# IMPACTS OF TRANSPORTATION INFRASTRUCTURE AND SERVICES ON URBAN POVERTY AND LAND DEVELOPMENT IN COLOMBO, SRI LANKA

***Amal S. Kumarage***

## 1. Introduction

The City of Colombo serves both as the national capital and the largest city in modern Sri Lanka. Colombo and its metropolitan area — referred to as the Colombo Metropolitan Region (CMR) — fall within the Western Province, which is the most densely populated and economically active region within the country (see Table 1). Transportation activity within this region is also the densest in Sri Lanka.

**Table 1 : Summary of Vital Statistics of Colombo Metropolitan Region**

| | CMR | Sri Lanka | Percentage (%) |
|---|---|---|---|
| Land Area (sq. km.) | 3,593 | 62,705 | 5.8 |
| Population (2001- Millions) | 5,361 | 18,732 | 28.6 |
| GDP (1994 – Rs. Millions)[1] | 22,582 | 51,227 | 44.1 |
| Vehicle Licenses (2001) | 456,164 | 955,238 | 47.7 |
| Sea Freight (2001) TEU | 1,726,605 | N/A | |
| Air Traffic (Pax. Movements-2001) | 2,916,407 | 2,916,407 | 100.0 |

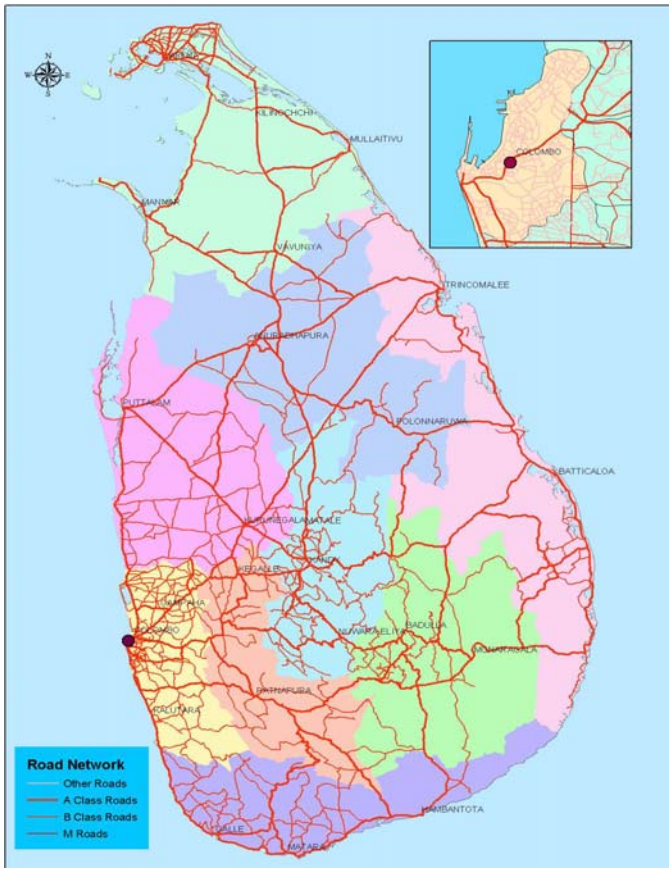


**Figure 1: Sri Lanka**

**History:** From ancient times, Sri Lanka has been largely an agricultural economy. In recent history, particularly under colonial rule, the development of the Port of Colombo and the availability of suitable human resources led to the majority of industries locating within one hour travel distance from the port. The growth of industries and the development of Colombo as the administrative capital and primary commercial center of the country have formed the basis of the physical expansion of Colombo and its environs.

The legacy of urbanization dating back to the 16th century centered on the development of the Port of Colombo under Portuguese occupation. Under British occupation in 1871, the City had an extent of 2,449 hectares with a population of 98,847 persons. The density doubled by 1931 by which time the city grew to 3,368 hectares with population growing to 284,155 largely due to annexation of surrounding areas. This density doubled by 1981, by which time the land area had reached

a near maximum of 3,711 hectares. The most recent strategic land use plan has proposed to reduce the extent of residential land use from 1,401 hectares to 691 hectares by 2010 in order to provide for more commercial development (UDA, 1998).

**Geographic:** Colombo is a relatively small city with a resident population of around 700,000 with a day time inflow of a million persons. Its area is 3,730 hectares. The Colombo Metropolitan Region (CMR) which serves as the suburban feeder area for Colombo city has a population of over 5.3 million with a gross population density of 15 persons per hectare. In the City of Colombo itself the density is 188 persons per hectare.

**Table 2: Population (2001)**

| Area | Population 2001 |
|---|---|
| Colombo Municipal Area | 697,396 |
| Colombo District | 2,234,289 |
| Colombo Metropolitan Region | 5,361,185 |
| Sri Lanka | 18,732,255 |

**Demographic:** The land use distribution in the City of Colombo shows that residential use takes up 40%, of the available land, while transport & communications takes up 13%, with a further30% presently developed for commercial and administrative purposes, with around 17% land bare or still under non-urban use. The residential densities within the city range from between 165 to 1,537 persons per hectare (UDA, 1998). The highest densities are accompanied by concentrations of people living in illegal squatter settlements that are badly overcrowded with respect to facilities available within them. These have, however, become popular forms of settlements for the poor in the absence of affordable public or private sector housing programs. It is estimated that at present about 35% of the city's population lives in these settlements, which have semi permanent houses, shared toilets and poor sanitation conditions. This shortage of housing for the poorest sections of the city is commonly attributed to economic indicators, particularly affordability to the low income consumer to purchase or rent, scarcity of land and high land prices and high construction costs.

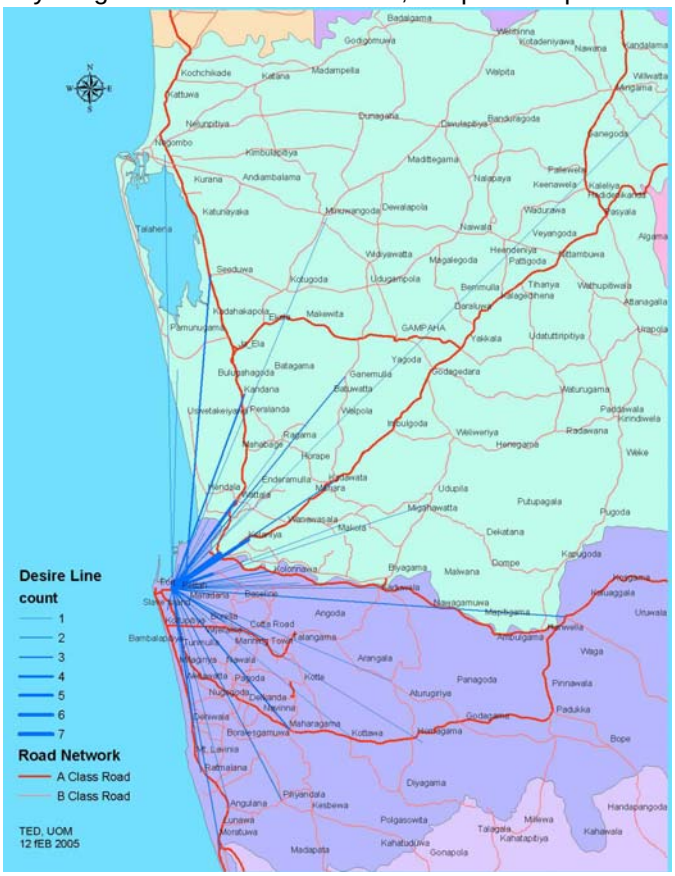


**Figure 2: Commuting Desire Lines by Public Transport to City of Colombo**

**Transport:** During the period 1961 to 1979, the traffic flows crossing the city boundary increased at the rate of 2.8% per annum. However it has increased at a much higher rate of 5.4% per annum over the last two decades. The passenger growth observed during the period 1985-95 was 4.7%, with bus transport growth at 4%, private vehicles growing at 11.8% and railways at 2.8%. It analyses the fact that these growth rates are inversely proportional to the cost of travel. In other words, the cheapest forms have had the lowest growth. In all, there are presently

an estimated 2 million passenger crossings (both directions) per day in 315,504 vehicles of which 80% are private vehicles (Kumarage, 2000). The desire lines which indicate the direction, distance and volume of flow arriving at the centre, for the commuting trips to Colombo City can be illustrated as in Figure 2. This shows that commuting trips are rather short distances, with a few exceptions, where low cost railway travel is available.

**Housing:** It is estimated that around 25,000 to 30,000 new houses would be required to house these low income families adequately. The land that is presently occupied by these settlements can be used partially for this purpose. However, most resettlements would have to take place outside the city. The land values in Colombo City during the period 1985 to 1998 increased at the rate of 16.5% per annum (p.a.) in nominal terms and adjusted for inflation this is approximately 5% p.a. (UDA, 1998) while that of the suburban areas increased by around 18% p.a where the real rate was around 6.5% p.a.. This makes purchase of land nearly impossible for poor people. The alternative areas for relocation are located at distances between 20 to 30 kilometres (kms) from the city centre. The relocation of the poor to these locations will make accessing jobs in the city more difficult for them. It is most unlikely that they will move since it adversely affects their livelihood.

**Income:** Income Distribution for the Western Province, as calculated from the Sri Lanka Integrated Study (1999/2000) data, is given in Table 3. This reinforces the position that two-thirds of the population is not engaged in income receiving occupations. It seems that a significant proportion of income receiving (34%) fall within the lower half of income range of up to Rs 3,000/= per month (US$ 430), while 11% falls in the income range of over Rs. 10,000/= (US$ 1,430) per month.

**Table 3: Income Distribution (1999/2000)**[2]

| Income Range | Western Province | Sri Lanka |
|---|---|---|
| Not employed/student/sick | 66.1 | 64.9 |
| Up to Rs 1,000/= | 1.0 | 4.3 |
| Rs 1,001 to Rs 2,000/= | 4.2 | 6.2 |
| Rs 2,001 to Rs. 3,000/= | 6.4 | 7.2 |
| Rs 3,001 to Rs 5,000/= | 9.8 | 8.6 |
| Rs 5,001 to Rs 10,000/= | 8.9 | 6.2 |
| Rs 10,001 to Rs 25,000/= | 2.4 | 1.8 |
| More than Rs. 25,000/= | 1.2 | 0.7 |
| Total | 100.0 | 100.0 |

## 2. Objective and Scope of Paper

The Sri Lanka Transport Sector Strategy Study (World Bank, 1997) notes that poverty alleviation requires a transport policy that is focused on the poor. The lack of such a policy and of relevant information has made it difficult to analyze how the transport sector is serving and helping the poor. It has been assumed that the mobility needs of the poor could be resolved by improving transport networks and public transport services in both rural and urban areas.

Policies should address, among other things, the best ways to provide adequate and affordable access for the poor to get to work, particularly in rural and marginal urban areas, opportunities for generating employment through the transport sector, and the strategic use of transport to reduce regional disparities. There are no studies where the transport needs of the poor have been studied specifically.

This paper examines the relationship between employment of the low income earners, their places of residence, and the transport linkages that are made available.

## 3. Analysis of Income and Transport in the Western Province

This analysis is undertaken from aggregate socioeconomic data collected through Census and other household surveys and published from time to time. This data is not available for the City of Colombo. It does however exist for the Western Province. The objective of this analysis is to identify the patterns of (a) expenditure on transport and (b) of income of those living in the Western Province.

### 3.1 Individual Income and Distance of Travel to Work

Data from the Sri Lanka Integrated Survey (1999/2000) have been used to analyze the relationship between place of work and place of residence. Table 4 shows results for the Western Province (WP) compared to the rest of the country where over half of people working, do so within their own community. This could be interpreted in several ways. First, it might suggest that population is so distributed that the majority of the employment opportunities are located outside the communities they live in. Second, it might suggest a higher mobility for finding employment outside the local community, due to existence of acceptable transport services.

**Table 4: Relationship between Place of Work and Place of Residence**

| | Western Province | Sri Lanka |
|---|---|---|
| Same Community | 51.2 | 66.0 |
| Other Urban Community | 37.3 | 23.9 |
| Other Rural Community | 0.6 | 0.8 |
| Other | 10.9 | 9.3 |
| Total | 100.0 | 100.0 |

Table 5 gives the cross-relationship between income and place of work/place of residence for the Western Province. These two tables show that there is a direct correlation between individual incomes and the propensity to seek employment in other communities. This is an interesting phenomenon that could be due to the fact:

(a) That those who are able to commute outside their communities can get better incomes.

(b) That those who have higher incomes tend to seek employment away from their own communities.

**Table 5: Individual Income and Place of Work with Respect to Place of Residence – WP**

| | Same Community | Other Urban Community | Other Rural Community | Other |
|---|---|---|---|---|
| Not employed/student/sick | 71.4 | 7.1 | 0 | 21.4 |
| Rs 0 to Rs 1,000/= | 76.2 | 9.5 | 4.8 | 9.5 |
| Rs 1,001 to Rs 2,000/= | 56.6 | 31.3 | 0 | 12.0 |
| Rs 2,001 to Rs. 3,000/= | 51.2 | 40.0 | 0 | 8.8 |
| Rs 3,001 to Rs 5,000/= | 44.9 | 45.9 | 0.5 | 8.7 |
| Rs 5,001 to Rs 10,000/= | 38.9 | 53.3 | 1.7 | 6.1 |
| Rs 10,001 to Rs 25,000/= | 54.2 | 35.4 | 0 | 10.4 |
| More than Rs. 25,000/= | 48.0 | 36.0 | 0 | 16.0 |
| Total | 50.6 | 38.3 | 0.6 | 10.4 |

In the case of (a) it relates to the availability and affordability of transport. This implies that poor transport will make people immobile and captive to their own communities, thus preventing them from accessing and holding employment that is higher paying. Both Tables 4 and 5 indicate that only those with incomes less than 1000/= per month appear to show a marked difference to other income categories with respect to the percentage of persons working within the same community. The amount of income that falls within this category in all probability refers to part time employment which cannot be compared with the full time employment as the commuting distances would be very much less in the case of the former.

In the case of (b) above, it is a known social factor that higher paid employment is generally concentrated in centers (usually urban) and thus the average commuting distances would increase as people seek higher paying employment. This argument also can be used to explain why the percentage working in other urban areas increases with income and then begins to decrease when monthly incomes increase beyond Rs. 10,000/=. This could possibly mean that relocation becomes more affordable when incomes are in that magnitude. The reverse inference of this observation is that when incomes are less than Rs 10,000/= per month, people are more likely to be constrained by the availability of transport facilities in seeking employment away from their community of residence.

A comparison of the two tables indicates that in the Western Province, there is higher mobility between residence and employment communities for the same income groups. This means that people have to commute further as residential and employment areas tend to be more separated in urban and suburban areas.

### 3.2 Occupation and Travel to Work

Table 6 gives the cross-relationship between type of occupation and place of work/place of residence for the Western Province. There is relatively little mobility among those engaged in agriculture, as many people in this category are farming their own land or fishing, both activities generally being located close to residences. Those in business, trade, and manufacturing activities also appear to be, in general, residing close to their places of employment - for example, family-based businesses where home and shop or home and trade are located within the same premises. On the other hand, casual labour shows a somewhat higher propensity to seek employment in urban centers. These might be persons who are engaged in construction or similar work and who might not actually be commuting on a daily basis - more because of distance than transport fare. Salaried employees mostly travel outside their communities to urban communities for employment and show the highest degree of mobility.

**Table 6: Type of Occupation and Place of Work with Respect to Place of Residence - WP**

| | Same Community | Other Urban Community | Other Rural Community | Other |
|---|---|---|---|---|
| Casual Labour | 55.1 | 23.2 | 1.7 | 19.8 |
| Salaried Employees | 29.3 | 63.4 | 0.3 | 7.0 |
| Business/Trade/Manufacturing | 76.1 | 15.0 | 0.0 | 8.8 |
| Personal Services | 50.0 | 6.3 | 0.0 | 43.8 |
| Agricultural | 92.8 | 6.3 | 0.0 | 0.9 |

### 3.3 Income and Ownership of Vehicles

Ownership of all types of vehicles in the Western Province increases with income, as shown in Table 7. All income groups own bicycles in significant numbers and bicycles are the most common vehicle owned. Motorcycles are also used by all income groups, although their ownership levels become significant only when household incomes rise above Rs 5,000 per month. In the case of cars and vans, ownership is

recorded even at low income levels, but becomes significant only when household incomes reach Rs 25,000 or more.

**Table 7: Vehicle Ownership per 100 Households by Income (Rs/month) - WP**

| | 0-1000 | 1001-2000 | 2001-3000 | 3001 – 5000 | 5001 – 10000 | 10001 -25000 | Over 25000 | Total |
|---|---|---|---|---|---|---|---|---|
| Bicycles | 34 | 15 | 17 | 28 | 38 | 41 | 34 | 33 |
| Motor Cycles | 07 | 04 | 02 | 14 | 11 | 24 | 21 | 14 |
| Cars & Vans | 00 | 01 | 02 | 01 | 04 | 15 | 52 | 09 |

### 3.4 Percentage of Income Spent on Transport

The analysis of expenditure on public transport as a percent of expenditure on transport incurred by three different income groups is given in Table 8. This clearly confirms the earlier trend but also provides information that the income group with less than Rs 3,500/= for monthly incomes are clearly captive to public transport, while this figure falls to around 50% to 60% percent of households when incomes are between Rs 3,500/= to Rs 10,000/=.

**Table 8: Distribution of HH Income Groups by Expenditure on Public Transport (2000)**

| Income group | Expenditure on Public Transport as a Percentage of Expenditure on Transport | | | | | |
|---|---|---|---|---|---|---|
| | 0-20% | 20-40% | 40-60% | 60-70% | 70-80% | 80-100% |
| Less than Rs 3,500/= | | | | | | 100% |
| Rs 3,500- Rs 6,000/= | 3.7% | 5.6% | 5.6% | 18.5% | 11.1% | 55.6% |
| Rs 6,500 – Rs 10,000/= | 9.6% | 1.9% | 17.3% | 3.8% | 7.7% | 59.6% |

### 3.5 Expenditure on Public Transport and Income

Data from SLIS (1999/2000) have been tabulated in Table 9 to show the percentage of household expenditure spent on public transport by income group, for the Western Province. The table shows that the percent of expenditure on transport is below 3 percent for the majority of households, irrespective of their level of income. The higher percentages are to be found among those households with higher incomes. However, it should be pointed out that the vast majority of public transport travel should be undertaken by those in the higher income categories. In this respect it should be noted that since the consideration is by household income and not individual incomes those households with several income-earning members would have a higher income but also a proportionately higher transport cost due to increased travel to work.

Table 9 does, however, indicate that the higher percentage expenditure on public transport is concentrated in the middle class households where incomes range between Rs 3,000/= to Rs 25,000/= per month. In the case of those households with incomes less than Rs 3,000/=, less than 2 percent of households incur more than 9 percent of their expenditure on pubic transport and less than 6 percent of the households incur more than 6 percent of expenditure on public transport. The respective values are higher and nearly double in the Western Province. This means that the urban poor appear to spend proportionately more on public transport than the rural poor do. This could be due to difficulties in using alternative modes of transport in urban areas, particularly bicycles; or else it could also be due to longer distances to work and school.

**Table 9: Percent Expenditure on Public Transport by Income Group (WP)**

| Percentage Expenditure | Income Group (Rs) | | | | | | | Total |
|---|---|---|---|---|---|---|---|---|
| | 0-1000 | 1001-2000 | 2001-3000 | 3001-5000 | 5001-10000 | 10001-25000 | Over 25000 | |
| 0 percent | 65.5 | 69.2 | 51.2 | 44.7 | 35.6 | 35.0 | 34.5 | 41.9 |
| 0 to 3 percent | 13.8 | 11.5 | 9.8 | 16.0 | 16.0 | 26.5 | 24.1 | 18.0 |
| 3 to 6 percent | 13.8 | 15.4 | 26.8 | 23.4 | 27.0 | 14.5 | 27.6 | 22.0 |
| 6 to 9 percent | 3.4 | 3.8 | 7.3 | 11.7 | 8.6 | 12.8 | 6.9 | 9.4 |
| 9 to 12 percent | 3.4 | 0.0 | 4.9 | 1.1 | 7.4 | 6.0 | 6.9 | 5.0 |
| 12 to 15 percent | 0.0 | 0.0 | 0.0 | 3.2 | 3.7 | 1.7 | 0.0 | 2.2 |
| Over 15 percent | 0.0 | 0.0 | 0.0 | 0.0 | 1.8 | 3.4 | 0.0 | 1.4 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

## 4. Analysis of the Travel Patterns of the Working Poor in Colombo City

The second source of data is from a survey of those identified as the working poor that studies the ability to access work and their residential features such as distance and type of house. The paper also compares the potential to work with the commuting distances. The comparison is based on the relative costs of transport, time of travel, availability of late night travel and social parameters such as type of housing, status of children's education, etc. The survey also investigates the impact on those employed in transport services. The results are particularly significant with respect to three-wheeler (auto-taxi) drivers who are resident in urban settlements and prefer to live close to the city centre which is a focal point of their work and cannot drive their vehicles long distances for the night. They are different for bus crews who usually live a fair distance away from the city centre as they can ride their own bus home for the night.

**Survey**: A total of 164 personal interviews were made of people who were working within the Colombo Municipal City Limits. The questionnaire used for these surveys is given in Annex 1. The survey included location of employment and residence, mode(s) of travel, travel cost and time by each mode, nature of employment, work hours, nature of residence, if transport curtails longer work hours, monthly expenditure, income and household vehicle ownership.

The breakdown by employment type is given as follows:

- Security Guards: Mostly earning the minimum legal monthly pay and often working double shifts
- Parking Wardens: Mostly permanent employees of local government
- Cleaning Personnel: Government and private sector contracted staff
- Labourers: Working on daily wage basis
- Traders at Wayside Stalls: Working in fixed areas but self employed.

These five groups represent the lowest earning employees in the city. In addition two other groups representing transport-sector workers were also interviewed. These are identified as:

- Three Wheeler Drivers: Mostly self-employed auto-rickshaws drivers
- Bus Crews: Crews mostly working on daily pay basis for buses owned by private individuals.

### 4.1 Distance of Travel & Generalised Cost

The mean travel distance and the Generalised Cost of Travel by each group of employees are given in Table 10. The distance is taken as the minimum road based distance for travel computed by the TransPlan traffic model (University of Moratuwa, 2003). Generalised Cost is computed to represent in addition to the fare or cost of transport, the cost of time, which is calculated at 20% of the income rate. The income rate is calculated by dividing the monthly income stated in the survey form and dividing by the total working hours reported for the month.

**Table 10: Travel Characteristics of Employees**

| | General Employment | | | | | Transport Sector Employment | |
|---|---|---|---|---|---|---|---|
| | **Security Guards** | **Parking Attendants** | **Cleaning Personnel** | **Labourers** | **Wayside Traders** | **3 Wheeler Drivers** | **Bus Crew** |
| Distance to Work place (km) | 7.3 | 9.2 | 12.6 | 8.1 | 8.6 | 7.9 | 14.1 |
| Cost of Travel (Rs/one-way) | 10.3 | 10.5 | 9.3 | 11.2 | 9.1 | 35.1 | 4.0 |
| Travel Time (mts/one way) | 46.3 | 52.1 | 40.9 | 42.0 | 33.4 | 31.1 | 38.5 |
| Total Generalised Cost/day | 31.3 | 31.2 | 24.4 | 30.4 | 19.0 | 85.2 | 18.1 |
| Monthly Income Rs/Month | 8,318 | 6,584 | 6,914 | 5,750 | 10,111 | 10.285 | 12,384 |
| % of Income for Transport | 15.1% | 19.0% | 14.1% | 21.1% | 7.5% | 33.1% | 5.8% |

It is seen from Table 10 that average travel distances between different employment categories vary between 7.3 kms and 14.1 kms. The travel time varies between 31 minutes and 52 minutes. The travel cost varies between Rs 4.00 for bus crews- who travel for free along with the bus most of the distance and a high of Rs 85.2 for three wheeler operators who have to ride their vehicles to the place of operation. Apart from these extremes demonstrated in the transport sector employment, other employment demonstrates fairly uniform costs and travel times.

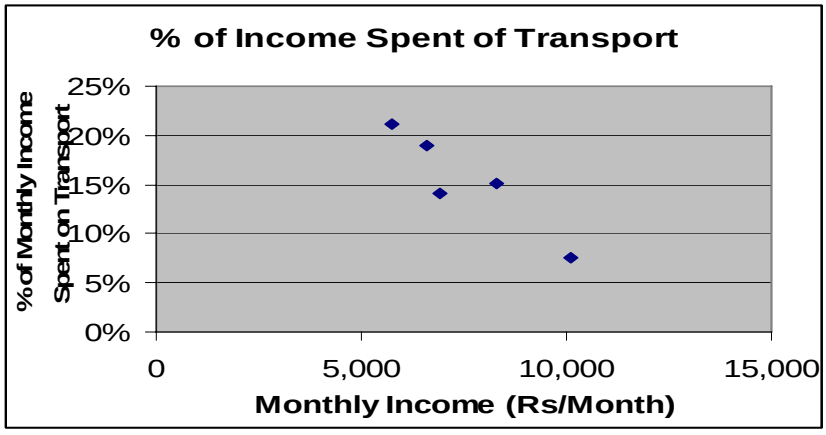


**Figure 3: Variation of % of Income Spent on Commuting to Work and Income**

Interestingly, however, the relationship between expenditure for transport as a percentage of total income appears to have an inverse relationship with income. As indicated in Table 10, the lowest average income earners who are labourers spend 21.1% of the their incomes on generalized costs for travel, while the highest income earners who are the wayside traders spend only 7.5% of their incomes on transport. Figure 3 shows this relationship where the lower the average income, the higher is the percentage of their income that is spent on transport. While the bus was the predominant mode of travel for all categories, the higher income earners spent less time to travel to the same distances as they tended to live closer to the main bus routes and the travel times were less. This is intuitively plausible since the higher income groups could afford to live in lands closer to the main roads. Thus the distance from the main bus routes appear to be the primary reason for increase in total travel costs.

### 4.2 Land Ownership, Land Prices & Distance to Work

The survey, by tracing the location of work, alternative housing locations, and access and cost of transport finds that land prices in suburban areas which are alternative locations for the urban poor to be relocated are usually away from the main transport corridors and are presently poorly served by public transport. The irregular hours that the poor work are not conducive to public transport which usually operates well only during peak periods. The costs of travel to these alternative sites are high — hence, the need to reside in the city. This increases the value of land and also overcrowding in settlement areas which are the only such affordable lands for the poor.

In addition this puts pressure on services in urban areas and results in the poor not having adequate equal access to these services which are more freely available in suburban areas. For example, the city has the most popular schools, but the ones attended by the children of the poor are neglected when compared to similar schools in suburban areas. Similarly, the incidence of health and safety problems is higher, as is that for crime and other related activities in these squatter settlements.

The house and land ownership of the residences occupied by the interviewees is given in Table 11. It is seen that only 22% of the people were on rented land. While 42.1% stated that they were occupying legally owned land, 26.8% stated it was government land. The latter are to be considered mostly as squatters on state lands, usually marginal lands in the periphery of the city. The fact that nearly 70% of the people claimed a fixed abode makes them less mobile to seek accommodations closer to their places of residence. This also adds to increased commuting distances and increased transport costs.

**Table 11: Breakdown of Land & House Ownership**

| | **Percentage** |
|---|---|
| Own Land | 42.1% |
| Government | 26.8% |
| Rented House & Property | 22.0% |
| Other | 9.1% |

This is further reinforced by the evidence that the percentage of those who own their own house and property decreases as the distances between residence and work place decreases. This is shown in Table 12, which shows that only 31% of those living within 5 kms from their places of employment occupy their own houses. This increases sharply to 64.5% when the distance increases to over 10 kms.

**Table 12: Percentage of Employees who live in Own House & Property with respect to Distance from Work Place**

| | Percentage |
|---|---|
| Less than 5 kms | 31.0% |
| 5 to 10 kms | 50.0% |
| Over 10 kms | 64.5% |

However, the quality of housing appears to fall when employees get closer to their workplaces — i.e. to the centre of the city. As shown in Table 13, those living less than 5 kms from their work places do so in Housing Settlements which have only shared amenities, as opposed to Separate House and Property or Flats (Apartments). Thus it is clear that while going further away from the city centre has an added advantage, as the quality of housing that can be afforded improves.

**Table 13: Percentage of Employees who live in Settlements with respect to Distance from Work Place**

| | Percentage |
|---|---|
| Less than 5 kms | 31.0% |
| 5 to 10 kms | 11.1% |
| Over 10 kms | 6.5% |

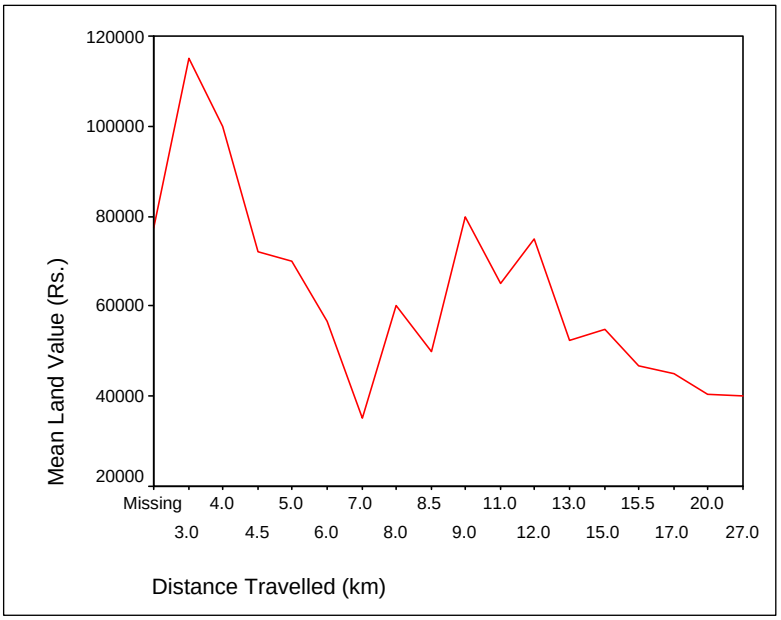


**Figure 4: Land Value and Commuting Distance**

The value of land as perceived by most of the interviewees appears to be quite suspect as they seem to have no clear idea of the market value of land. Even those who stated they lived on their own land had a poor idea of the actual value. This could also be due to the fact that most of the land which was considered as 'own' is also encroached and not legally owned. Hence the value of exchange of such land is only a fraction of the market price. Moreover, these lands, most often located on marginal areas such as on canal banks, marshy areas prone to stagnating water or flooding, underdeveloped localities, etc., have a depressed market value compared to the better developed and sought after land at equal distance from the city centre.

However Figure 4 clearly shows that even the perceived land value has a correlation with the distance from the centre. It also shows the lower land value in the city centre itself, which due to the commercial and wholesale trade environment has lower market prices. The highest prices are distances between 2 to 4 kms from the city centre. According to Figure 4, the value of land drops to about 1/3rd the cost at distances of 20 kms.

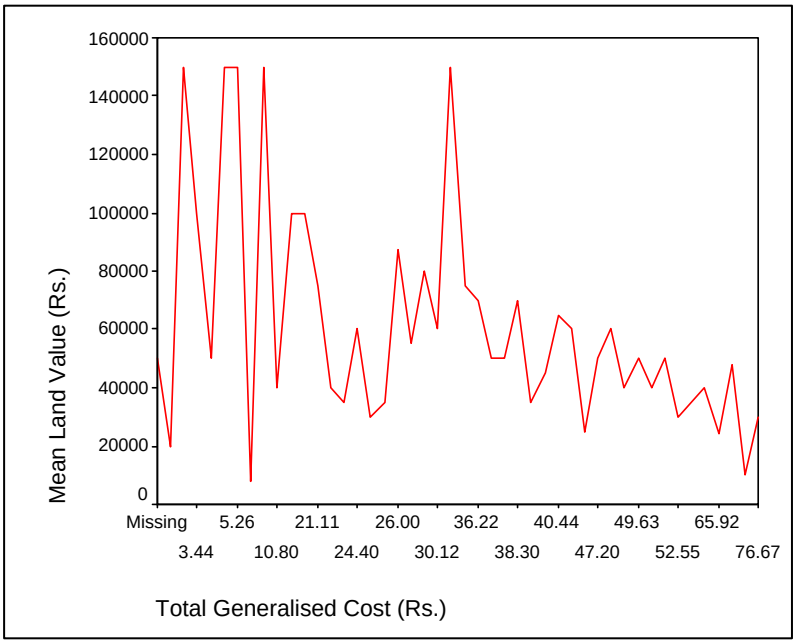


**Figure 5: Land Value and Generalised Cost of Commuting**

Figure 5 shows the relationship between the total one-way Generalised Cost of Transport and the value of the residential land. While sharp variations are evident especially within shorter distances, as the distance (and the cost) increase, the relationship appears more distinct. At a Generalised Cost of Rs 80, the land value is around Rs 25,000 per perch – which is 1/160th of an acre or approximately 272 square feet in area.

When the Generalised Cost falls by half to Rs 40, the land value doubles to around Rs 50,000 per perch. Similarly, when the Generalised Cost reduces by one half again to Rs 20, the land value once again doubles to Rs 100,000 per perch. This clearly shows how transport costs and land values are inversely related, so that an inverse linear relationship exists between the two.

### 4.3 Working Hours and Commuting Distances

The ability to supplement fixed incomes by working longer hours is an important means of overcoming the ever-increasing cost of living especially in urban areas. However, poor transport and increasing distances between work places and residences may limit opportunities for this. This is shown by the results displayed in Table 14 where those living within a total Generalised Cost of commuting one way of less than Rs 5 from their work places indicate they have no restrictions imposed by availability of transport to working extra hours. When the Generalised Cost increases to between Rs. 5 and Rs. 10 per one way trip, the percentage decreases to 90.9%, and to 84.4% when the Generalised Cost increases to over Rs 10 per trip.

**Table 14: Generalised Cost of Commuting and Average Working Hours**

| Generalised Cost of One Way Travel (Rs.) | Average Work Hours |
|---|---|
| Up to Rs 10/= | 11.9 |
| Between Rs 10/= and Rs 20/= | 10.9 |
| Between Rs 20/= and Rs 30/= | 11.5 |
| Between Rs 30/= and Rs 40/= | 10.5 |
| Between Rs 40/= and Rs 60/= | 10.2 |
| Over Rs 60/= | 9.8 |

The average working hours for these employees appear to also suffer with increasing Generalised Cost. Thus around 2 hours of potential work appears to be lost when Generalised Cost increase beyond Rs 60. When it is between Rs 30 to Rs 40, around one hour is lost. Thus longer commuting distance not only increases the cost of transport, it reduces the potential working hours. Thus considering a mere 20% of the value of the income rate for commuting travel appears to be too conservative. It is therefore considered that the value of commuting time for low salaried employees may be significantly similar to the wage rate.

### 4.4 Vehicle Ownership & Income

The vehicle ownership of the working poor is also an important parameter of commuting to work. As shown in Table 15, the majority of people with monthly incomes of less than Rs 15,000/= do not have access to any vehicle, not even a bicycle. This impedes access to employment. While affordability is unlikely to be the cause, it is most likely to be lack of facilities for riding a bicycle. Bicycle ownership increased with income up to the Rs 10,000 to Rs 15,000/- level, after which using a motorcycle or three wheelers appears to be a more likely choice of a vehicle.

**Table 15: Vehicle Ownership as a Function of Monthly Income**

| | Vehicle Ownership | | | | |
|---|---|---|---|---|---|
| **Monthly Income of Interviewee (Rs)** | **No Vehicle** | **Only Bicycle** | **Having a Motorcycle or 3 Wheeler** | **Having a Motor car or Van** | **Total** |
| Less than Rs 5000/= | 72.0% | 18.7% | 9.3% | 0% | 100% |
| Between Rs 5,000 to Rs 10,000 | 62.5% | 26.8% | 8.9% | 1.8% | 100% |
| Between Rs 10,000 to Rs 15,000 | 53.8% | 30.8% | 7.7% | 7.7% | 100% |

## 5. Conclusions

The research concludes that

(a) In urban areas, more people work outside their local communities when compared to rural or agriculturally based communities. It is also shown that those who are employed outside their communities enjoy higher incomes. However, for income groups below Rs 10,000/= there is a lack of adequate and affordable transport facilities and therefore it can be concluded that for those with lower incomes a greater value addition for their output can be obtained if they can commute to urban centres where employment opportunities are greater. This is further confirmed when daily paid casual labour show a significantly lower propensity to seek work in outside communities when compared to salaried (monthly paid) employees. This may be mostly due to the fact that those with steady jobs can get discounted bus and rail passes, while those seeking casual labour and work in different places are unlikely to obtain convenient and cheap transport facilities and thus consequently have to bear the full cost of travel.

(b) The ownership of bicycles is relatively high for all income groups. This level of affordability makes the bicycle a vehicle to access work for the poor. This may be in fact one reason why the poor appear to be constrained to work in local communities, since this relatively inexpensive form of non-motorized transport is available.

(c) With respect to expenditure on transport it appears that the urban poor spend proportionately more on public transport than the rural poor do. This could be due to difficulties in using alternative modes of transport in urban areas, particularly bicycles; or else it could also be due to longer distances to work and school.

(d) The analysis of the data from surveying of the working poor shows that the lower the average income, the higher is the cost of transport for commuting. This includes time costs. It is also indicative that the lower the income, the greater appears to be the access distances to the main bus and train corridors. The access costs — namely the time costs — appear to be the significant contributor to increasing the cost of transport of the lower income earners.

(e) The analysis also provides evidence that land prices decrease sharply with the increasing cost of commuting from the place of work. Doubling of transport costs indicates a halving of land prices and vice-versa. This results in more people who live in distance areas being able to afford their own house as opposed to those who live closer to the city who live in rented or illegal squatter lands. Thus there is clear evidence that poor transport forces the working poor to seek residence within the city, where the only 'affordable' land is the illegal squatter type or low-amenity government flats within the city.

(f) The survey also reveals that the average working hours also decrease proportionately with the cost of commuting to work. The average cost of time appears to be valued at around Rs 30 to Rs 40 per hour. This works out to a daily wage rate of between Rs 250 and Rs 400, which is close to market rates.

(g) As opposed to general vehicle ownership, it appears that the ownership of bicycles among those who commute to work in Colombo City is significantly lower. This indicates that fewer workers utilize bicycles to access work in Colombo or even to access motorized modes of transport such as buses and trains. However, this also provides an opportunity for accessing work outside their own communities if park and ride facilities are provided for bicycles in small town within commuting distances. There are a few such places that have evolved — however there is now evidence that a more organized attempt could be justified.

(h) The above clearly indicates that the relationship of transport facilties, distances between work and housing and the value of land have a close relationship. The need to provide for city centre housing for the poor increases with poor transport facilities. Thus land use policy should take into account the quality of transport services that are available.

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***Amal S. Kumarage*** *is a Professor of Civil Engineering of the University of Moratuwa in Colombo, Sri Lanka. He also is serving as the Chairman of the National Transport Commission in Sri Lanka.*

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[1] In 1994, 1 US $ was Rs 60, while it is Rs 100 in 2005.

[2] In 1999/2000, the average conversion rate was 1 US $ = 70 Rs.

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## Annex 1: Survey Questionnaire

Survey on Transport to Work (City of Colombo)

Transportation Engineering Division

University of Moratuwa

**A.1. Where is your Place of Residence**

DSD……..Town…….Area…….

**A.2. Where is your Place of Work**

DSD……..Town……..Area…….

**A.3. What Type of House do you live in:**

Settlement/Flat/Apartment/Single House

**A.4. Is the house you live in:** Your Own/Family Members/On Rent

**A.5. Is the land your house is located:** Your Own/Family Members/On Rent/Govt/…..

**A.6. What modes of Transport do you use to get to work (underline all modes)**

Walk/Bicycle/M'Cycle /Three Wheeler/Bus/Train/Van/Car

**A.7. How long does it take to walk to your house from a main bus route** Mts……

**A.8. What is the cost of Transport to work (one way)** Rs ……..

**A.9. How much time does it take to travel to work (one way)**

Hours……Mts…...

**A.10. Describe the nature of your work** ……..

**A.11. What are your Official Working Hrs** Start ..……..End…….

**A.12. Do you usually work extra hours** Yes/No

**A.13. If Yes, What are the usual extra work hours** Start ……..End…….

**A.14. Is your work period curtailed by the time of the Last Bus/Train** Yes/No

**A.15. What is the approximate Land Value where you live** Rs …….. per perch

**A.16. How many members are there in your household……**

**A.17. Is there a vehicle for the use of any member in your household** Yes/No

**A.18. If Yes, What are the vehicles** Bicycle/M.Cycle/Three Wheeler/Van/Car

**A.19. What is your total household expenditure per month for all items including rent/transport/food/clothing etc….** Rs……

**A.20. What is your monthly/daily Take Home salary from employment**

Rs……..