (of providing alternative vehicle types and services, together with any identifiable external costs like congestion and safety) provides the main criteria for judging alternative options.

There are, however, other criteria which go beyond the purely transport factors, and which might be considered important, particularly in the Third World context. Energy and employment are two obvious candidates for consideration. Another factor which should be given due attention is the development of the city itself and the extent to which a particular public transport policy will influence that development.

In this paper the data currently available limits the extent of comparison to the following factors:-

— the operational costs of providing public transport and related issues of relative productivity and subsidy.

— the energy and employment implications of each policy.

Thus the comparison is not yet comprehensive in the sense that it is possible to say that one system is more cost-effective than another. It is possible, however, to draw some conclusions on relative advantage of different systems and to make informed speculation about the consequences of

introducing conventional systems into a city like Patna.

City Characteristics

Jaipur and Patna are the State capitals of Rajasthan and Bihar respectively. Vadodara is the third city of Gujerat State. All three have experienced rapid growth within the last decade and Jaipur is now a metropolitan city with a population just in excess of one million. However, for the purpose of this study it is deemed a second order city. Table 1 shows basic census data for the three cities.

Table 1 — Census data for three cities

	Vadodara	Jaipur	Patna
Population (millions) 1981	0.741	1.004	0.916
Density (persons per sq. km) 1981	6800	4900	10800
Population growth (%) 1971-1981	59	58	87

Source: Census of India

Public Transport Characteristics

Supply

Table 2 shows the inventory of the main public transport modes in the three cities. They are sub-divided into two main groups: those vehicles providing bus-like services and those providing taxi-like services.

In each of the three cities conventional public transport, which is organised by the State, loses money. All other modes are operated by the private sector and are profitable. The estimated daily cost of providing public transport in each city is shown in Table 3. (These costs are the cumulative total of the estimated daily operating costs of each vehicle being used to provide a public transport service).

Use made of Public Transport

The importance of public transport in the three cities may be gauged from the modal split figures given in Table 4.

It is evident that public transport is much more important in Vadodara and Patna than in Jaipur, a fact that is reflected in the cost of providing public transport in the three cities (Table 3). Estimates of the use of public transport in each city are shown in Table 5. Although the number of trips per head of population is about the same for Patna and Vadodara, trip lengths are longer in the latter and hence the demand for public transport (measured in terms of passenger km) is correspondingly greater.

Table 2 — Public Transport Inventory in three cities

Nos. of vehicles per 1000 population	Vadodara (1983)	Jaipur (1982)	Patna (1983)
Bus Services:			
— conventional buses	0.25	0.09	0.08
— minibuses	—	0.18	0.09
— auto-rickshaws	—	neg.	0.87
Taxi Services:			
— auto-rickshaws	7.9	2.4	—
— cycle-rickshaws	—	7.1	39

Table 3 — Cost of providing Public Transport three cities

Rs'000 per day	Vadodara	Jaipur	Patna
Bus services	112	113	165
Taxi services	221	96	306
All public transport	333	209	471
Subsidy paid to State operators	30	20	21

Source: Study estimates

Table 4 — Modal split for main Transport Options in three cities

% of trips by	Vadodara	Jaipur	Patna
Walk	40.1	39.5	35.8
Cycle	15.1	26.5	12.5
Public Transport	32.1	21.0	33.2
Personal Motor Vehicle	11.6	12.0	17.2

Source: household surveys

Table 5 — Use of Public Transport

	Vadodara	Jaipur	Patna
Public transport trips/head of pop/yr	213	94	222
Per cent by bus	70	69	39
Per cent by conventional bus	70	32	8
Public transport pass. km/head of pop/yr	760	366	618
Per cent by bus service	74	82	56
Per cent by conventional bus	74	42	10

Source: Study estimates

Quality of service

There is a high degree of variability in the quality of service offered by different modes, both within and between cities. Table 6 lists some of the attributes which can be used to describe quality, together with some qualitative remarks about the main modes in use in the three cities. (Quantitative analysis of these indicators is yet to be completed).

Table 6 — Quality assessment of main modes in use in the three cities

	Minibus	Conventional bus	Auto rickshaw	Cycle rickshaw
Speed	usually good	usually good	average	poor
Regularity	variable	"	n/a	n/a
Wait times	usually good	average	good	good
Load factor	high	high	n/a	n/a
Accessibility	average	average	good	good

Energy consumption

Estimates have been made of the expenditure on petrol, diesel and lubricating oil by the main mechanised modes of public transport. Table 7 records these costs.

Table 7 — Estimated energy costs of Public Transport

	Vadodara	Jaipur	Patna
Energy costs Rs'ooo per day	117	56	48
as a % of total public transport costs	35	27	10

Source: Study estimates

The significantly higher energy costs in Vadodara and Jaipur (as a proportion of total costs) reflect the high content of auto-rickshaws in the total public transport fleet. The incidence of tax on petrol (used in auto-rickshaws) is much higher than on diesel. A more detailed analysis of energy costs, net of tax (i.e. resource costs, which reflect the real cost of consumption) would undoubtedly show Jaipur and Vadodara in a somewhat better light.

Employment Generation

Table 8 contains estimates of the number of employees directly involved in the public transport sectors of the three cities. Those involved in ancilliary and support services have not been included.

Table 8 — Estimated number of Public Transport Workers in three cities

	Vadodara	Jaipur	Patna
Number	6,400	7,700	28,000

Source: Study estimates

The domination of the public transport sector in Patna by cycle-rickshaws is reflected in its very high employment figure.

Discussion

The cost of public transport per passenger carried varies little between the three cities despite the different inputs to provide public transport services. Table 9 shows unit costs for the main modes in use, as well as for the total system. (These costs include all direct operating costs plus fixed overheads, where appropriate).

The better cost performance of conventional buses in Vadodara reflects the high utilisation of vehicles and high number of passengers using the system, as compared to Jaipur and Patna. The higher utilisation of vehicles is partly a result of better operational efficiency and also possibly the less congested nature of the street network in Vadodara. The higher throughput of passengers will itself be dependent on the better vehicle utilisation, as well as the absence of any competing stage-bus service in Vadodara. Furthermore, passengers in Jaipur, and to a lesser extent Patna, make longer journeys on conventional buses than they do in Vadodara; as a result the effective capacity of the vehicle is less.

Minibuses in Patna are a relatively high cost mode. This is accounted for solely by the extensive use of the 6-seat auto-rickshaw, a high cost vehicle when used in the bus-like role. (The larger 25 seat minibuses in Patna are equally as cost efficient as those in Jaipur). It is generally considered that the minibus is likely to be more inefficient in its use of road space than larger buses: to achieve the same level of capacity as a small number of large buses would require a larger number of minibuses. However, in the centre of Patna, where traffic congestion is conditioned by the disordered activities of numerous cycle-rickshaws, the small auto-rickshaw may well have the advantage over larger vehicles of greater case of penetration.

In terms of costs per passenger km, public transport in Patna is significantly more expensive than in the other two cities, due to the high use of cycle-rickshaws for short journey lengths. Cycle-rickshaws are a costly form of public transport; although their capital investment and operating costs are low, their output is correspondingly small.

The similar cost of public transport in Vadodara and Jaipur is not reflected in similar use, which is much lower in the latter. The reasons for this are not immediately clear and further analysis is required to identify what other modes are being used in preference to public transport and the reasons for such use. It might be expected that the high cost of public transport in Patna, compared to Vadodara, would be reflected in lower use; this is the case, with demand (measured in terms of passenger km per head of population) being some 20 per cent greater in Vadodara.

Subsidy given to State bus operators is higher in Vadodara than the other two cities, both in absolute terms and per head of population. (The subsidy ranges from Rs. 15 per person per year in Vadodara to about Rs. 8 in both Jaipur and Patna). It seems probable, however, that more of the Vadodara subsidy goes towards maintaining cheap fares and/or better services than is the case in the other two cities. (If it is assumed, conservatively, that private operators could provide the same services, using the same vehicles, for 10 per cent less cost than the State operators-for the reasons already discussed in Section 2 - then the total cost savings would range from Rs. 11,000 per day in both Vadodara and Jaipur to Rs. 16,000 per day in Patna. The difference between this and the actual subsidy paid represents the cost of maintaining low fares and/or socially desirable services. It represents about two thirds of the subsidy in Vadodara, one half in Jaipur, and less than one quarter in Patna).

Table 9 — Operating costs per Passenger and per Passenger Km.

	Vadodara		Jaipur		Patna	
Costs-paise	per pass	per pass km	per pass	per pass km	per pass	per pass km
Conventional bus	37	10	83	17	71	18
Minibus	—	---	45	10	77	18
Auto-rickshaw (2-seat)	167	56	226	58	—	—
Cycle-rickshaw	—	—	76	51	90	45
All public transport	76	21	80	21	84	30

Source: Study estimates

The Vadodara public transport system undoubtedly has high energy costs. It is an all-mechanised system, and a high proportion of its content is auto-rickshaws. The Jaipur system is little better in energy terms, having energy costs per passenger km. double that of the Patna system. There is a clear trade-off between the high energy costs of Vadodara and Jaipur with the high labour employment (and hence costs) of Patna. Labour costs represent something like 60 percent of the total operating costs of public transport in Patna.

A direct comparison of the two extreme options for public transport provision does suggest that operating expenditure could be reduced in Patna by the introduction of more conventional services and/or larger minibuses, with a corresponding reduction in cycle-rickshaws and small minibuses. Whether users of public transport in Patna currently have a better quality of service than those in Vadodara is yet to be established. (This task is part of the current study). Journey times by cycle-rickshaw may be faster overall (because cycle-rickshaws eliminate the long wait times and walk times associated with conventional bus activities). It seems unlikely, however, that any such advantage would outweigh the high cost penalty of providing this form of transport.

The indications are that the conventional bus system should be encouraged to provide the backbone of the overall public transport system in second order Indian cities. At the same time, there is a role for IPT: rickshaws providing a relatively cheap taxi-service and minibuses providing for destination oriented route patterns on narrow roads and for low demand routes. This is vividly brought out in the case of Jaipur where all forms of public transport combine to produce a low cost system catering for a wide cross-section of trips. Vadodara indicates how a combination of conventional buses and auto-rickshaws can still be effective. Patna is an example where too much stress on the auto-rickshaw has increased the cost per passenger km., though has contributed to the much needed employment potential and energy saving.

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