

URBANIZATION, ROAD SAFETY AND TRAFIC MANAGEMENT IN SRI LANKA

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1. Introduction

The main objective of any transport service should be the safe arrival at the destination. There is a close correlation between landuse, transport planning and traffic management. Traffic management in turn decides the safety level.

Urbanization normally leads to an increase in urban job opportunities which demands an increase in spatial mobility which is reflected in the intensity of traffic. When urban employment opportunities are concentrated in limited spatial extent, the spatial mobility would give rise to lower total trip kilometerage. Thus the needed amount of total road kilometerage could be achieved by a higher number of road lanes within a given road network. However, this type of demand prefers less of private vehicle ownership and more of public transport. On the otherhand, when the job opportunities are dispersed due to extension of urban field, one would expect a higher total trip kilometerage which in turn would require lower number of road lanes, but a higher length of road kilometerage. This situation might create a problem in provision of public transport, hence could tolerate a higher percentage of private vehicle ownership.

Traffic management in both these situations is crucial. In the present day urban transport policy, traffic management has become the main objective with road user safety as the ultimate aim. In effective traffic management, factors such as road congestion, provision of public transport and institutional framework have to be taken into consideration. Comprehensive traffic management can be viewed in three angles : management for capacity, management for priority and management for demand. In all these situations the expected result is the road safety.

When road user safety is considered, one would come across positive as well as negative problems. For instance, positive problems would be unsuitable road surface, sub-standard alignment, inadequate lane widths, obsolete traffic signals etc. while negative problems would be driver and other road user behaviour, poor traffic management and increasing high axle loads.

This article analyses and explains the extent of urbanization in Sri Lanka which has given rise to a primate city and the resultant spatial mobility and also demonstrates the correlation between the increased mobility and traffic congestion and associated problems of road accidents.

Author holds the view that better traffic management can reduce the severity of accidents and bring down the ratio of victims per accident. An analysis of accident data in the most urbanized area reinforces the author's view. Paper examines the measures which could be applied to minimize traffic problems and maximize efficiency of transport systems. The work is based on recorded data in relevant departments, published reports and field observations.

2. Urban Development in Sri Lanka

The growth of the city of Colombo in relation to the growth of the population and its physical extent indicate that the evolution of the city began from the mid-nineteenth century. The first recorded census of Colombo was in 1824 which counted the population to be 31,188. The decennial census commenced in 1871 (Table 1).

TABLE 1 : GROWTH OF POPULATION IN THE CITY OF COLOMBO

Year	Area Sq. Km.	Population	Growth %	rate %/gr.	Density per Sq. Km.	Growth %	rate %/gr.
1871	—	98,843	—	—	—	—	—
1881	24.63	110,502	11.8	1.12	4486		
1891	24.63	126,825	14.8	1.39	5149	14.8	1.39
1901	27.37	154,691	22.0	2.01	5653	9.8	0.94
1911	31.10	211,274	36.6	3.17	6793	20.2	1.85
1921	22.71	244,163	15.6	1.46	7243	6.6	0.64
1931	33.89	284,155	16.4	1.53	8385	15.8	1.47
1946	34.59	362,074	27.4	1.63	10467	24.8	1.44
1953	36.16	425,881	17.6	2.35	11778	12.5	1.7
1963	37.33	511,639	20.1	1.85	13706	16.4	1.53
1971	37.33	562,160	10.0	1.20	15059	0.87	1.18
1981	37.33	585,776	4.2	0.41	15691	4.2	0.41

Source : Urban Development Authority of Sri Lanka.

Table 1 illustrates the growth of the city in terms of area and population over the years. Since 1871 only about 12.7 sq.km. have been added to the areal extent while there had been a continuous growth in, the city population with an annual growth rate of 1.68%. The census years 1911 and 1953 show the highest rate of growth per year. Population density per sq.km, also shows an average growth rate of about 1.8% till 1971. However, the 1981 census records an annual growth rate of 0.4% both in population and in the density. Comparing these figures with the national growth rate of population, 2.2% in 1971 and 1.7% in 1981 suggest that the population in the city is undergoing stabilization.

3. The Physical Configuration and the City Growth

Colombo can be described as a stereotype of a Colonial port city. The Fort is the hub of the city which was the residential area of the white settlers. The Fort gradually became the financial and Government centre. The Pettah which was adjacent to the Fort, turned out to be a centre for retail and wholesale trade, serving the needs of not only the growing city population but also of the entire island. Port and railway terminals in this area attracted industries and warehouses. It can be reasoned out that the further expansion of the city was guided by the terrain and the communication routes. Towards the north was the lowlying lands and the Kelani Ganga, and towards the west is the extensive marshes which decided the pattern of expansion of the city. Hence the development which were originally towards north moved southwards taking advantage of the Galle road.

3.1 The City Landuse

The spatial pattern of activities have changed periodically which has intensified during recent years resulting a change in the character of different areas. For example, Mutwal one time high class residential zone has subjected to recent intrusions of large scale warehousing. Another example is the transformation of Kotahena from a middle class residential area into a zone where light industrial and commercial activities with consequent concentration of low income residents. Prince of Wales Road and northern part of Baseline Road, the roads leading to Negombo and Kandy have developed as industrial areas. Galle Road which was predominantly middle income residential zone is transforming into an office and shopping area. Offices, restaurants and similar activities have infested the once high-class residential areas of Cinnamon Gardens and Duplication Road. The extensive floor areas in large houses have been sub-divided for these purposes. Shanty

settlements have mushroomed in marginal lands on the edge of the marshes (Wanathamulla) and along canals (Kirillapona and Dehiwela).

3.2 Demographic Factor

The estimated birth rate for the city in 1977 was 2.1% while the death rate was 0.8%. The infant mortality rate was 4%. The ratio of males to females was 1 : 1.3, indicating the existence of a large number of single males. The age structure indicates, 48% between the age group of 20–54 years and 22% in the age group of 5–14 years; of the latter 31% did not attend school. (City of Colombo Development Plan Vol.1, UDA 1985, p. 10).

The urban population of Sri Lanka as a percentage of total population, in 1965, was 20%. This increased to 21% in 1984. The average annual growth rate of urban population in the island between 1965 and 1973 was 3.4% and between 1973 and 1984 was 3.5%. (World Bank Report 1986)

Area of Colombo District is 652 Sq.Km. which is about 1% of the total land areas of Sri Lanka. 11% of the island's total population live in the Colombo District ; and 585, 776 people or 4% of the island's total, live within the Colombo Municipal limits which constitute an area of 0.05% of island's total land surface. The island's total population is 16m and the area is 65,610 sq.km. (Census Report 1981).

Out of the island's total urban population; the city of Colombo had 28% in 1980, which had reduced to 16% in 1986. (World Bank Report 1986). Although only about 30% of the Colombo districts land area come under the administration of Municipal or Urban Councils, 74.4% of its people live in urban areas (Colombo District Report, Vol. part 1, Census of Population — Housing 1981).

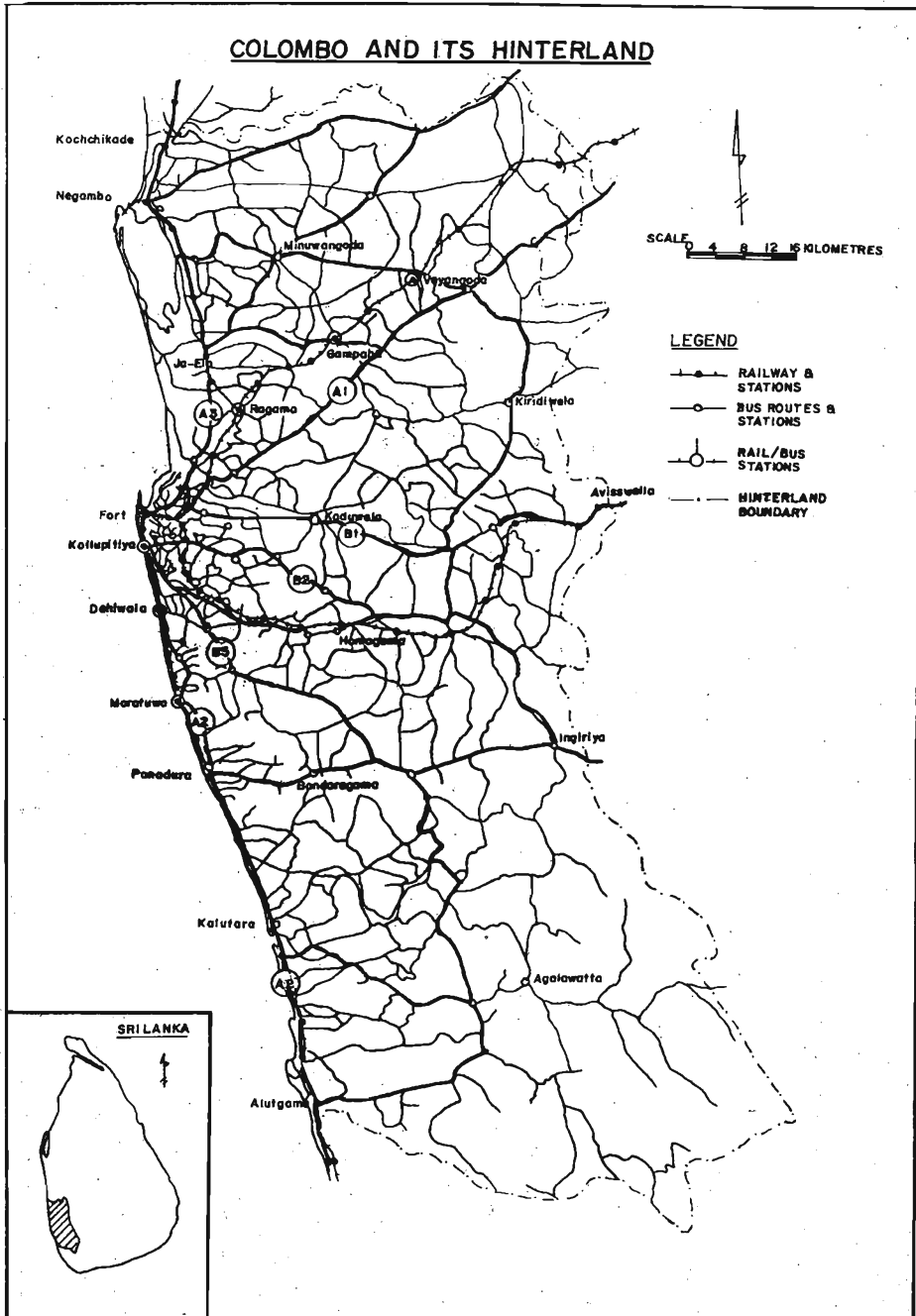
TABLE 2 : LAND USE IN THE CITY IN 1977

Land — use type	Extent Hectares	% of total
Residential	1687	45
Commercial	201	5
Industrial	151	4
Public and semi—public	465	13
Transport	600	16
Open spaces	142	4
Developed area	3256	87
Undeveloped area	379	10
Water bodies	98	3
TOTAL	3733	100

Source : UNDP Master Plan Project, 1984.

3.3 Residential Pattern of the City

Residential population is spread throughout the city. Out of the total land area in the city, in 1977, 45% were occupied for residential purposes. High densities are found in Kochchikade, Maradana and Grandpass followed by Mattakkuliya and Dematagoda. The Central Business District has a population of 17,205 which is greater than the numbers in the exclusive residential area of Cinnamon Gardens (16,740). The lowest densities are in Bambalapitiya, Cinnamon Gardens and Kirillapona. The Cinnamon Gardens consists of large houses of the affluent class. Kollupitiya and Bambalapitiya have a mixture of high, medium and low income households. North of Colombo is clustered predominantly with low income households.



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TABLE 3 : LABOUR FORCE IN THE CITY

Activities	Number	Percentage
Mining and manufacturing	17,337	10
Agriculture	2,438	1
Utilities and Construction	4,564	3
Commerce	39,322	22
Transport	22,202	12
Finance	3,871	2
Services	53,202	30
Other	35,659	20
TOTAL	178,594	100

Source : Census Report 1971.

3.4 Resident Workforce in the City

According to the 1971 Census the resident labour force of Colombo was 178,594 or 32% of the total city population. Table 3 demonstrates that the bulk of the employment is in commerce and services which are mainly urban activities. Incidentally, the 1971 Census reports that out of the total employed people in the city the women resident workers are only 13%.

3.5 Non-resident workforce

As can be expected from any metropolitan city, Colombo also provides a large number of jobs for non-resident employees. In 1971 it had an estimated number of 319,200 jobs of which 12% in mining and manufacturing, 23% in commerce and finance, 13% in transport and 46% in services. (City of Colombo Development Plan, UDA 1985)

4. Functional Characteristics of the City

The composition and the structure of employment clearly demonstrate the role of Colombo as the nerve centre of commercial and transport sectors of the entire island. The total Government

functions are carried out from the city. The President's Secretariate and several Ministries are located in the Fort, while the Courts of Justice are located in Hultfsdorf. A number of large Government Departments are housed in recently built building complexes. However, in addition to these, many offices still continue to be located in large residential buildings spread over the entire city. The estimated floor area in which the Government offices are housed is over 250,000 sq. meters. The shift of Parliament and some offices to Kotte is meant to relieve pressure on the city.

The commercial activity is concentrated in and around the Pettah area. This includes wholesale and retail trade, private business enterprises and banking. These activities are still housed in buildings which were built during the early Dutch period. Although some of the commercial premises were rebuilt recently, still many commercial activities are located in original small sites. Wholesale markets of fish and vegetables are located in this area occupying recently built buildings for this purpose.

As regards retail trade, the Pettah area is the most important. However, this major shopping centre is gradually getting shifted to Galle Road. Borella has developed into a secondary retail trade centre.

The Fort area is still conspicuous for mercantile offices and financial institutions. The Fort and the Pettah together constitute the Central Business District. According to the Urban Development Authority the Central Business District has a built in space of approximately 994,782 sq. meters. Among the proposals of the Urban Development Authority, by end of 1986 there were going to be 32 multi-storeyed buildings intended for purposes such as office, shopping, hotel and apartment, adding built-in space of 962,772 sq. meters. These developments have already resulted in a growth of floor space by 97% and an increase in building intensity by 85%. It was estimated that in the Central Business District in 1980, the daytime population would be more than 550,000 people and it provided 100,000 jobs. Hence, it can be believed that the employment population also has expanded with the expansion of the building complexes and, therefore, there is a proportional increase in the demand for transport facilities and as such has necessarily lead to an intensification of traffic circulation.

The industrial activities of the city consists mostly of medium and small scale manufacturing and service establishments and warehousing. Most of these activities are concentrated in north Colombo,

in and around Union Place and also close to Beira Lake, which are all within easy reach of the Port. Several industries are also located along the northern section of the Baseline Road.

4.1 Colombo Port

Port function can be considered as one of the chief functions of the Colombo city. Port handles 86.3% (1986) of the freight shipped to the island and also handles a substantial amount of transshipment traffic which does not enter the country. The port handles deep draft vessels and has bulk facilities for wheat, cement, petroleum and coconut oil. (Econ. & Soc. Statistics of Sri Lanka Vol. IX, Central Bank, 1986).

The port contains two container terminals. These terminals are linked to 16 inland terminals which are mostly located in north-east Colombo.

The port operates on a twenty four hour basis with two shifts. It is estimated that there are 8000 vehicle trips in and out of the port on an average working day. 95% of the freight handled by the port travels by road, including almost all container traffic. More than 15,000 workers are employed in the port. This has necessarily exerted pressure on the roads which are radiating out of the Port traversing the Central Business District of the city. (City of Colombo Development Plan, Vol. 1, UDA 1986)

4.2 Transport terminals

The main terminals of Sri Lanka Railway and the State Transport Board are situated in the busiest commercial area of the city. There are 50 bus routes which serve both sides of the city, out of which 15 pass through and across the centre at the Fort and Pettah, 20 are radial and the other 15 are orbital. Some of these bus routes have services ranging from 300 to 30 trips per day. The location of the main transport terminals within Central Business District, and the idling of underused buses at and around these terminals add to the degree of congestion in the city.

4.3 Other functions

Colombo city, apart from being the main centre for administration, commerce, banking and industry, also acts as the nerve centre

for services such as health, education and entertainment. The largest State as well as private sector hospitals with their specialized services are located within the Colombo city. In addition to the University of Colombo with its many faculties and Maradana Technical College, 133 State schools with a student population of 131,553 are located within the Municipal limits. In addition, there are many varied type of private educational institutions within the Colombo Municipal limits which add to the travel demand to and from the city.

5. Hinterland of the City

The immediate hinterland of Colombo includes the entire Western Province consisting of Colombo, Kalutara and Gampaha Districts. This region can be identified in terms of population, employment urbanization and communication. This hinterland although rural in nature with large areas under agriculture, is intermingled with extensive ribbon development and satellite settlements where many of the city commuters reside. This hinterland contains over four million people, or 26% of the entire population of the island. Yet, this area holds only 5.6% of the island's total land area. The Colombo Municipal Council contains 14% of the total population of these three districts.

TABLE 4 : POPULATION OF THE HINTERLAND (1985)

District	Area (Km) ²	Population	Density persons/Km ²
Colombo	652.4	1,809,000	2,773
Gampaha	1,398.7	1,452,000	1,038
Kalutara	1,606.5	879,000	547
TOTAL	3,657.6	4,140,000	245

Source : Economic and Social Statistics of Sri Lanka, December 1985.

Colombo being the commercial and business centre of Sri Lanka, attracts large number of people daily into the city from this hinterland. Outside the city, the Katunayake Airport and the Free Trade Zone exert great influence on travel patterns. It is estimated that 200,000 job opportunities are available in the coastal areas north of the city. Similarly, the development which is taking place along the Galle Road between Dehiwela and Kalutara attract large number of work and

business trips. Employment and commercial attractions are thus concentrated in the city and along the coastal belt. Population on the otherhand are more evenly distributed throughout the region and largely rural in character. Hence, the travel patterns are more or less radial, converging at the city centre.

The Colombo Master Plan by UNDP (1978) envisaged the Population of Colombo and its hinterland to grow at 2.5% – 6.5% per annum and it is also expected for job opportunities to grow at 3.5% to 9.5% annually.

TABLE 5 : POPULATION GROWTH (ANNUAL PERCENTAGE) FOR THE CITY AND ITS HINTERLAND

POPULATION GROWTH BY DISTRICT (PERCENTAGE)				
District	46/53	53/63	63/71	71/81
City	1.5	1.5	1.2	0.4
Colombo	2.7	2.5	2.3	1.3
Kalutara	2.0	1.8	1.7	1.4
Gampaha	—	—	—	1.8
Average	2.8	2.7	2.2	1.7
POPULATION GROWTH BY SECTOR (PERCENTAGE)				
Urban	2.8	4.8	4.9	1.2
Rural	2.8	2.2	1.9	1.8
Total	2.8	2.7	2.2	1.7

Source : Department of Census and Statistics, 1981.

The urban characteristic of this hinterland is, however, indicated by the fact that out of 12 Municipal Councils of the island, 3 are situated within this hinterland; and 14 out of 39 Urban Councils and 21 out of 83 Town Councils are located in these three Districts. On the other hand out of 25,453 villages in the island only 6.5% are located within this region which further reinforces the suggestion that although this hinterland demonstrates a rural character in terms of landuse, the demographic factor and also the other services well illustrate that this is the most urbanized area of the whole island.

TABLE 6 : ADMINISTRATIVE DIVISIONS IN COLOMBO METROPOLITAN REGION (CMR)

District	M.C.	U.C.	T.C.	Villages
Colombo	2	4	6	188
Gampaha	1	6	9	836
Kalutara	—	4	6	630
Sri Lanka	12	39	83	25,453

Source : Census of Housing and Population, General Report Vol. 3, 1981.

Rapid urbanization in the Colombo Metropolitan area is further indicated by the internal migration pattern. Within the Western Province, population movement has been mostly confined to Colombo and Gampaha Districts. According to the census of 1981, immigration to Colombo District is around 330,000 people.

TABLE 7 : IN-OUT AND NET LIFETIME MIGRATION IN CMR

District	Migration			Net migrants per 1000 of resident population
	out	in	Net	
Colombo	250,295	333,257	+ 82,967	+ 5
Gampaha	88,961	209,232	+ 120,271	+ 9
Kalutara	118,465	82,892	- 35,633	- 4

Source : Census of Population and Housing 1981.

Out of 9 towns with over 50,000 population, 5 are situated in the vicinity of Colombo. 16 of the 30 towns with a population of 20,000 — 49,000 are found within the Colombo District.

TABLE 8 : SECTORWISE DISTRIBUTION AND GROWTH OF EMPLOYMENT IN SRI LANKA

Employment	Persons employed Number '000		1971 %	1981%	Increase % 1981
	1971	1981			
Agriculture	1,829	1,876	50	46	2.5
Manufacturing	456	577	12	14	27
Services	1,050	1,298	29	31	24
Unspecified	314	369	9	9	18
All Sectors	3,649	4,119	100	100	13

Source : Census of Population and Housing 1981 Vol. 3.

Table 8 illustrates the sectorwise employment distribution in the island and it clearly shows that the greatest expansion has been in the manufacturing and the service sectors; the increase being 27% and 24% respectively. Both these sectors are necessarily urban based which would in turn indicate the growing demand for urban transport.

TABLE 9 : DISTRIBUTION OF INDUSTRIES BY DISTRICTS (1985)

District	Establishments Number	Employed persons in '000	Output Rs. m.	Value Added Rs. m.
Colombo	7411	112.5	13236.6	7832.3
Gampaha	9851	86.2	17123.2	3282.2
Kalutara	6677	24.9	839.8	483.7
All island	102605	625.1	48142.0	18569.9
% in the three districts	23	37	65	63

Source : Census of Industry, Department of Census and Statistics.

The three districts which exert influence on the travel patterns of the city contain 23% of the industrial establishments and 37% of the

total number of people employed in the industrial sector. 65% of the value of industrial production and 63% of the value added are formed within these three Districts. This means that the majority of the blue-collar jobs are also located within the urban zone of the island, and these people have to be moved between residences and work places at least five days of the week. In addition to these, there is a fair number of people who walk to their work place, especially at Katunayake Free Trade Zone.

6. Urban Development and the Road Network

In an urban area the roads have two functions to perform. One is to provide access to land and the other is to provide rapid and safe mobility. Slow speed is adequate to provide access to land while for mobility high speed is required. In the city of Colombo the urban arterial roads carry the major proportion of trips entering and leaving the city and also facilitate the through traffic. On the otherhand, urban connecting roads provide the primary access to land and also carry the local traffic to residential, commercial, and industrial areas.

6.1 *The main traffic arteries*

Linking the city with the hinterland and also connecting various parts of the city with each other are Galle Road, Reclamation Road, Prince of Wales Road, Havelock—Highlevel Road and Piliyandala Road. These roads facilitate the North—South movement of traffic. East-west movement, which is comparatively less, is provided by Maradana Road, Baudhdhaloka Mawatha, Union Place, Ward Place, Dharmapala Mawatha, Darley and Deans Roads and High Street. Urban development which was intensified during the last ten years have caused heavy traffic demands on the roads. Lack of investment and poor maintenance had degenerated the road conditions. In 1984 the Government initiated a campaign to improve the situation and undertook a five year plan of road rehabilitation which is at present improving some roads in the region. Within the Municipality there are 50 kilometers of trunk roads and 430 kilometers of other paved roads managed and maintained by the Municipality.

6.2 *Spatial pattern of road network*

The spatial pattern of the road network in the city is more or less radial which is guided by the physical configuration of the city. The major radial routes to the city can be identified as : Galle Road

(A2) from the south, High Level Road/Havelock Road (A4) Horana Road (B5) and Athurugiriya Road (B2) from the east and south-east, Kotte Road from the new Capital area and the Low Level Road (B1) to the east, Kandy Road/Prince of Wales Avenue (A1) from the north-west, and Negombo Road (A3) from the north. One obvious drawback in this system of road network is the absence of supporting ring roads or concentric links which could provide connectivity by-passing the city. Kelani river further reduces the opportunity to by-pass the city.

Traffic in the city, especially the peak-hour traffic, can be identified in three types. One is the traffic for work caused by high concentration of job opportunities, second is traffic for business purposes and the third is the transit traffic through the centre. This through traffic is often constrained by the road network to pass through the city. This increases the pressure on the city roads and creates congestion at key locations.

Much of the congestion in the city can be attributed to the poor road use than the limitations on the capacities. Some of these limitations, of course, are due to poor infrastructure such as inadequate junction layouts and inadequate lane demarcations. In most instances the road users themselves are responsible for this congestion. Indiscriminate and uncontrolled parking, unreasonable behaviour at bus stops by the bus drivers as well as by the passengers, pedestrian interference with the traffic and also slow moving traffic can be considered as major factors caused by road users.

The Colombo Master Plan in 1978 (UNDP, Technical Report) has analysed the traffic flow in a few roads in the city and has estimated that Galle Road, Sir Chittampalam A. Gardiner Mawatha and D. R. Wijewardena Mawatha carry 51% of traffic but only 23% goes direct to Fort. Although this report does not say what happens to the balance traffic it can be reasonably deduced that the balance is going to Pettah. Another drawback in this statement is that it neither says at which point the survey was undertaken nor does it demarcates the boundary of Fort. However, it illustrates that even before the intensification of the urban growth within the city, the radial network contributed to the traffic congestion. Major bottle-necks can be identified as Old-Victoria Bridge, Galle Road adjacent to Colombo Municipal limits (Wellawatta Bridge), Maradana Road adjacent to the railway line, Main Street, Central Road, Olcott Mawatha, Union Place and Kotte Road.

TABLE 10 : ROADS MAINTAINED BY THE ROAD DEVELOPMENT AUTHORITY [KILOMETERAGE OF PAVED ROADS IN 1986]

District	'A'		'B'		'C'		'D'		TOTAL	
	Km	%	Km	%	Km	%	Km	%	Km	%
Colombo	100	2	170	4	310	3	121	4	700	3.3
Gampaha	161	4	473	10	447	5	431	14	1513	7.2
Kalutara	80	2	259	5	477	5	188	6	1004	4.8
Sri Lanka	4092		4730		8923		2987		20766	

Source : Road Development Authority, 1986.

Table 10 illustrates the kilometerage of different classes of roads that are found in the hinterland of Colombo. It shows that out of the national road network 8% of 'A' roads and 19% of 'B' roads are found within this region. Out of the total paved road network of the island which is maintained by the Road Development Authority 15% are found within these three Districts. Out of the total road network within this hinterland 99% are paved roads which further illustrates the urban nature of this region.

TABLE 11 : ROADS MAINTAINED BY LOCAL AUTHORITIES [KILOMETERAGE IN 1978]

District	Metalled	Gravelled	Other	Total
Colombo	1753	2288	298	4339
Gampaha				
Kalutara	324	1530	109	1963
Sri Lanka	5995	24901	9697	40593

Source : Ministry of Local Government and Housing.

Table 11 shows that out of the road kilometerage maintained by the Local Authorities, 16% are found within the hinterland of the city. 35% of the metalled road network under Local Authorities are also located within this region.

TABLE 12 (a) : COMPARATIVE STATISTICS (1986) FOR REGIONS

Region	Area (Km ²)	Population	Road Km	*Vehicles (1983) (regis- tered)
Colombo Municipality	37	585,776	480	not available
Colombo District	625	1,809,000	700	+137,613
Colombo and Hinterland	3,659	4,140,000	3,217	144,560
Sri Lanka	64,628	16,117,000	20,766	233,900

*Includes cars, buses, vans and taxis and trucks.

+Includes Gampaha Districts.

Source : Department of Census and Statistics.

TABLE 12 (b) : AS A PERCENTAGE OF ISLAND'S TOTAL

Region	Area	Population	Roads	Vehicle
Colombo Municipality	0.057	3.63	2.3	not available
Colombo District	0.96	11.22	3.37	58.8
Colombo and Hinterland	5.65	25.68	15.49	61.8
Sri Lanka	100.0	100.0	100.0	100.0

7. Motor Vehicles in the City

There are three types of automobiles in the city roads today. Firstly, passenger cars powered by 4 stroke gasoline and diesel engines; secondly, motor cycles, scooters and three wheelers powered by two stroke engines; and thirdly, buses and trucks powered by 4 stroke diesel and petrol engines. Out of the total automobiles imported to the island, over 50% are licensed in the Colombo District.

7.1 Motor cars

In 1976 there had been 104,876 revenue licenses issued, which increased to 561,403 in 1986, 81% increase for 10 years. In the

Colombo District from 57306, vehicles in 1976, with an increase of 67% it reached 175,350, in 1986.

Vehicle ownership is dependent on population, the income levels and the availability of vehicles to purchase. Although the population of Colombo and its environment increased over the years, the vehicle population did not show an increase till late 1970's.

However, the registration of motor cars in the island shows a very steep upward trend during 1980's due to liberalization of imports and the open economic policy. For instance, the year 1979 records 114,453 motor cars which has increased to 155,972 in 1986. For three years between 1983 and 1986 the car population had increased by 35%. The annual growth rate of car population is expected to be 2.5%. Out of the total car population in the island 66% are registered in the Western Province and 63% are registered in the Colombo District. Out of the revenue licenses issued in 1986, 37% were issued in the Colombo District. During a normal working day the number of cars entering the city exceeds 51,000. Thus car as a mode of travel in Sri Lanka is essentially urban. Cars with a low passenger carrying capacity clog the city roads, especially during the peak hours.

7.2 *Motor cycle*

In 1979 the number of motor cycles in the island was 45,087. In 1986 it had gone up to 186,843 with four-fold increase. The use of the motor cycle and the scooter has become very popular during recent years due to cost of travel with the rise of fuel prices. Motor cycle, among other advantages, provide a mode of reasonable and comfortable transport for an emerging middle class, mostly junior executives and professionals, which is also an outcome of urbanization.

Out of the revenue licenses issued for motor cycles, 26% are issued in the Colombo District. Out of the total revenue licenses issued for all motor vehicles in the whole island, 28% are issued for motor cycles.

TABLE 13 : TOTAL NUMBER OF MOTOR VEHICLE REVENUE LICENSES ISSUED IN THE COLOMBO DISTRICT -
(ACTIVE VEHICLE POPULATION)

Class of vehicle	1983	1984	1985	1986	%	1986	
						Total for Sri Lanka (Vehicles)	% in Colombo District licensed)
Motor cars	47,821	50,981	51,470	58,400	33	155,972	37
Motor cycles	41,253	43,796	40,250	48,950	28	186,843	26
Lorries	27,701	32,239	34,924	39,300	22	93,350	42
Tractors/Trai	6,761	6,593	5,685	6,550	4	76,449	8
SLTB buses	5,000	5,000	5,000	5,100	5	5,100	100
Private coaches	61	987	580	950	0	3,675	26
Hiring buses	2,175	3,670	5,450	6,600	4	21,572	31
Hearses	76	81	150	150	0.008		
Govt. vehicles	5,400	5,465	6,300	9,350	5		
Total active vehicles in Colombo District	136,251	148,812	149,809	175,350	100.0		
Out of Islands Total	30,99%	31.11%	28.67%	31%			
Sri Lanka (Registered)	439,666	478,104	522,607	561,403			

Source : Commissioner of Motor Traffic.

7.3 Sri Lanka Transport Board Buses

The increase of travel can be examined in relation to the mode of travel or vehicles. Sri Lanka Transport Board has the primary obligation of providing mobility to the nation. SLTB experienced a dramatic increase in the travel demand from about 15 billion passenger kilometers in 1977 to over 20 billion in 1980. During the decade 1975 to 1983, the statistics also show a steep increase in passenger kilometers, except in the years of stiff fare increases. In 1985 SLTB had operated 4,880 buses daily with a seat kilometerage of 20,255 m. The total number of buses belonging to SLTB is 7,345 out of which Colombo South Regional Board has 1,581 and Colombo North has 1,448 buses.

TABLE 14 : SRI LANKA TRANSPORT BOARD OPERATIONS 1986

Region	Long— distance	Other services	Total buses
Colombo South	36	1236	1272
Colombo North	46	1016	1062
Central	107	830	937
Uva	80	495	575
Northern	56	195	251
Eastern	55	158	213
North Central	49	257	306
North Western	48	704	752
Southern	39	548	587
Total	516	5439	5955
Colombo Metropolitan	82	2252	2334
	16%	41%	39%

Source : Sri Lanka Transport Board.

Sri Lanka Transport Board operations for 1986 indicate that 38% of all buses operated primarily within the Colombo North and South Transport Boards, and that a fair portion or 9% of all buses on long distance services entered Colombo to reach one terminal.

7.4 Private Passenger Buses

The distribution of bus operations by districts and the number of routes operated in each district can be considered as indications of the extent of urban transport demand in the island.

TABLE 15 : PRIVATE BUS OPERATIONS 1986

District	Buses Registered	Operated [estimated at 80%]	Operational Routes	Performance Vehicle/km/day [estimated 205 km/bus/day]
Colombo	3,954	3,163	313	648,415
Gampaha	1,555	1,244	208	255,020
Kalutara	884	707	121	144,935
Total	6,393	5,114	642	1,048,370
Sri Lanka	11,001	8,800	1,818	1,804,000
% in 3 districts	58%	58%	35%	58%

Source : Ministry of Private Omnibus Services.

The private bus operation has increased considerably by the year 1986. Out of the registered number of 11,001 private buses, 80% were in effective operation, and 58% of these were in the Colombo Metropolitan Region. Although only 35% of the private bus operational routes are in this area, it has accounted for 58% of the vehicle kilometers operated per day. This well illustrates the demand for road transport in Colombo and its hinterland.

TABLE 16 : COORDINATED SERVICES – RTB AND PRIVATE BUSES

Region	Private buses	RTB buses	Number of Routes	Total buses
Colombo South	597	203	42	800
Colombo North	635	209	21	844
Central	696	334	74	1030
Southern	551	294	59	845
North Western	387	173	35	560
North Central	53	23	09	76
Uva	3	12	04	15
Total	2992	1248	224	4170
Colombo Metropolitan Region	1232	412	63	1644
	41%	33%	28%	39%

Source : Sri Lanka Transport Board.

Private bus operators are greatly motivated by revenue considerations. They also operate more or less in the same route as the SLTB buses. The passengers have the tendency to board the first bus which arrives. This leads to competition where an individual operator is given the opportunity to carry a large share of the passengers on a given route. This is achieved, more often than not, with driving practices which disrupt traffic and impose risks on bus passengers, other vehicles and on pedestrians.

Passenger buses are also run as coordinated services between RTB and Private operators. Colombo and its hinterland has 1232 private buses and 412 RTB buses running on 63 routes operating as coordinated services. Out of the total active bus fleet of Sri Lanka, 39% run as coordinated services within the Colombo hinterland.

Out of the estimated all island passenger kilometers of 14,495m. covered by SLTB in 1985, 24% were within the Colombo hinterland, while out of the estimated passenger kilometers of 14,060 million covered by private buses, 51% were in Colombo hinterland. Total

estimated all bus passenger kilometers for 1985 were 28,555 m.; out of which 37% were in the Colombo hinterland. This well illustrates the level of urban passenger transport demand in Sri Lanka.

8. Vehicle Density

Vehicle density is a good indicator to illustrate the urban development and associated traffic problems. For example, districts of Colombo and Gampaha together had 211 vehicles per square kilometer and 45 vehicles per 1000 population in 1983; while the island's density was 3.5 vehicles per square kilometer and 15 vehicles per 1000 population for the same year.

Increasing urbanization and the growth in vehicle density has led to increased traffic congestion in the Colombo city with an escalation of traffic accidents on road network which were never designed for the volumes and type of traffic which they are now required to carry. The net result is very often a severe deterioration in driving conditions and a significant increase in the hazards to all road users. Out of the goods vehicles in the island 69% are licenced in the Colombo Metropolitan Region.

9. Traffic Flow in the City

The main gateways to the city of Colombo by road are through (1) Victoria and (2) New Kelani Bridges and (3) Nagalagam Street in the North; (4) the Wellampitiya and (5) Kolonnawa Bridges and (6) Kotte Road in the East; (7) Narahenpita Road; (8) Pamankada and (9) Kirullapona Bridges to the South-east and (10) Dehiwela Bridge to the South.

Traffic surveys in the city reveal that more than half of the inbound traffic during the morning peak are mostly work trips. Business trips are more concentrated in the Central Business District and are heaviest during mid-morning and at mid-day. Business trips account for more than half of the trips into and out of Fort area during mid-morning.

TABLE 17 : TRAFFIC FLOW AT THE CITY LIMITS IN-BOUND

Route	1961	1980	1983
A ₃ Colombo—Negombo (Victoria Bridge)	10,650	17,478	18,677
A ₁ Colombo—Kandy (New Kelani Bridge)	8,750	19,487	21,344
B ₁ (Kolonnawa Bridge)	6,900	10,702	16,278
B ₂ (Kotte Road)	7,600	15,428	15,780
A ₄ Colombo—Ratnapura (Kirullapona Bridge)	12,050	18,804	28,753
A ₂ Colombo—Galle (Dehiwela Bridge)	17,700	29,360	34,487

Source : 1961 : Wibur Smith & Associates.
 1980 : Department of Highways.
 1983 : Ranasinghe.

Table 17 demonstrates the in-bound traffic at the city limits through 4 'A' class roads of the island. There is a substantial increase in the traffic flow in all four roads when compared to 1961, which would logically expect additional investments on highways. But the fact is that none of these roads entering the city improved during the last two decades either quantitatively or qualitatively to cope up with the increased volume of traffic. The net results had been the bad road surfaces, greater wear and tear on vehicles, more congestion, slower traffic, dust and vehicular emission, more noise, higher maintenance costs and greater risks of accidents.

**TABLE 18 : TRAFFIC BY THE TYPE OF VEHICLE IN THE CITY OF
COLOMBO DURING A NORMAL WORKING DAY (1983)**

Vehicle Type	In-bound		Out-bound	
	Number	%	Number	%
Car	50,784	29	50,477	29
Bus	31,884	18	30,585	18
Land Vehicle	14,292	8	16,709	10
Motor Cycle	27,843	16	26,397	14
Pedal Cycle	31,095	18	29,548	17
Sundry	18,348	11	20,295	12
Total	174,246	100	173,011	100

Source : Author's compilation.

Out of all types of vehicles in the city roads, motor car which dominates the scene comprises 29% of the total traffic, while bus takes the second place contributing 18% of the city traffic. Private buses form a very significant proportion of the bus traffic. Third place is taken by pedal cycle which comes to 17% - 18% of the traffic. Motor cycle forms 14% - 16% of the city traffic. Commercial vehicles account for about 10% of the traffic flow.

Although these figures are not high compared with the traffic in cities of developed countries, there are several reasons why they are becoming a threat to the urban environment of Colombo. Among other reasons the main reasons are: they operate in spatially limited areas; most of the vehicles are old and not properly maintained; improper traffic control demands stop-and-go during rush hour; two stroke vehicles are increasing in numbers on the city road and they have a high accident risks; road user education is almost nil; pedestrians, pedal cyclists and slow-moving hand driven and on-driven vehicles take a fair proportion of the carriage way even during rush hour; a large number of trucks or goods vehicles use the city centre since Colombo is a port city; parking on the roadside, absence of sidewalks, the inappropriate use of pavements and sidewalks for purposes other than walking; and also the conducting of public works in most unsystematic manner frequently damaging the carriageway.

10. Road Safety

Road Traffic Accidents

Traffic accidents can be considered as the most serious disamenity associated with increasing urbanization and growth in number of motor vehicles. Growth in traffic is a direct result of urban development. The studies in several developing countries have shown a close correlation between the increased traffic congestion in urban centres and growth in traffic accidents on road networks which were never designed for the volumes and type of traffic which they are now required to carry. (Alan Ross, 1986) However, the experience in most countries have not shown that there is a rise in the number of casualties in proportion to the number of vehicles or to the increase volume of vehicle-miles. The traffic accident figures in the island for the last five years show an increase of 24%.

Out of the total of 31,931 accidents in the island in 1986, 59% have occurred in the 3 districts of Colombo, Gampaha and Kalutara or in the Colombo and its hinterland. Out of 1,253 fatalities, 44% were in this area. 50% each in grievous and non-grievous accidents respectively, also occurred in this area (Police Department, 1986).

TABLE 19 : NUMBER OF ACCIDENTS BY *¹DEGREE OF INJURY 1986

Police Division	Total		Fatal		Grievous		Non-Grievous		Damage
	*2		*2		*2		*2		
Colombo	8,872	.014	128	.023	202	.149	1,323	.814	7,219
Gampaha	1,392	.048	67	.078	109	.318	443	.555	773
Kelaniya	2,314	.053	123	.038	87	.286	662	.623	1,442
Kalutara	1,620	.051	82	.060	97	.336	545	.553	896
Nugegoda	2,798	.032	89	.038	106	.301	842	.629	1,761
Mt. Lavinia	1,897	.036	68	.071	135	.265	502	.628	1,192
Total -Cbo Hinterland	18,893	.029	557	.039	736	.228	4,317	.703	13,283
Sri Lanka	31,931	.039	1,253	.046	1,471	.270	8,610	.645	20,597
			11,334						
Percentage Cbo Hinterland	59		44		50		50		64

- *¹Fatal — at least one fatality as well as injuries and damage
grievous — at least one grievously injured victim + lesser harms
non-grievous — at least one non-grievously injured victims + damage
damage — only damage to vehicle or other property.

*2 Ratio per accident

Source : Police Department.

Out of the total of 14,081 casualties in the island, 47% were in the three districts of Colombo, Gampaha and Kalutara. Among the driver casualties, 40% were in these three districts. Out of the all island casualties among riders and pedestrians, 52% and 51% respectively were from this area. These figures for 1986 and the forgoing analysis of vehicle growth well illustrate the intensity of the traffic concentration in these three districts.

TABLE 20 : CASUALTIES BY THE CLASS OF ROAD USER 1986

Police Division	Total	Drivers	Riders	Pedestrians	Passengers	Others						
Colombo	.203	1,801	.009	77	.062	550	.108	959	.023	201	.002	14
Gampaha	.568	790	.026	36	.169	236	.121	307	.150	209	.001	2
Kelaniya	.443	1,024	.021	49	.157	364	.171	395	.089	205	.005	11
Kalutara	.563	912	.031	50	.193	313	.141	313	.142	230	.004	06
Nugegoda	.436	1,220	.033	92	.150	420	.161	450	.090	252	.006	06
Mt. Lavinia	.432	820	.020	38	.146	277	.195	369	.068	129	.003	07
Total Cbo Hinterland	.348	6,567	.018	342	.114	2,160	.148	2,793	.065	1,226	.002	46
% of Sri Lanka Total		47		40		52		51		34		59
Colombo Police Div.		13		9		13		18		6		18
Sri Lanka	.441	14,081	.087	850	.130	4,137	.170	5,444	.119	3,572	.002	78
Percentage		100		6		29		39		25		1

* Ratio per casualty.

Source : Police Department.

However, the tables 19 and 20 show that although the total number of accidents in the Colombo Police Division account for 47% of the accidents that occurred in Colombo and its hinterland and 28% of the whole island, there is a gradual increase in the incidence of fatal and more grievous accidents as one moves away from the Colombo Police Division. For example, the incidence of fatal accidents per accident are .014 in Colombo Police Division, .029 in Colombo and its hinterland and .039 for Sri Lanka. Likewise Colombo Police Division suffers lower incidence of grievous hurt accidents and non-grievous hurt accidents. In other words accidents per vehicle or per vehicle-kilometer may be more (or perhaps less) in the most congested police division, but they mainly comprise low-severity accidents in human terms. Data is not available to have a more rigorous analysis to find out the correlation between the number of accidents and types of vehicles or between the severity of accidents and vehicle kilometerage. The victim column in table 19 which deals with the total number of accidents aggregates to 11,334, whereas the total victims in the table 20 accounts for 14,081. This gives a ratio of 1.24 victims per victim associated accident.

TABLE 21 : CASUALTIES BASED ON ROAD USER AND REGIONS

Casualties per accident	Colombo Police Div.	Colombo & hinterland	Sri Lanka	Kalutara Police Div.
Pedestrian	.108	.148	.170	.193
Rider	.062	.114	.130	.193
Passenger	.023	.065	.112	.142
Driver	.009	.018	.027	.031
Other	.001	.002	.002	.004
Total	.203	.347	.441	.563

The figures in Table 21 demonstrate that accidents in the most urbanized area are the least severe, and that even in the whole of Colombo and its hinterland are less severe than taken the Island as a whole. Kalutara Police Division separately shows a higher rate of casualties per accident. This suggests that the systematic traffic management in urban areas could reduce the severity of the accidents although more traffic on the roads tend to cause a greater number of accidents.

According to the Police records out of the pedestrian casualties, 49% have met with the accident while walking on the road; another

39% have been subjected to an accident while crossing the road without making use of the pedestrian crossing. The causes could be the irresponsibility of either of the party or both the parties viz. the motorists and the pedestrians; the road space is not adequate in some places; the existing side-walks are used for purposes other than walking, or no sidewalks provided.

TABLE 22 : PEDESTRIAN VICTIMS BY POLICE DIVISIONS

Division	Pedestrian Victims	%
Colombo	959	17
Gampaha & Kalutara	1,834	34
Colombo & hinterland	2,793	51
Others	2,652	49
Total Sri Lanka	5,445	100

Out of the total casualties of the island, although pedestrians form the greatest proportion, accounting for 39% of all casualties, table 22 suggests that the prevalence of pedestrian crossings, traffic signals and footwalks in the Colombo Police division may have resulted in a lesser number of pedestrian casualties when compared with areas outside Colombo city. This feature reinforces the fact that better traffic management can reduce the incidence of traffic accidents. As one goes away from the urban areas where the traffic management is not very intense, the number of pedestrians subjected to road accidents are also increasing.

Out of the passenger casualties, 25% had been private bus passengers and 18% had been SLTB passengers. Out of the private bus passenger casualties 91% had been classified as 'occupants'. Since the occupants inside a bus do not in any way contribute to the cause of an accident, however, suggests the irresponsibility and or incompetence of the private bus drivers, or the long hours of driving and the resultant fatigue, or bad mechanical condition of the vehicle as the factors responsible for these accidents. Police records show that as much as 95% of the drivers had 'no defect' during the time of the accident; and 50% of the accidents have been accounted as 'no unusual action'.

TABLE 23 : TYPES OF VEHICLES INVOLVED IN ACCIDENTS 1986

Police	Total	Private Car	H.G.V.	L.G.V.	Mopeds	SLTB	Private Bus	Bicycle	Other
Colombo	15,209	5,963	1,621	2,311	1,182	1,104	2,151	385	492
Gampaha	2,043	319	506	192	309	231	280	161	45
Kelaniya	3,799	773	761	445	390	356	713	293	68
Kalutara	2,536	479	344	346	253	283	481	286	64
Nugegoda	4,465	1,127	684	554	488	550	643	257	162
Mt. Lavinia	3,215	820	509	392	314	267	617	203	93
Total									
Greater Colombo	31,267	9,481	4,425	4,240	2,936	2,791	4,885	1,585	924
Percentage	100	30	14	14	9	9	16	5	3
Sri Lanka	49,981	12,494	8,621	7,047	5,205	4,942	7,329	3,111	1,232
Percentage	100	24	17	14	10	10	15	6	4
Accidents in Greater Colombo as % of Sri Lanka	63	76	51	60	56	56	67	50	75

Out of the other vehicles involved in accidents, 1% scooter taxis, 5% bicycles and 22% composed of bullock carts and other unspecified vehicles.

Source : Police Department.

An analysis of the time of the occurrence of the accidents reveal that 73% of the accidents have occurred between 0600 and 1800 hours. 22% had occurred during morning peak hour and 28% during the evening peak time. Mondays and Fridays have recorded the highest number of accidents. These information show that the traffic accidents in the Colombo city are directly proportional to the traffic density. However, no data is available to correlate the severity of accidents with that of time of occurrence.

TABLE 24 : TIME OF OCCURANCE OF ACCIDENTS

Time span	hours	%	%/hr
Evening peak hour	1	28	28
Morning peak hour	1	22	22
Both peak hours	2	50	25
Other hours between 600-1800	10	22	2.2
Total between 600-1800 hrs.	12	72	6
Other hrs. between 1800-600	12	28	2.3
Total	24	100	4.2

The above table shows that the accident percentage per peak hour is about 25%. This information demonstrates that traffic accidents in the city are directly proportional to the traffic density. However, if severity incidence is taken into consideration the impact in peak hours may be less than proportional.

TABLE 25 : COMPARISON OF ACCIDENT DATA 1986

	Accident		Victims		ratio	Vehicles		ratio
	Table 19	%	Table 20	%		Table 21	%	
Colombo Police area	8,872	28	1,801	13	.203	15,209	31	1.7
Rest of Colombo								
hinterland	10,021	31	4,766	34	.476	16,058	32	1.6
Colombo and its								
hinterland	18,893	59	6,567	47	.347	31,267	63	1.65
Rest of the island	13,038	41	7,514	53	.576	18,714	37	1.44
Sri Lanka	31,931	100	14,081	100	.441	49,981	100	1.56

The comparative figures for accidents, victims and vehicles give out certain noticeable facts. Colombo Police Area accounts for 28% of

the accidents, 13% of the victims, 31% of the vehicles involved in accidents. The ratios of victims and vehicles per accident show that Colombo Police Area has the lowest in terms of victims and highest in terms of vehicles. Colombo and its hinterland accounts for 59% of the accidents, 47% of the victims and 63% of the vehicles involved in accidents. In this case ratio of victims is higher while the vehicle ratio is lesser in relation to Colombo Police Area. This suggests that too many vehicles in the Colombo Police Area contribute to a higher incidence of accidents yet, better traffic management in the urban zone may have reduced the severity of the accidents. These reasoning is further reinforced when one takes into account that the rest of the country accounts for 41% of the accidents and 37% of the vehicles involved in accidents but as much as 53% of the victims. This also suggests that more strict traffic management outside Colombo may be able to reduce the victims ratio.

10.1 Types of vehicles involved in accidents

Records for the year 1986 in Sri Lanka show that out of 49,981 vehicles involved in road accidents 24% were motor cars; 17% were composed of heavy goods vehicles, while 15% were private buses. Light goods vehicles, mopeds and SLTB buses rank next respectively.

In Colombo Metropolitan Region 31,267 vehicles were involved in accidents in 1986, which is 63% of the island's total. Out of the total number of private cars and private buses involved, 76% and 67% respectively, were in the Colombo Region. 51% of heavy goods vehicles, 60% of light goods vehicles, 56% of mopeds and 56% SLTB buses and 50% of bicycles which were involved in accidents were within the Colombo Metropolitan Region. This definitely shows the direct correlation that exists between the number of accidents and the vehicular density in the Colombo urban region.

When examining the type of vehicles involved in accidents in the Colombo Metropolitan Region, private car (30%) and private passenger bus (16%) rank first and second respectively. Heavy goods vehicles and light goods vehicles contribute 14% each, whereas, mopeds and SLTB buses contribute 9% each. 5% are composed of bicycles and another 3% are formed by scooter taxis, bullock carts and other vehicles.

Police records indicate that 93% of the vehicles involved in accidents have 'no defect apparent'. Out of the vehicle defects, the biggest number had been with the brakes. Bad tyres account as the second

major defect in the vehicles. Among other frequent defects are overloading and defective steering.

When comparing the manoeuvring of the vehicle at the time of accident, 76% of the vehicles have met with accidents while 'going ahead', 7% had occurred while the vehicles were at stationary position. 4% had occurred while overtaking from the wrong side. Turning right and reversing are the other main actions which are associated with accidents.

Damages to the vehicles due to accidents show that 38% damages are to the front side of the vehicles, 15% to the rear side and another 15 to the offside. These features indicate that in the Colombo and its hinterland the main cause of traffic accidents could be due to too many vehicles on some sections of the road network at some times of the day. This reasoning is further reinforced by the data in the Police records which show under the feature of the accidents that 84% are recorded under 'no unusual feature'.

10.2 Road Network and the accidents

A quarter of all accidents in 1986 have occurred in Colombo Municipality. This again reflects the distribution of vehicle ownership and vehicle use.

Police Department has computed a list of roads which were having over 10 accidents during the year 1986. According to these records, Galle Road in Kollupitiya, with 542 accidents, records the highest number of accidents and as well as fatalities. Galle Road in Bambalapitiya with 420 accidents, and Galle Road in Wellawatta with 257 accidents rank second and third in the list respectively. The number of accidents along the Galle Road have increased with the proximity to the Central Business District. Hence Galle Road link adjacent to the CBD stands out as the road which suffers most stress.

Baseline Road in Dematagoda with 227 accidents during the year 1986, and Havelock Road in Bambalapitiya with 216 accidents take the fourth and the fifth place respectively. Prince of Wales Avenue in Grand Pass records the next highest number of accidents, These three routes carry the heaviest traffic flow in the city next to Galle Road.

Union Place in Slave Island, R.A. De Mel Mawatha in Kollupitiya, High Level Road in Kirulapona, Panchikawatta Road in Maradana,

Kotte Road in Borella, Horton Place and Kannangara Mawatha in Cinnamon Gardens, ranking in the same order, recorded more than 100 accidents each during the year 1986.

Out of the number of accidents that occurred in 'A' roads, Colombo Police Division records the highest number amounting to 8,872 accidents. Gampaha, Kelaniya, Kalutara, Nugegoda and Mount-Lavinia Police Divisions together record 31% of the accidents in 'A' roads.

It is imperative to identify hazardous sections of the road network within the Metropolitan Region so that appropriate remedial measures can be taken to eliminate or to reduce the likelihood of accidents at those sections.

10.3 Traffic Laws

Enforcement of traffic laws aims at making the road user more disciplined by preventive, persuasive or punitive measures with two ultimate specific objectives. One objective is to achieve safe movement of all road users including pedestrians; and the other to ensure a free flow of traffic. Although there is a degree of conflict between these two objectives, the law enforcement is directed at ensuring the roads are safer and easier for all road users.

Observations on the roads in Colombo show that the driver behaviour at traffic signals, pedestrian crossings and priority junctions are particularly poor. Overloading in public passenger vehicles and as well as in goods vehicles is a common sight. Traffic laws are generally disregarded by the road users and it is difficult to inculcate in the minds of the people concerned the respect for traffic laws. However, the laws should be very clear and specific in order to make them easier for the drivers to understand and appreciate. Laws should be constantly reviewed in the light of experience.

One way to improve road safety may be to use traffic management to modify and influence driver behaviour at potentially hazardous times and locations

11 Traffic Management

Traffic management is a sine-qua-none for an efficient urban transport system. Some of the common traffic problems in large urban

areas, especially in the developing countries, are congestion, poor public transport, inadequate finances and difficulties in implementation of traffic projects. Traffic congestion increase the costs particularly, in the fuel consumption, and cause serious loss of productivity in commerce and industry.

Two major causes contribute to traffic congestion in cities in developing countries; namely inadequate road space and excess number of motor vehicles. However, the analysis of the traffic accidents reveal that, in the city of Colombo the major traffic problem is congestion which result at certain times of the day at certain places where the traffic demand exceeds the capacity of the road space. Poor traffic management outside the city is demonstrated by the ratio of victims in terms of number of accidents. In Sri Lanka as in many other developing countries the public transport operated by the State sector was weak in meeting the passenger demand. Hence, private sector was allowed to operate public passenger transport. In instances where privately owned public transport systems are operating cities usually suffer from congestion which is common to Colombo as well.

11.1 Options

There are many short and long term options to ease the congestion. One option is to build more road space to accomodate the increasing number of vehicles. This option, of course, will place a considerable burden on the city budget. The rapidly increasing motorisation would soon fill up the extra roadspace provided ultimately leading to congestion.

Some planners also suggest that the development and implementation of effective parking policies could be another option to reduce traffic congestion. In urban areas parking has become a major problem and occupies large areas of road space which could be better used by moving vehicles and pedestrians. It has been estimated through a traffic count that there is a shortage of 400 peak hour parking spaces in Fort area alone. Outside the Fort area, parking is somewhat unsystematically distributed throughout the city. Parking on verges and sidewalks adds to the congestion on the roads. (Sri Lanka Transport Sector Planning study, p. 5-4, 1987).

Restriction of the use of private vehicles in the city centre also could be an effective option to ease traffic congestion. To implement this measure a reasonable alternative means of transport is essential. Therefore, it is imperative to improve the public transport, which practically means making buses work more efficiently and productively.

However, without efficient public transport, congestion in central areas of the city will continue unless a balance between traffic demand and the available roadspace is brought about through some form of traffic limitation or restraint.

12. Conclusion

The Traffic management measures should aim to improve the quality of the transport system by increasing safety for all road users especially by improving conditions for the lesss priviledged urban poor and public transport users.

The range of traffic management techniques available is exceptionally broad. The ultimate aim of the traffic management is to adapt existing facilities with the aim to maximize potential capacity to minimize the current problems.

In order to achieve worth-while improvements in the efficiency of the traffic system, it is advisable to use a traffic scheme and policies as a package, which should include parking and loading/unloading controls, traffic control schemes including traffic circulation measures, traffic segregation schemes, junction improvements, traffic signal schemes and public transport priorities. The approach to efficient traffic system should be one of management — intensive rather than capital — intensive. Traffic management achieves this through the planning, designing, implementation, maintenance and monitoring of physical and policy measures which promote the safe flow of passengers, vehicles and pedestrians.

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