# BICYCLE RESEARCH REPORT NO. 115

March 2000

**Sewa RAM, A.K. SHARMA: Sustainability And City Size**

**Bicycles and Rickshaws are best for cities with populations under 100,000**

Key Facts

According to an Indian survey the non-motorised means of transport from a sustainability point of view are the best suited means of transport for small and medium-sized cities with populations under 100,000 in order to pursue a sustainable traffic policy. Because of their large areas, greater frequency of journeys and longer average journeys large cities with more than one million inhabitants require both good public and private transport facilities and also on-going traffic influencing measures.

Contents

The urbanisation of India leads to a quick change in population distribution. During 1971 20% of the population had still been living in cities, but at the turn of the millennium this was 34.5 %.

A cross-section of cities was examined in an Indian study, looking at the needs, characteristics, city forms and structures, existing journey lengths, use of trans- port and frequency of journeys in order to ascertain how a transport facility might look, thus fulfilling sustainment criteria. Sustainability also means that the resources of future generations are not reduced because of today's traffic.

The reference numbers ascertained in the traffic enquiry and traffic facilities of Indian cities and towns continue to reflect the different sizes and functions. Table 0 shows data for the frequency of use of bicycles and public and private transport. Depending on the size of the city the proportion of bicycles lies some- where between 15 and 25%, therefore somewhat lower than the public and private transport, but except for in small towns under 300,000 inhabitants, higher than the proportions of the "paratransit" means of transport. (These are the widely-used intermediate forms of transport between private and public transport, e.g. taxi sharing). Cycle rickshaws too in parts have considerably more traffic importance.

Table 2 shows some data regarding ownership of private means of transport. Whilst 163 cyclists/per 1,000 inhabitants are counted in Delhi, there are generally only a few in small cities. Table 5 shows the upper medium journey

distances: they are between 3.1 km and 7.4 km. The most important reason for using a bicycle in almost every city is for going to work. Whilst the non-motorised road users in the lower and medium income brackets do travel more frequently by bicycle than by rickshaw, people in the higher income groups are transported more often by cycle rickshaw (Table 7).

Worthy of note are the results of the smaller cities with a population of under 100,000 inhabitants. The statistics show a low mobility rate of 0.5 to 0.67 journeys/per inhabitant a day. When there is a lot of traffic around the proportion of cycle and pedestrian traffic is dominant (60 to 92%), between 4 and 25% of all journeys are made by cycle rickshaw and tine average journey lengths are short (approx: 1.5 km). Two thirds of the journeys documented is town traffic and one third come from out of town or goes out of town.

Because of the respective size of the cities and the traffic situations suitable transport facilities are different in cities of various sizes from the point of view of sustainability This is the situation with non-motorised forms of transport which from a sustainability point of view are the best-suited form of transport for small and medium-sized cities with fewer than 100,000 inhabitants. The extensive non-motorised transport system in these cities can operate without high costs.

In cities with up to 1 million inhabitants there are already out of every 1,000 inhabitants 107 private passenger vehicles (including bicycles) and 13 paratransit vehicles. These cities can be sustainable if with the support of the non-motorised traffic the "paratransit" forms of transport and public transport are used as well.

In order to reduce the environmental imbalance large and medium-sized cities must control the growth of motorised forms of transport for passengers. Because of their great expansion, more frequent journeys and longer average journeys the very large cities also need to take steps to influence the traffic (Transport System Management) and solutions outside the field of traffic, e.g. in the field of location planning.

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| Authors | *"Sustainability and City Size"* (in English) by Sewa Ram and A. K. Sharma, Conference article (Contribution to the 8th World Conference on Transport Research, Antwerp/Belgium |
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*Table 0.* **Traffic Reference Numbers for Groups of Cities of different sizes in India**

| S. No. | Attributes | | Population Size of Cities | | | |
|---|---|---|---|---|---|---|
| | | | > 10 Lakh | 5-10 Lakh | 3-5 Lakh | 1-3 Lakh |
| 1 | PCTR | Including walk | 1.29 | 0.975 | 1.223 | 0.973 |
| | | Excluding Walk | 1.04 | 0.717 | 0.935 | 0.727 |
| 2 | IPT | Per 1000 Population | | | | |
| | | Fast | 4.65 | 3.75 | 5.6 | 18.29 |
| | | Slow | 6.96 | 4.17 | 1.97 | 18.76 |
| | | Total | 11.61 | 7.92 | 7.57 | 37.05 |
| 3 | Modal | Share (%) | | | | |
| | | Pubic Transport | 47.32 | 26.15 | 24.69 | 33.86 |
| | | Private Transport | 26.17 | 26.61 | 42.8 | 23.76 |
| | IPT | Fast | 6.55 | 7.19 | 5.77 | 8.59 |
| | IPT | Slow | 5.07 | 6.69 | 1.73 | 19.43 |
| | IPT | Total | 11.62 | 13.88 | 7.5 | 28.02 |
| | | Cycle | 15.17 | 15.7 | 25.15 | 14.48 |
| 4 | PER 1000 Population | | | | | |
| | | Passenger Vehicle | 108.92 | 106.9 | 401.31 | 94.5 |
| | | Public Transport | 0.39 | 0.286 | 0.12 | 0.087 |

Source Study of 21 Cities, RITES New Delhi
* IPT Vehicles per 1000 population are more in smaller size towns.
* Share of IPT trips is more in smaller size towns
* PCTR Decreases as we go from big towns to small size towns
* Public transport / 1000 population decreases as we go from small to big towns.

**ABBREVIATION**
ATL Average Trip Length
C/R, CR Cycle Rickshaw
H/H Household
HIG High Income Group
IPT Intermediate Public Transport (Para Transit)
LIG Low Income Group
MIG Medium Income Group
NMT Non Motorised Transport
PCTR Per Capita Trip Rate

**1Lakh = 100,000 inhabitants**

### Table 2   Household Vehicle Ownership in Selected Indian Cities (in percentage) of Households

| City | City size by population groups in Lakhs (%) | More than one car | One Car | Two Wheeler | Cycle |
|---|---|---|---|---|---|
| Panipat | (1-5) | 1-2 | 11,6 | 21,3 | 58,2 |
| Vadodara | - | 1,3 | 12,1 | 23,3 | 48,0 |
| Meerut | (5-10) | 1,4 | 12,5 | 28,7 | 42,2 |
| Calicut | - | 1,6 | 12,7 | 3,01 | 40,0 |
| Lucknow | (10-15) | 1,2 | 13,6 | 45,5 | 31,3 |
| Patna | - | 1,5 | 12,1 | 40,2 | 43,0 |
| Jaipur | - | 1,4 | 3,2 | 38,1 | 55,0 |
| Ahmedabad | >15 | 0,8 | 10,0 | 54,8 | 27,1 |
| Bangalore | - | 3,1 | 20,8 | 43,4 | 24,1 |
| Delhi | - | 5,6 | 22,4 | 29,5 | 23,2 |

Source for Table 2
1 Mobility level and transport problem of various population group CRRI 1988
2 Travel characteristics of medium sized cities – Thesis by S. Sathpathy - 1984
3 Transport system study of Patna - 1985
4 Travel characteristics of three cities – TRRL Working PaperN°202
5 Role ofl I.P.T..in Panipat – Thesis by A. Gulleria
6 Transport Studyon Bangalore – C.R.R.I. – 1988

### Table 5   Travel Characteristics in Selected Indian Cities

| City | AV Trip Length for work (KM) | AV Trip Length for cycle (km) | AV. Trip Length avt. c/r (km) | P.C.T.R. excluding walk trips |
|---|---|---|---|---|
| Panipat | 4,2 | 7,4 | 5,1 | 0,6 |
| Vadodara | 4,1 | 6,0 | - | 0,57 |
| Meerut | 3,8 | 5,2 | 1,5 | 0,63 |
| Calicut | 4,9 | 4,1 | - | 0,53 |
| Lucknow | 4,7 | 6,7 | 4,7 | 0,58 |
| Patna | 5,1 | 3,8 | 3,3 | 0,62 |
| Jaipur | 4,9 | 3,1 | 3,1 | - |
| Ahmedabad | 6,0 | - | 2,3 | 0,58 |
| Bangalore | 7,1 | 3,4 | - | 0,68 |
| Delhi | 9,5 | 4,7 | 1,1 | 0,54 |

Source for Table 5
1 Mobility level and transport problem of various population group CRRI 1988
2 Travel characteristics of medium sized cities – Thesis by S. Sathpathy - 1984
3 Transport system study of Patna - 1985 4 Travel characteristics of three cities – TRRL Working PaperN 202
5 Role ofl I.P.T..in Panipat – Thesis by A. Gulleria
6 Transport Studyon Bangalore – C.R.R.I. – 1988
**P.C.T.R. = Number of Journeys per Head**

## *Table 7.* Non-motorised Journeys by various Income Groups (in percentage)
## (CR = C/R = cycle rickshaw)

**Table - 7**    NMT Trips by various income groups (in percentage)

| City size by population groups in lakhs | City Size | Low Income Cycle | Low Income CR | Medium Income Cycle | Medium Income C/R | High Income Cycle | High Income C/R |
|---|---|---|---|---|---|---|---|
| (1-5) | Panipat | 51 | 12 | 30 | 16 | 3 | 10 |
|  | Vadodara | 41 | 11.7 | 29.1 | 11.5 | 5 | 16 |
| (1-5) | **WTD. Avg. NMT Trips (Cycle + C/R)** | 55.1 | | 40.1 | | 19.0 | |
| (5-10) | Meerut | 32 | 12 | 20 | 11 | 3 | 11 |
| " | Calicut | 33 | 14.1 | 15 | 12 | 2 | 9 |
| (5-10) | **WTD. Avg/ NMT Trips** | 45.5 C/R | | 28.9 | | 12.4 | |
| (10-15) | Lucknow | 28 | 10 | 18 | 11 | 4 | 6 |
| " | Patna | 24 | 12 | 19 | 10 | 5 | 7 |
| " | Jaipur | 24 | 13 | 21 | 7 | 5 | 4 |
| (10-15) | **WTD. Avg. NMT Trips** | 36.9 C/R | | 28.6 | | 10.2 | |
| >15 | Ahmedabad | 18 | 3 | 10 | 4 | 1 | 2 |
|  | Bangalore | 15 | 4 | 8 | 5 | 2 | 5 |
|  | Delhi | 18 | 3 | 7 | 5 | 1 | 2 |
| >15 | **WTD. Avg. NMT Trips** | 20.5 C/R | | 12.7 | | 4.1 | |

Source for Table - Mobility level and transport problem of various population group CRRI 1988.
2. Travel characteristics of medium sized cities - Thesis by S. Sathpathy 1984. School of Planning and Architecture.
3. Transport system study of Patna - 1985.
4. Travel characteristics of three cities, T.R.R.L. Working Paper - 202.
5. Role of I.P.T. in Panipat - Thesis by A. Gulleria, School of Planning and Architecture.
6. Transport study on Bangalore - CRRI - 1988.