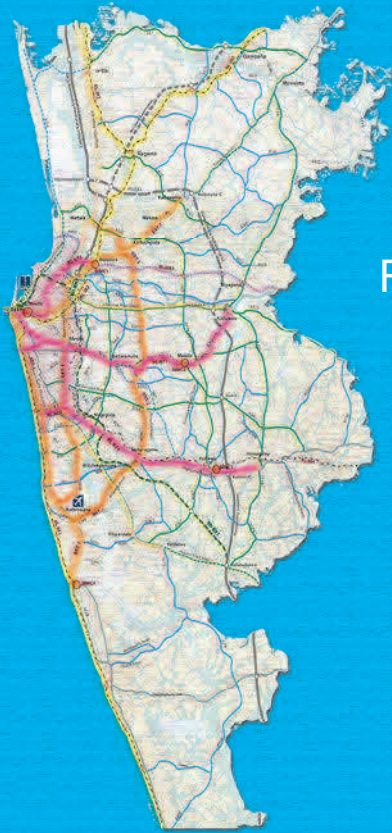


DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA
MINISTRY OF TRANSPORT



URBAN TRANSPORT SYSTEM DEVELOPMENT PROJECT

FOR COLOMBO METROPOLITAN REGION AND SUBURBS

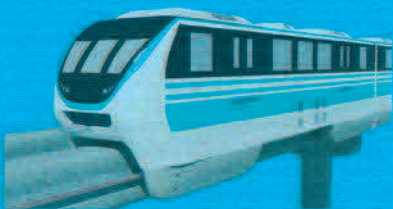


URBAN TRANSPORT MASTER PLAN



FINAL REPORT

TECHNICAL REPORTS



AUGUST 2014

JAPAN INTERNATIONAL COOPERATION AGENCY
ORIENTAL CONSULTANTS CO., LTD.

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DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA
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Technical Report No. 1

Analysis of Current Public Transport

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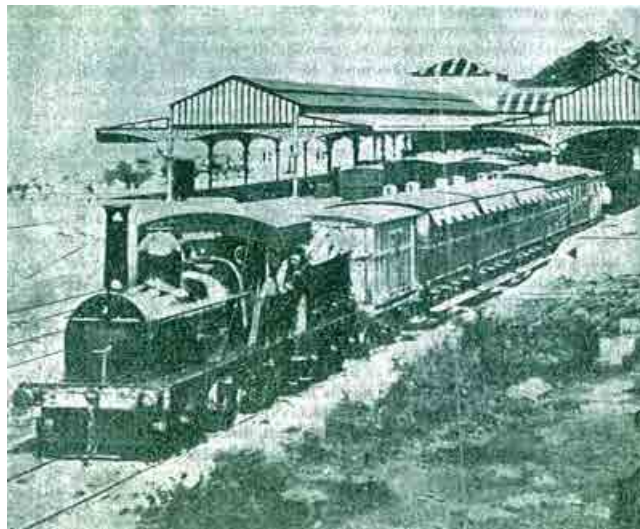
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CHAPTER 1 Railways

1.1 History of Railways in Sri Lanka

The Sri Lanka Railways (SLR), the only railway operator and regulator in Sri Lanka, is going to celebrate its 150-year anniversary in 2014. The history of railways in Sri Lanka commenced with a 54 km railway line from Colombo to Ambepussa for transporting coffee plantation goods, labour, machinery, manure, rice and foodstuffs. While coffee plantations were replaced by tea due to the coffee blight of 1871, the main function of the railway service in the colonial era was to transport plantation products and related goods.



Source: Ceylon Government Railway One Hundred Years

Figure 1.1.1 First Train Leaves Colombo Station in 1884

The other railway lines were developed during the period between 1880 and 1928; the Mannar Line in 1914, the Kelani Valley Line in 1919, the Puttalam Line in 1926, and the Batticaloa and Trincomalee Lines in 1928 under the Ceylon Government Railway (CGR). It is noteworthy that no major railway line has been developed in the more than 80 years since 1928 and a part of the northern line and branch lines to the Ports of Colombo were temporarily out of operation. In terms of laws and regulations, the Railway Ordinance created in 1902 still governs much of the railway's operation.

After the development period of the railway lines, the main function of the railways has been gradually shifted to passenger transport rather than cargo. Although the CGR improved her service by introducing diesel locomotives and express services and upgrading stations and rails after the independence of the nation, she gradually lost her patronage for both freight and passenger transport after the 1980's due mainly to motorization. As the SLR has posted losses since 1993, Parliament passed the Sri Lanka Railways Authority Act in 1993. However, trade unions strongly opposed and eventually precluded implementation of the Act. The act was finally converted into an Authority in 2003, but it was repealed in 2005. As a result, the SLR,

under purview of the Ministry of Transport, is the sole organization operating and regulating railways in Sri Lanka.

In addition to the intercity railways operated by the SLR, the Fort and Pettah area, including York Street and Main Street, had electric tram car services that commenced around 1900 and was operated by the Colombo Electric Tram Car and Lighting Company Ltd. The Colombo Municipal Council terminated the tram car operation in the 1960's due to the tram car drivers strike.



Source: Lankapura, Historic Image of Sri Lanka (<http://lankapura.com>)

Figure 1.1.2 Tram Car on Main Street in 1950's

Sri Lanka Railway is constructed with broad gauge (1676mm) and total line length was 1380km as of year 2011. Figure 1.1.2 shows the network of Sri Lanka Railway. Most of the line is single track but there is 126km of double track, 14km of three tracks and 3km of four tracks around Colombo area.

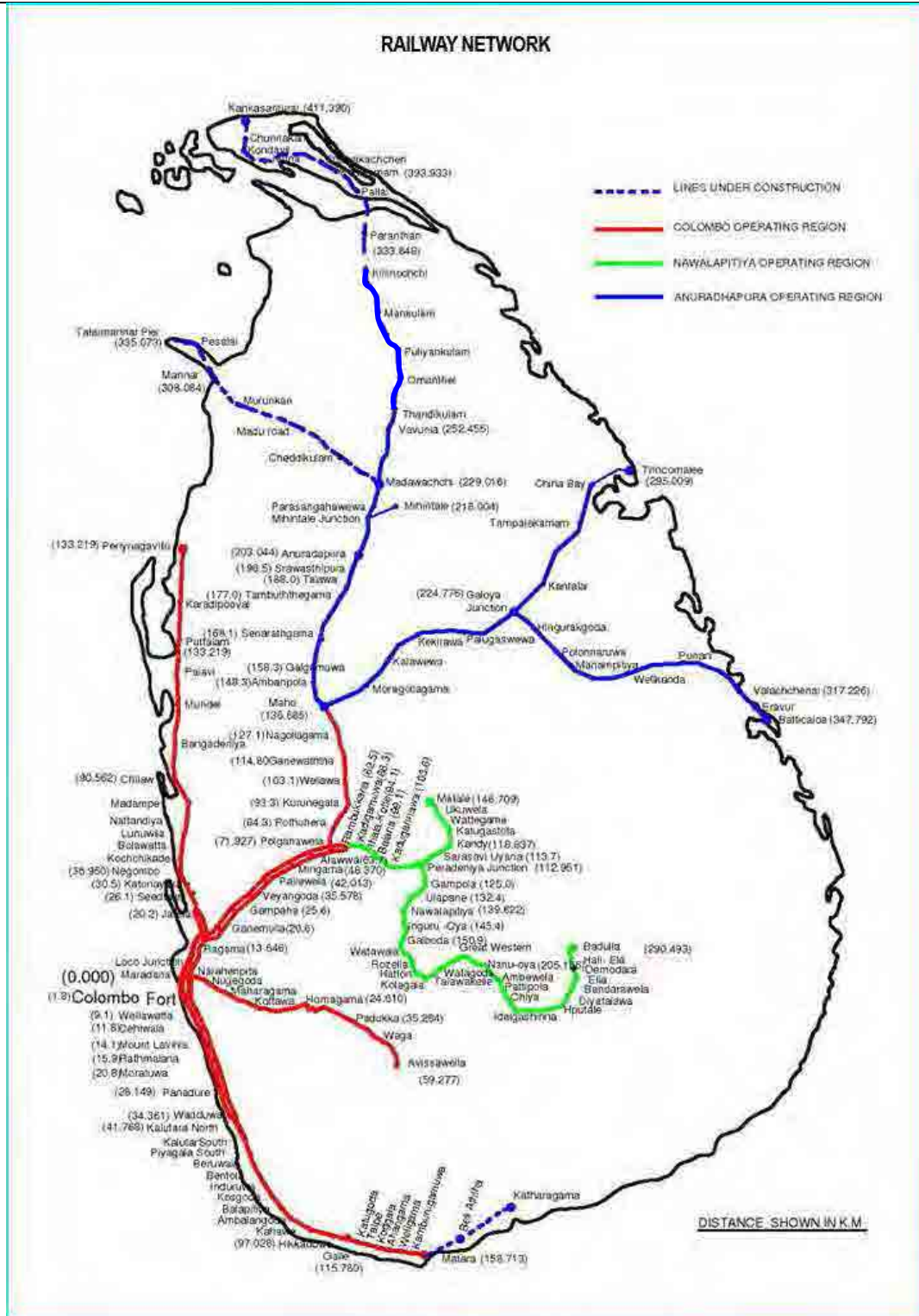
There are 7 lines in the network. The number of stations and number of trains of each line are indicated in Table 1.1.1.

Table 1.1.1 Number of Stations and Number of Trains per Line

Name	Origin	Destination	Distance (km)	No of Stations			No of trains
				Main	Sub	Total	
Main Line	Fort	Badulla	292	47	31	78	124
Matale Line	Peradeniya	Matale	34.	6	6	12	14
Puttalam Line	Ragama	Periyangavillu	141	17	28	45	50
North Line	Polgahawela	Kilinochchi (Kankasanturai)	193+(155)	30	25	55	32
Talaimannar Line	Medawachchi	Talaimannar Pier	(106)	7	4	11	Closed
Batticaloa Line	Maho	Batticaloa	213	14	17	31	23
Trincomalee Line	Galoya	Trincomalee	70	4	3	7	8

() closed

Source: Sri Lanka Railway arranged by Study Team



Source: Sri Lanka Railway

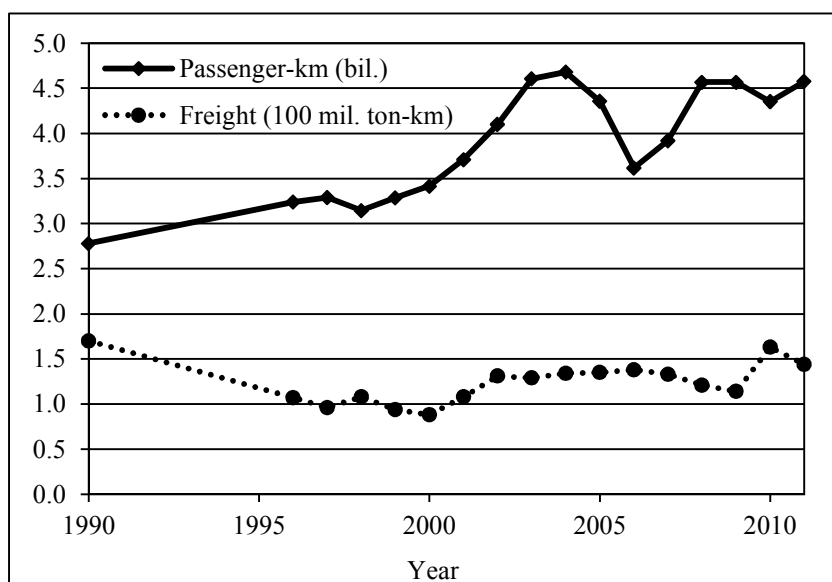
Figure 1.13 Network of Sri Lanka Railway

Major operational indicators of the SLR are shown in Table 1.1.2 and Figure 1.1.4. The total passenger kilometres have increased in the last twenty one years. Despite criticism on low efficiency in railway operation, the number of staff in the SLR has significantly decreased since 1990. An operational index of daily passenger kilometres per staff member also increased by a factor of almost three in two decades. Freight tonnage-kilometres in 2011 were less than the level of 1990 but there was a significant increase in the number of freight ton-km in the last two years.

Table 1.1.2 Major Indicators of Railway Operations

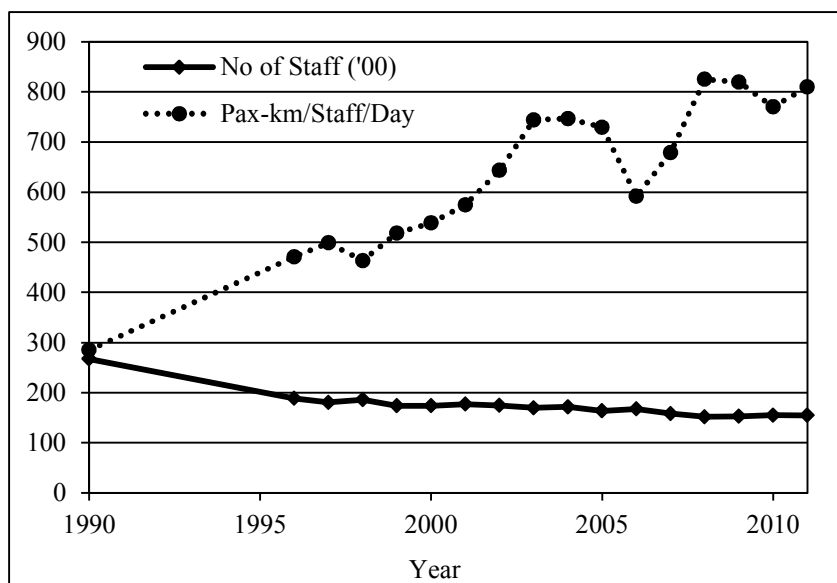
Indicator	Unit	1990	1996	2001	2006	2011
Route Length	km	1,453	1,477	1,449	1,143	1,165
Stations	station	168	165	169	172	172
Passengers	Mil. pax.	69	85	93	105	97
Passenger km	billion pax.-km	2.8	3.2	3.7	3.6	4.6
Freight Volume	Mil. ton	1.4	1.0	1.3	1.6	1.6
Freight	Mil. ton-km	170	107	108	138	144
Staff	persons	26,729	18,843	17,697	16,761	15,480
Pax km/Staff/Day		285	471	575	592	810

Source: 2006 and 2011; Economic and Social Statistics of Sri Lanka 2012, Central Bank of Sri Lanka
1996 and 2001; Economic and Social Statistics of Sri Lanka 2012, Central Bank of Sri Lanka
1990; Sri Lanka Facts and Figures 1989-1998



Source: 2002-2011; Economic and Social Statistics of Sri Lanka 2012, Central Bank of Sri Lanka
1996-2001; Economic and Social Statistics of Sri Lanka 2012, Central Bank of Sri Lanka
1990; Sri Lanka Facts and Figures 1989-1998

Figure 1.1.4 Historical Trend of Passenger-Kilometres and Freight Tonnage-Kilometres in Sri Lanka



Source: 2002-2011; Economic and Social Statistics of Sri Lanka 2012, Central Bank of Sri Lanka
 1996-2001; Economic and Social Statistics of Sri Lanka 2012, Central Bank of Sri Lanka
 1990; Sri Lanka Facts and Figures 1989-1998

Figure 1.1.5 The Number of Staff and Daily Passenger-Kilometres per Staff Member in Sri Lanka

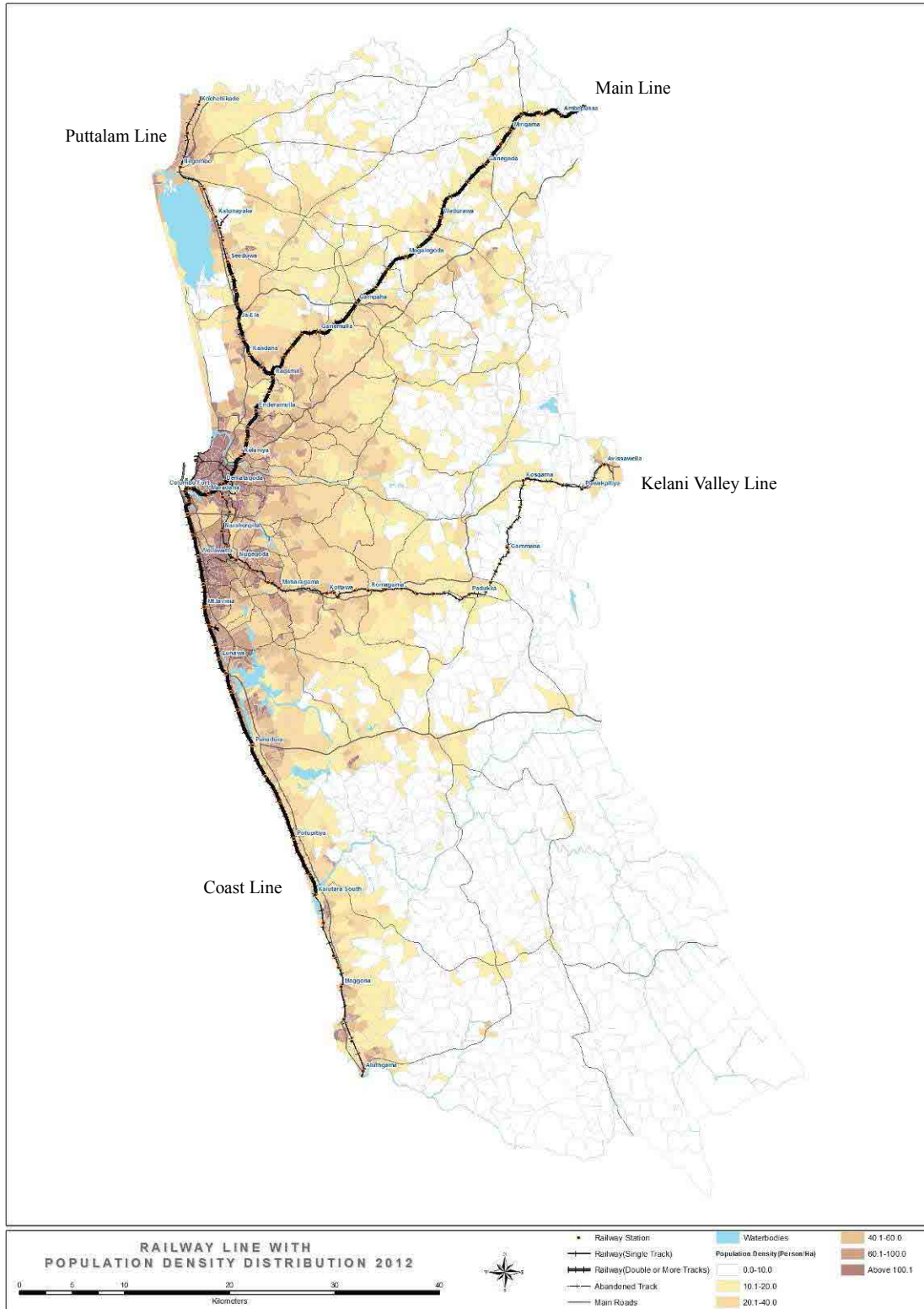
1.2 Railway Lines in Western Province

In the Western Province, the Main Line, the Coast Line, the Puttalam Line and the Kelani Valley Line are currently operated. The main line has double track for the whole section. The coast line has a double track section from Colombo Fort station to Kalutara. The Sri Lanka Railways (SLR) is extending its double track section further south. A part of the Puttalam line from Ja-ela to Seeduwa was improved to double track recently, and the double track section reached from Ragama to Seeduwa. However, no line is electrified. Currently, all lines are built as a broad gauge (1,650 mm). The Kelani Valley Line was built as a narrow gauge for rubber plantations in 1902. Although the line was upgraded to a broad gauge in 1996, the line has a number of sharp curves with radii less than 200m.

Figure 1.2.1 shows railway lines of western province with population density.

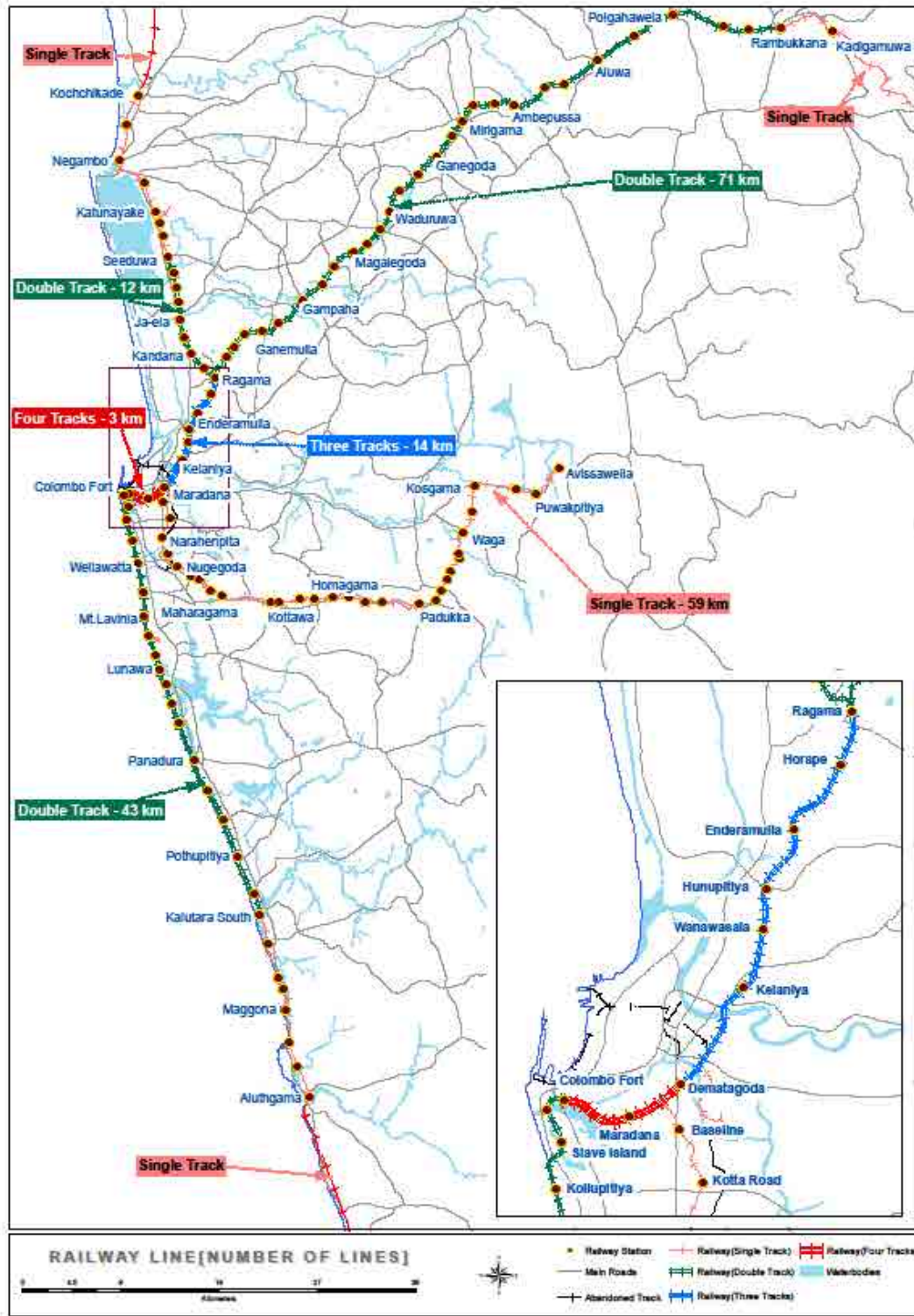
Figure 1.2.2 shows the number of tracks in the railway lines of Western Province.

Details of the railway in Sri Lanka, history and trend of pax-km and Freight-ton-km in Sri Lanka, are described in the appendix.



Source: CoMTrans Study Team

Figure 1.2.1 Railway Lines and Population Density



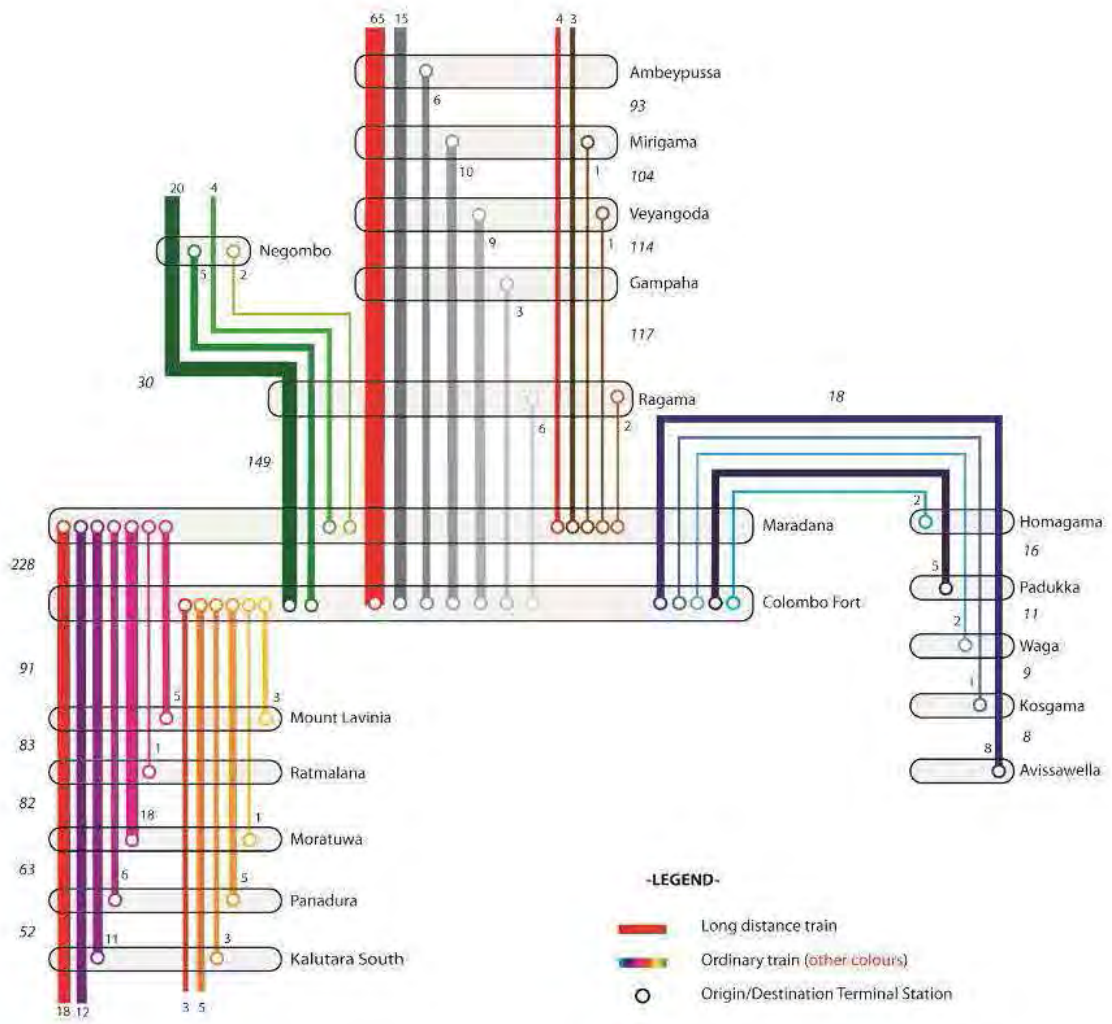
Source: CoMTrans Study Team arranged from SLR data

Figure 1.2.2 Number of Tracks on Railways in Western Province

1.3 Train Operation

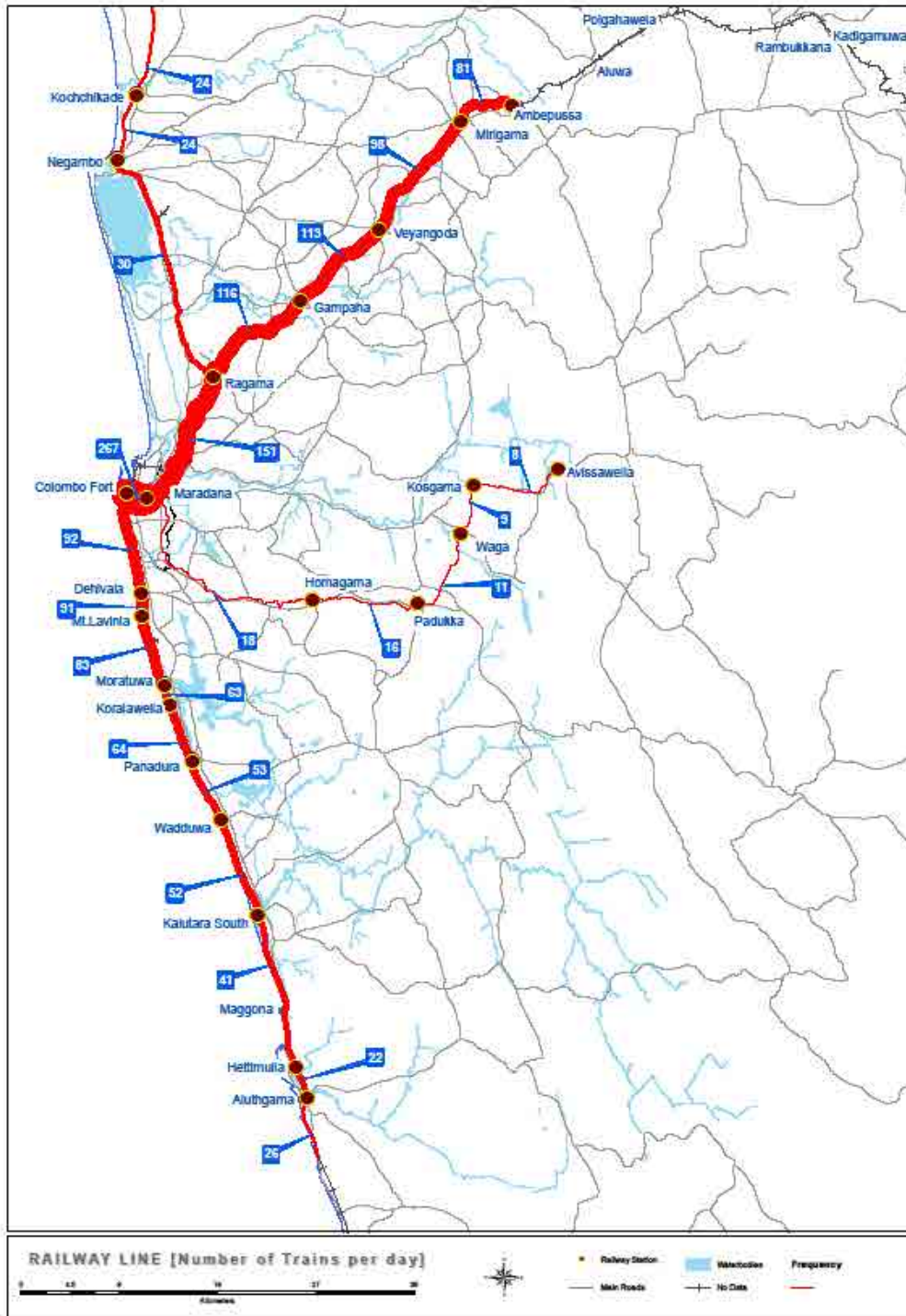
There are long distance trains and commuter trains operated in the Western Province area of Sri Lanka Railway for passenger service. Trains of the Coast line start from Maradana station while most of the trains going north and east start from Fort station. Study Team

Figure 1.3.1 to Figure 1.3.3 indicates the train network of this area, number of trains running in each section, and scheduled speed.



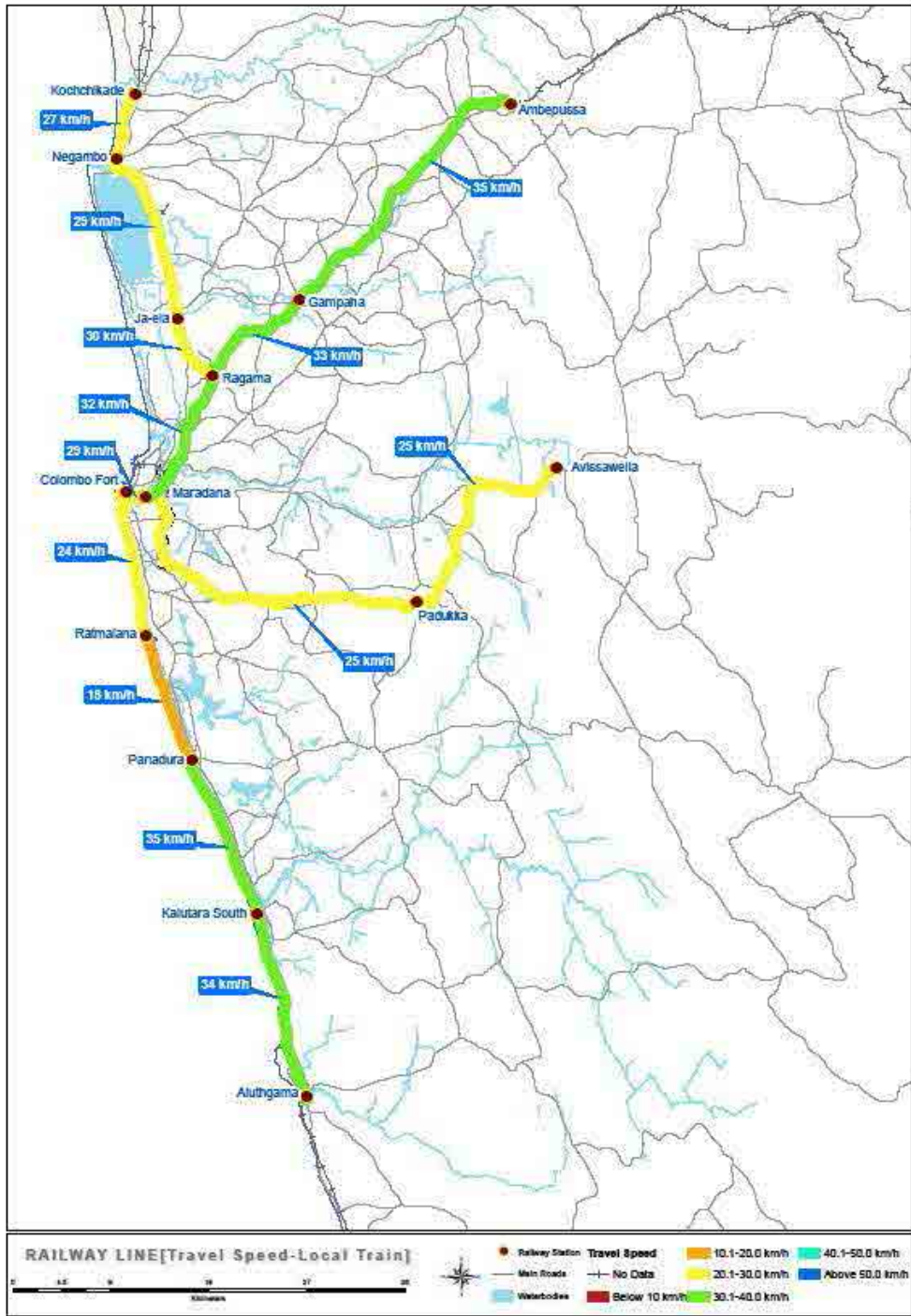
Source: CoMTrans Study Team

Figure 1.3.1 Train Distribution Diagram of Western Province



Source: CoMTrans Study Team arranged from train schedule of SLR website

Figure 1.3.2 Train Distribution Diagram of Western Province

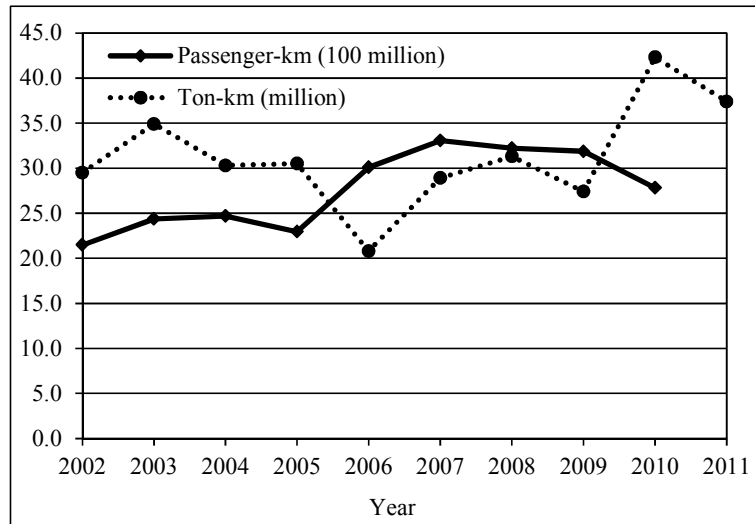


Source: CoMTrans Study Team arranged from train schedule of SLR website

Figure 1.3.3 Average Scheduled Speed of Commuter Train

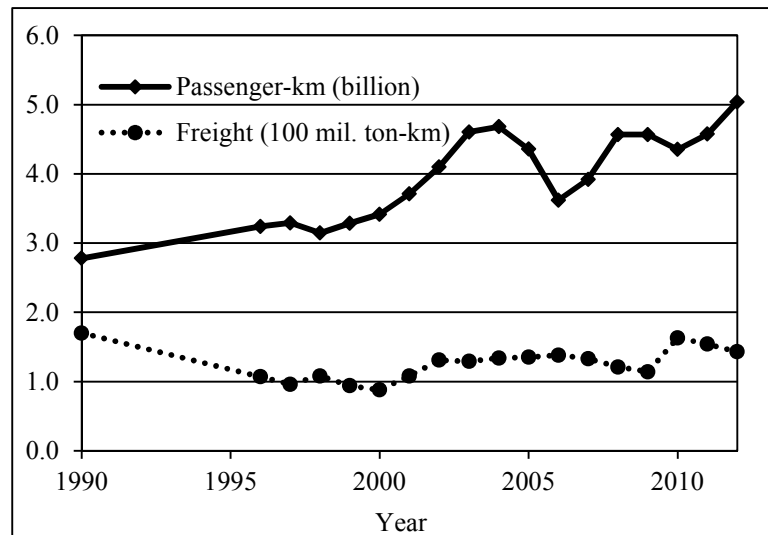
1.4 Railway Passengers

Railway passenger-kilometres and freight tonnage-kilometres in the Western Province for the last decade demonstrate an upward trend in general while annual fluctuations are observed. The passenger-kilometres of the Western Province accounted for approximately 64% of all passenger-kilometres in Sri Lanka in 2010. The passenger volume the Sri Lanka Railways is in an increasing trend in general since 2006.



Source: Economic and Social Statistics of Sri Lanka 2006-2012, Central Bank of Sri Lanka

Figure 1.4.1 Historical Trend of Passenger-Kilometres and Freight Tonnage-Kilometres in the Western Province

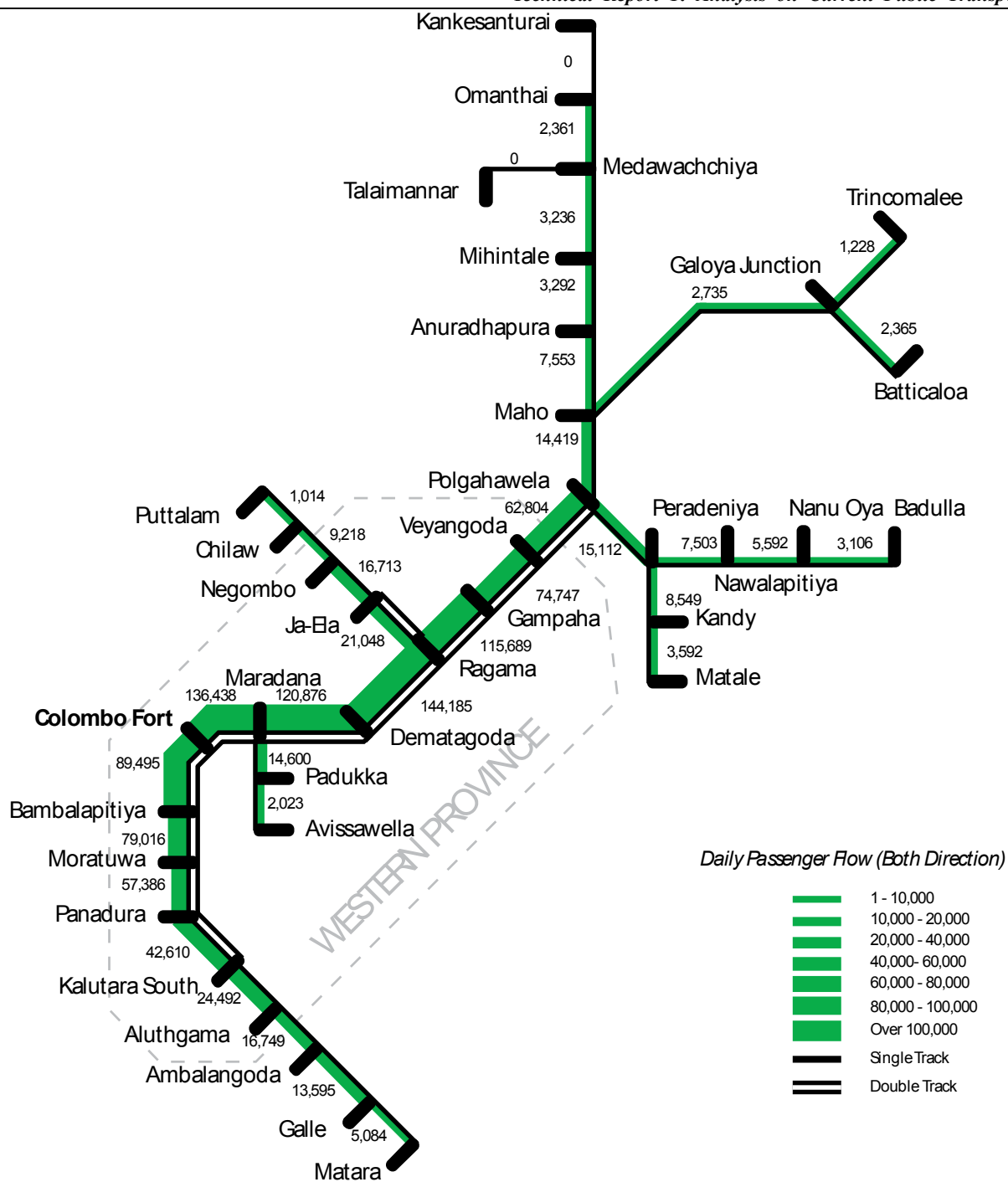


Source: Economic and Social Statistics of Sri Lanka 2006-2013, Central Bank of Sri Lanka

Figure 1.4.2 Historical Trend of Passenger-Kilometres and Freight Tonnage-Kilometres in Sri Lanka

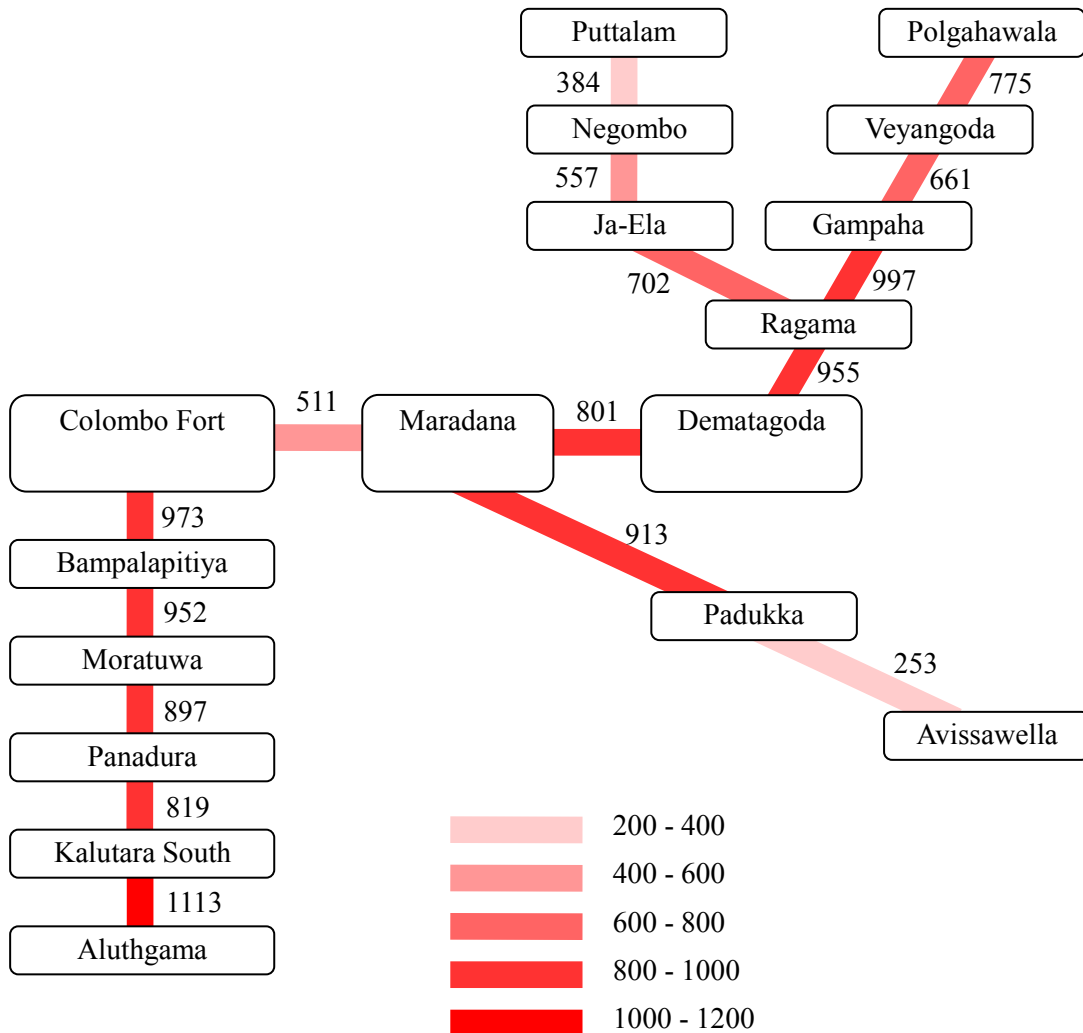
The daily sectional passenger volume is one of the key indicators to determine whether or not to improve the railway capacity. The estimated sectional daily passenger volume as determined by the University of Moratuwa based on the ticket sale data is shown in Figure 1.4.3. The highest sectional passenger volume for both directions of roughly 152,000 daily passengers is observed in the section between Dematagoda and Ragama where the Main Line and the Puttalam Line merge, followed by the Fort – Maradana section with 136,000 passengers, Maradana – Dematagoda section with 121,000 passengers and Ragama – Gampaha section with 116,000 passengers. Other higher volume sections are on the double track sections of the Main Line and the Coast Line. Some single track sections exceeded 15,000 passengers per day in the Western Province such as Kalutara South – Aluthgama and Seeduwa – Negombo.

Trains going north start from Fort station and trains going south start from Maradana station. The number of tracks between Fort and Maradana is four but one track is designed to the KV line, therefore, the effective number tracks for the Main line and Coast line is three. The number of tracks between Maradana and Ramaga is three. However, the number of trains operating between Fort and Maradana is about two times as many as the number of trains between Maradana and Ragama. Also, trains from the depot to Fort station or Maradana station run this section crossing the revenue line. Therefore, trains have to wait to pass this section until the track becomes clear.



Source: University of Moratuwa

Figure 1.4.3 Daily Average Sectional Passenger Volume of Railway Network in 2009 in Sri Lanka

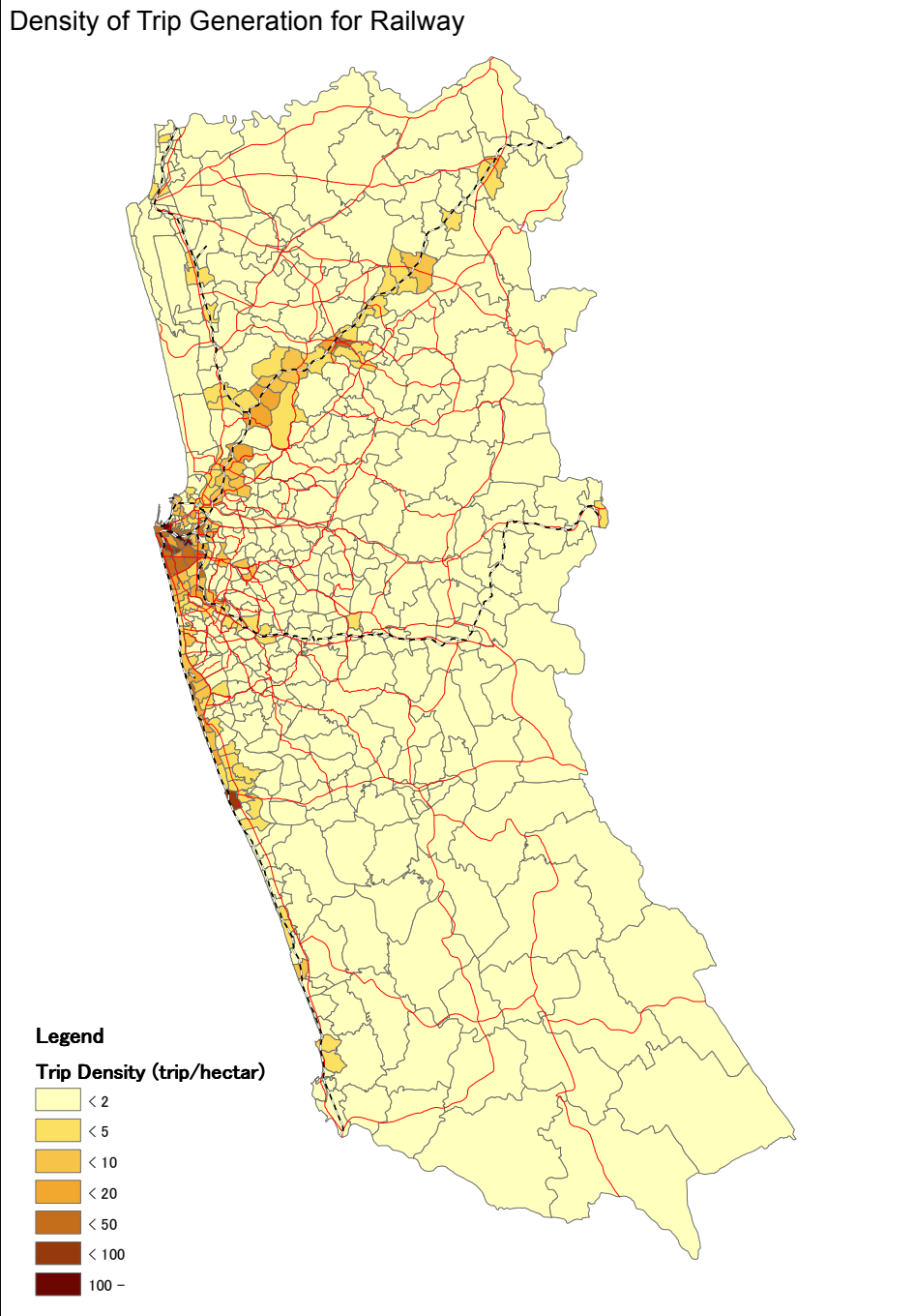


Source: Manipulated by CoMTrans based on the information from Sri Lanka railways

Figure 1.4.4 Average Number of Passengers in a Train

Most of the sections in the Main Line and Coast Line carry 800 to 1000 passengers. Trains are well distributed to maintain almost the same loading rate except for Colombo Fort and Maradana. In this section loading rate is only half compared to the other sections and it is considered to be an oversupply because trains of the Main line and trains of the Coast line run on this section. This causes traffic congestion on this section.

The trip density by railway is shown in Figure 1.4.5. It is evident that railway passengers are from zones close to a railway line. It is also noteworthy that average travel distance of railway, 25.5 km, is the longest among all public transport modes according to the CoMTrans Home Visit Survey. These imply that railway is mainly catering for medium to long distance passengers along railway corridors.



Source: CoMTrans Home Visit Survey 2013

Figure 1.4.5 Trip Generation Density for Railways

1.5 Railway Fares and Financial Conditions

The following table summarises railway fares of major cities in the countries which have a similar range of country gross domestic products (GDP) per capita. While economy class fares in India and Indonesia are similar to those of the SLR, the fares of other air-conditioned urban commuter railway services are twice to three times higher than the fare of third class train of the SLR; and they are at the same level as the fare of first class trains of the SLR.

Table 1.5.1 Fares of Urban Railways in the Asian Lower Middle Income Countries

Country	Country GDP per Capita	City	Railway Line	Minimum Fare	10 km	20 km
Sri Lanka	2,835 USD	Colombo	Sri Lanka Railways (Third Class, Non A/C)	Rs. 10.0	Rs. 10.0	Rs. 20.0
		Colombo	Sri Lanka Railways (Second Class, Non A/C)	Rs. 20.0	Rs. 20.0	Rs. 40.0
		Colombo	Sri Lanka Railways (First Class, with A/C)	Rs. 40.0	Rs. 40.0	Rs. 80.0
India	1,509 USD	Delhi	Delhi Metro (with A/C)	Rs. 18.7 INR 8	Rs. 37.3 INR 16	Rs. 49.0 INR 21
		All Indian Cities	Indian Railways, Non-Suburban (Non A/C)	Rs. 11.7 INR 5	Rs. 11.7 INR 5	Rs. 11.7 INR 5
Indonesia	3,495 USD	Jakarta	Economy Class Train, PT KAI Commuter Jabodetabek (Non A/C)	Rs. 12.9 IDR 1,000	Rs. 12.9 IDR 1,000	Rs. 19.4 IDR 1,500
		Jakarta	Air-Conditioned Train, PT KAI Commuter Jabodetabek	Rs. 58.1 IDR 4,500	Rs. 58.1 IDR 4,500	Rs. 58.1 IDR 4,500
Philippines	2,370 USD	Manila	Manila MRT Line 3 (with A/C)	Rs. 30.6 PHP 10.0	Rs. 42.8 PHP 14.0	Line length is 17km
		Manila	Metro Commuter, Philippine National Railways (with A/C)	Rs. 30.6 PHP 10.0	Rs. 30.6 PHP 10.0	Rs. 45.8 PHP 15.0

Note: Currency Rate was 1 Indonesian Rupiah (IDR) = 0.0129 Sri Lankan Rupee (Rs.), 1 Philippine Peso (PHP) = 3.0553 Rs., 1 Indian Rupee (INR) = 2.3327 Rs. as of 21 April, 2013 (Source: Central Bank of Sri Lanka) A/C means "air-conditioned".

Source: Gross Domestic Products per Capita (current USD as of 2011): The World Bank

<http://data.worldbank.org/indicator/NY.GDP.PCAP.CD>

Delhi Metro: Delhi Metro Rail Corporation Ltd. http://www.delhi.gov.in/wps/wcm/connect/DOIT_DTC/dtc/home

Indian Railways: Indian Railways Conference Association, Railway Fare Tables in Force from 22.01.2013

Jakarta; PT KAI Commuter Jabodetabek <http://www.krl.co.id/Info-Tarif-KA-Commuter.html>

Manila MRT Line 3: Manila Metro Rail Transit <http://dotcmrt3.gov.ph/guide.php>

Manila Metro Commuter: Philippine National Railways http://www.pnr.gov.ph/metro_commuter.htm

Online. Internet. Accessed on 22 April, 2013

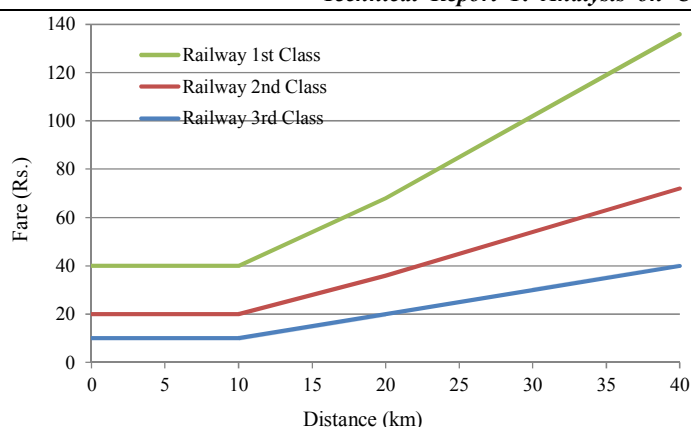


Figure 1.5.1 Railway Fare Setting in Sri Lanka Railways

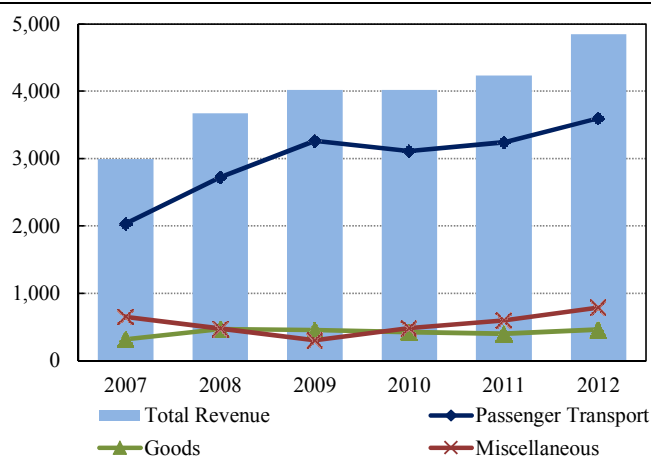
Additionally, discounts are applied for school children and students as a public service obligation. Government officers and workers are also eligible to purchase a season ticket for less than half of the price of a one month commuter’s ticket for other adult passengers.

Table 1.5.2 Fare for One Month Commuter’s Ticket

Category of Ticket	Fare
School Children below 12 years	5% of 30-day fare
All Other Students above 12 years	10% of 30-day fare
Government Officers / Workers	15% of 30-day fare
All Other Adults (Private)	40% of 30-day fare

Source: Commercial Department, Sri Lanka Railways

Figure 1.5.2 shows the annual revenue of SLR. From 2007 to 2012, the total revenue has increased 61 percent. Most of the growth was the revenue from passenger transport (77 percent increase). The number of ordinary ticket holders was 62 million (revenue: 2,806 million Rs.) and the number of season ticket holders was 43.7 million (revenue: 793 million Rs.) in 2012. Roughly 10 percent of the revenue is from freight transport, and the amount of the freight was 2.06 million tons (143 million tons-km) in 2012.



Description / Year	2007	2008	2009	2010	2011	2012
Passenger Transport	2,033	2,723	3,266	3,113	3,240	3,599
Goods	314	470	452	420	398	462
Miscellaneous	652	478	301	486	598	791
Total Revenue	2,999	3,671	4,019	4,018	4,235	4,852

Source: Sri Lanka Railways

(unit: Rs. Mn.)

Figure 1.5.2 Annual Revenue of Sri Lanka Railways 2007-2012

Figure 1.5.3 shows the annual expenditure of SLR. The expenditure consists of recurrent and capital expenditure. The recurrent expenditure has hovered around 7 to 9 billion Rs.

The capital expenditure has varied considerably from year to year, and it has a large impact on the total amount of annual expenditure. In 2011 and 2012, the capital expenditure was roughly three times higher than that in other years. This is mainly because a large amount was invested in maintenance of the permanent way and buildings.

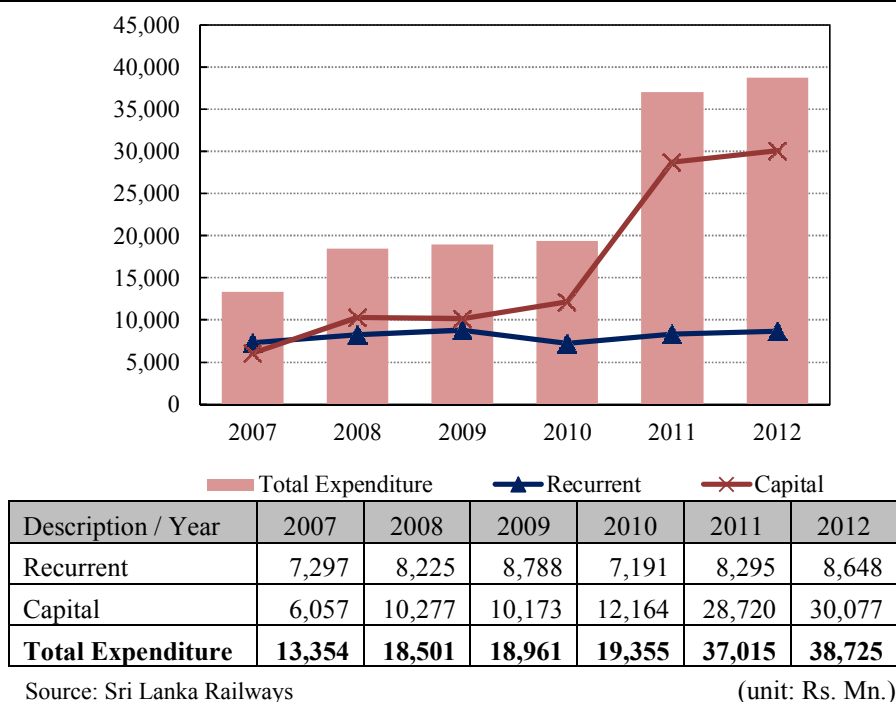
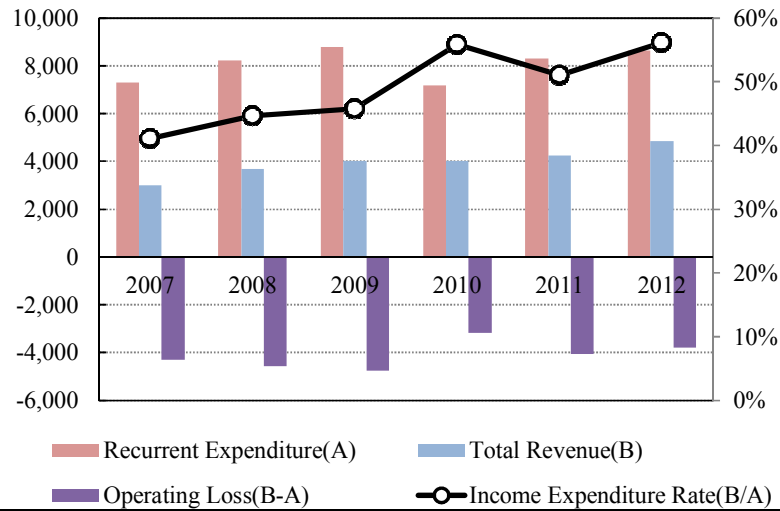


Figure 1.5.3 Annual Expenditure of Sri Lanka Railways 2007-2012

The SLR has continuously posted losses. Figure 1.5.4, depicts the revenue, expenditures, and profit/loss of the SLR in the last 6 years. The revenue could only cover approximately half of the expenditures. While the revenues are relatively level, there are some fluctuations in the expenditures.

Due to efforts to reduce the number of employees, both revenues and expenditures per staff member have been increasing although a drop has been observed in the recent two years (Figure 1.5.5).

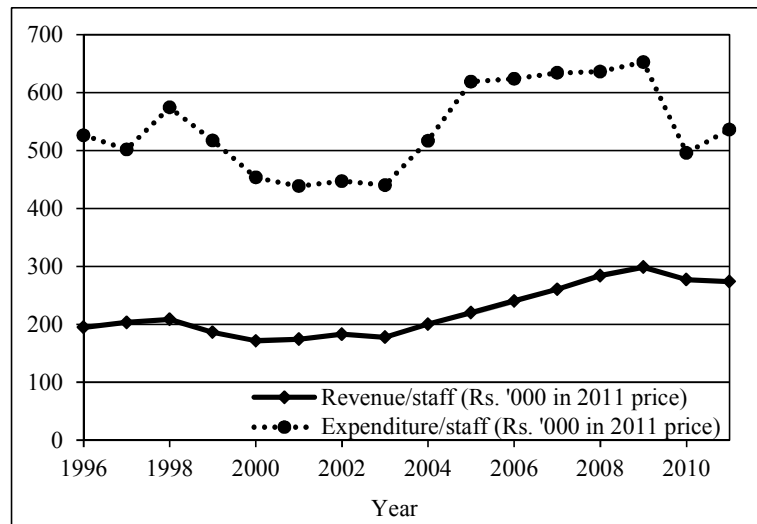


Description / Year	2007	2008	2009	2010	2011	2012
Recurrent Expenditure(A)	7,297	8,225	8,788	7,191	8,295	8,648
Total Revenue(B)	2,999	3,671	4,019	4,018	4,235	4,852
Operating Loss(B-A)	-4,298	-4,553	-4,769	-3,173	-4,060	-3,796
Income Expenditure Rate(B/A)	41%	45%	46%	56%	51%	56%

Source: Sri Lanka Railways

(unit: Rs. Mn.)

Figure 1.5.4 Revenue, Expenditure and Profit/Loss of the Sri Lanka Railways



Source: Economic and Social Statistics of Sri Lanka 2006-2012, Central Bank of Sri Lanka, adjusted by the Study Team

Figure 1.5.5 Revenue and Expenditures per Staff Member of the Sri Lanka Railways (2011 constant Price)

1.6 Railway Infrastructures and Rolling Stocks

1.6.1 Railway Rolling Stock

There are 1777 units of rolling stock in Sri Lanka Railway. They are categorised as shown in Table 1.6.1.

Table 1.6.1 Number of Rolling Stock

Type of Rolling Stock	Number	unit
Diesel Electric Locomotive	60	car
Diesel Hydraulic Locomotive	10	car
Diesel Multiple Unit	55	unit
Carriage (Passenger Coach)	900	car
Goods Wagon	600	car
Oil Tanker	152	car

Passenger trains consist of a locomotive and passenger coaches or diesel multiple units (DMU).

A locomotive and passenger coaches is the conventional train system and one locomotive pulls many passenger coaches where DMU has no locomotive but some cars have a diesel engine and push/pull the train. In DMU each end car has a driver's cab, therefore the train can operate either direction without shunting the locomotive. The ratio of wheels with traction on a DMU is higher than on a locomotive pulled train. Generally, acceleration and deceleration are higher than that of a locomotive pulled train therefore DMU is more suitable for commuter trains.

DMU of Sri Lanka Railway consist of one motor car at one end and five trailer cars. Approximately two thirds of the motor car is the machine room and the other one third is a passenger saloon. The engine and generator are installed in the machine room. Mostly, two units are coupled to make one train to provide enough passenger capacity.



Locomotive and Passenger Coach

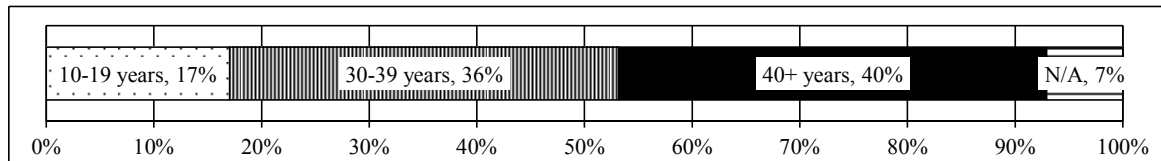


DMU

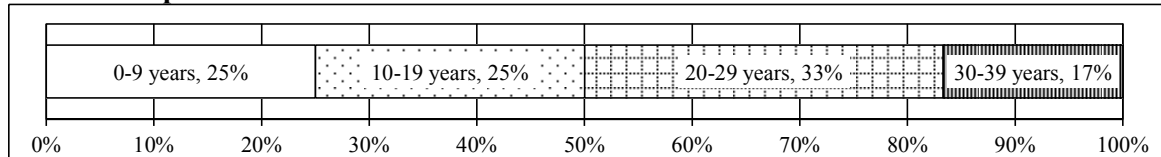
Figure 1.6.1 Trains of Sri Lanka Railway

The SLR possesses a variety of railway rolling stock. Most of the locomotives of the SLR were purchased more than 30 years ago and 40% of the locomotives were more than 40 years as shown in Figure 1.6.2. On the other hand, diesel multiple units (DMU) are relatively new. A half of the DMUs were purchased within the last two decades (Table 1.6.2). During the period from the 50's to the early 80's, the SLR imported mainly from developed countries such as Canada, Japan, Germany and England. After the 90's, the SLR imported mainly from China and India except for 10 locomotives from France. Recently, the SLR is shifting to a DMU rather than a locomotive-coach system. China is a key provider of DMUs. In addition to a total of 30 DMUs in 2000 and 2008, the SLR is planning to purchase 13 DMUs from China as a part of the Southern Railway Upgrading Project and 20 DMUs from India for the Coast Line.

Locomotives



Diesel Multiple Units



Source: Ministry of Transport,
http://www.transport.gov.lk/web/index.php?option=com_content&view=article&id=128&Itemid=114&lang=en
 Online. Internet. Accessed on 24 April, 2013

Figure 1.6.2 Age of Locomotives and DMUs of the Sri Lanka Railways

Table 1.6.2 Locomotives and Diesel Multiple Units of the Sri Lanka Railways

Type	Year of Purchase	Number	Manufacturer	Country	Availability
Locomotives					
M-2	1954	12	Canadian, General Motors	Canada	10
M4	1976	14	Canadian Locomotive Montreal	Canada	7
M5	1979	8	Japanese Hitachi	Japan	4
M5-c	2001	4			3
M6	1979	14	Henschel (ABB)	Germany	10
M7	1981	15	Brush	England	12
M8	1995	8	Indian (DLW)	India	5
M8-a	2001	2		India	2
M9	2000	10	Alsthom	France	5
W1	1969	10	Henschel West Germany	West Germany	6
W2	1969	3	Henschel East Germany	East Germany	2
W3		10		Germany	8
Y	1969	28	Hunslet	England	22
S5	1970	3	Hitachi	Japan	
DMUs					
S6	1975	4	Hitachi	Japan	2
S7	1977	6	Hitachi	Japan	3
S8	1992	20	Hitachi	Japan	15
S9	2000	15	Hubei Machinery & Equipment Import and Export Corporation	China	13
S10	2008	15	Hubei Machinery & Equipment Import and Export Corporation	China	15

Source: Ministry of Transport,
http://www.transport.gov.lk/web/index.php?option=com_content&view=article&id=128&Itemid=114&lang=en
 Online. Internet. Accessed on 24 April, 2013

1.6.2 Track

Sri Lanka Railways mostly uses ballasted track with concrete sleepers. Wooden sleepers are used in some areas.

Tracks have many joints because of the use of short rails. Deformation of rails and installation of rails with insufficient width at the heads are seen at joints. (Figure 1.6.3 and Figure 1.6.4)

In addition, significant irregularities in rail standards, alignments, and heights are observed because of low precision at rail joints and insufficient maintenance of track beds. (Figure 1.6.5 and Figure 1.6.6) Therefore, trains rattle badly while running. These aspects become great obstacles when increasing the speed of the trains.



Figure 1.6.3 Deformation of Rail



Figure 1.6.4 Insufficient width on Top



Figure 1.6.5 Irregularity of Alignment



Figure 1.6.6 Irregularity of Alignment

The noteworthy point is the Coast Line. The Coast Line is literally installed along the coastline, and some sections of the line are constantly exposed to wave splashes which are resulting in significant corrosion in the form of rust on the rails and fasteners (Figure 1.6.7). Fasteners are steel clips, and their own repulsive force causes them to snap when they rust. Actually, many fasteners are damaged and no longer functioning as fasteners. (Figure 1.6.8) They are badly rusted, and when fasteners are damaged they are not securing rails and sleepers, there is a possibility that designated track gauges cannot be maintained, or breakdown of rails may occur.



Figure 1.6.7 Corroded Rail



Figure 1.6.8 Snapped Fastener

Ballasts have been washed away toward the ocean due to wave motions in some areas, and sleepers are completely exposed from ballasts in such areas. (Figure 1.6.9).



Figure 1.6.9 Exposed Sleepers

In the worst case scenario, these conditions may cause derauling or overturning of trains.

1.6.3 Signalling System

Figure 1.6.10 indicates the signalling system of Sri Lanka Railway in Western Province. Most of the double track lines are equipped with Relay interlocking and Bi-directional Automatic Block Signalling systems. Electro Mechanical Interlocking and Uni-Directional Automatic Block Signalling systems are installed between Veyangoda and Rambukkana on the Main Line. Electronic Interlocking and Bi-Directional Automatic Blocking on single tracks was introduced between Kalutara South and Galle on the Coast Line in year 2000. Tablet Block Signalling System is used in other single track sections.

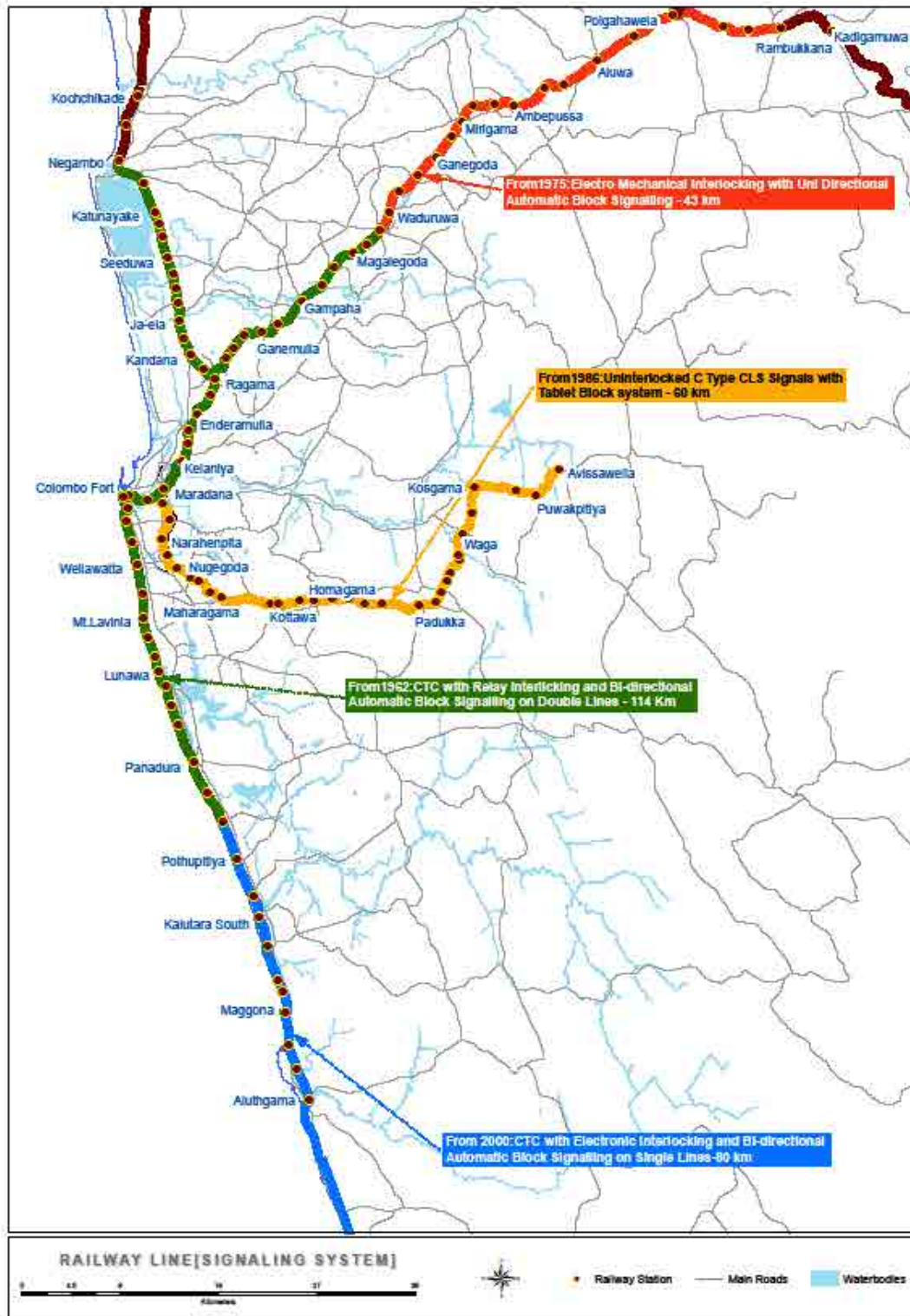


Figure 1.6.10 Signalling System in the Western Province of Sri Lanka Railway

The signalling system in Sri Lanka Railways is still using old signals that have been working for more than 40 years although some systems were installed after 2000 in the southern section of the Coast Line. Mechanical signals and tablet token block systems from more than 100 years ago are still in use in some local lines. A characteristic feature of the track signalling system is that six types of systems with different ages of installation are being used, and there are a variety of types of signals within a 120-kilometer radius of Colombo. (Figure 1.6.11 to Figure 1.6.14).



Figure 1.6.11 Colour Light Signal

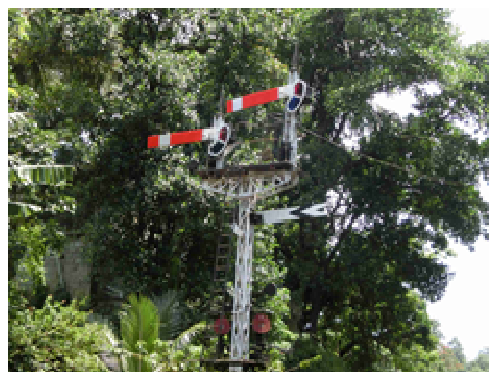


Figure 1.6.12 Broken Fastener

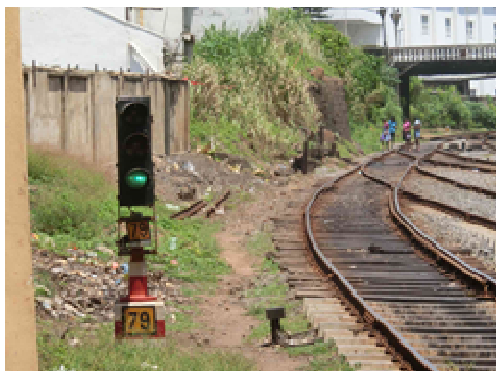


Figure 1.6.13 Colour Light Signal



Figure 1.6.14 Colour Light Signal

These signalling systems are in the following condition:

- Lack of maintenance(Figure 1.6.15, Figure 1.6.16)
- Significant age-related deterioration (Figure 1.6.17, Figure 1.6.18)
- Difficult to receive support from manufacturers
- Difficult to obtain replacement parts
- Unable to work with high speed and high frequency train operations

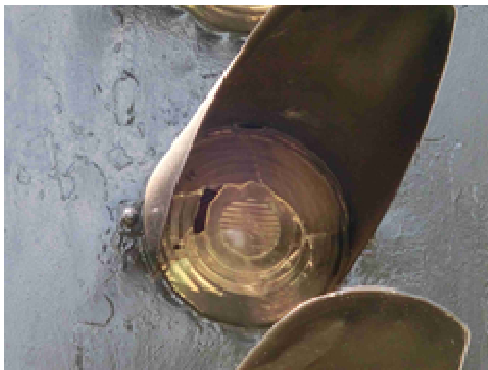


Figure 1.6.15 Dirty Signal Lens



Figure 1.6.16 Broken Signal



Figure 1.6.17 Exposed Terminal Box



Figure 1.6.18 Broken Fastener

These conditions indicate that signalling devices are not functioning as intended, and malfunctions and damages cannot be quickly repaired. Delays and cancellation of trains are frequently occurring as a result.

In addition, since these old signalling systems do not have features to protect trains automatically, there is a high risk that minor mistakes and misunderstanding of train drivers and station officers could result in collisions of trains.

1.6.4 Telecommunication Systems

For the Telecommunication system, a 155 Mbps ATM (Asynchronous Transfer Mode) System through optical fibre is applied in the Coast Line while the other lines are Radio Telecommunication through UHF/VHF.

Sri Lanka Railways is using a radio system using the UHF/VHF radio waves and the communication system using optical cables in the south as the backbone of its communication system.

The radio system which uses the UHF/VHF radio waves is a communication method that is widely used today in public emergency radios, portable communications, transmissions of images, and radios besides radio communications of railway systems. The transmission system using optical cables is also commonly used as a system that can quickly transmit large-capacity information.

Sri Lanka Railways have established communication methods as backbones, but age-related deteriorations are seen in some of the terminal devices. (Figure 1.6.19)



Figure 1.6.19 Terminal Devices

Communication systems in railways are essential in enabling voice communications and exchanges of image-based information among dispatchers, conductors, station officers, and maintenance staff. Reliability, stability, and ease of maintenance are required in these systems. Properly operating communication systems prevent accidents involving trains and enable on-time train services.

1.6.5 Railway Facilities

Buildings of the railway stations are generally old fashioned. Some stations are still using buildings of the colonial period. Unlike railways in Asian developing countries, the majority of SLR stations are equipped with a station square. Some bus terminals such as Moratuwa and Gampaha are just in front of the railway station.

Electronic signboards for passengers are also installed in some major stations such as Colombo Fort, Moratuwa and Negombo while small stations only have billboards.

Colonial Station Facilities
 of Egoda Uyana Station



Station Square
 of Negombo Station



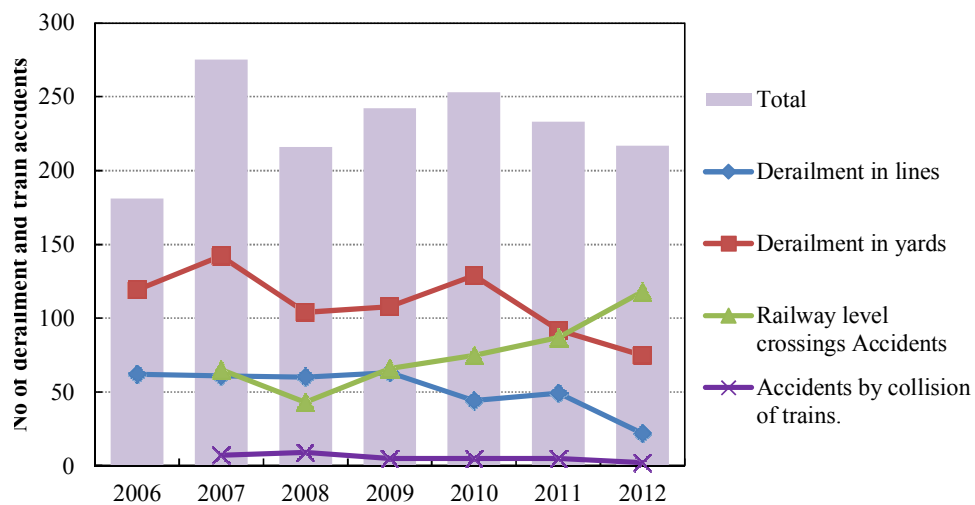
Source: CoMTrans Study Team

Figure 1.6.20 Examples of Station Facilities

The SLR has a variety of signalling systems as well. The Main Line is still using the 50-year old Colour Light Signalling and it will be replaced by a new colour light system including a Centralised Traffic Control (CTC) System and a telecommunication system. The 25-year old CTC system of the Coast Line will also be replaced. The signalling of the Kelani Valley Line is still manual using a token.

1.7 Railway Accidents and Derailments

As shown in Figure 1.7.1 the number of total derailments and accidents has hovered around 200 to 250 in the recent years. Both the numbers of derailments in lines and in yards are in a decreasing trend as shown in the figure. Especially, the number of the derailments in lines has decreased 65 percent in the last 7 years. However, the number of accidents at the railway level crossings has increased 81 percent and became the main factor.



Source: Sri Lanka Railways

Figure 1.7.1 Number of Derailments and Train Accidents

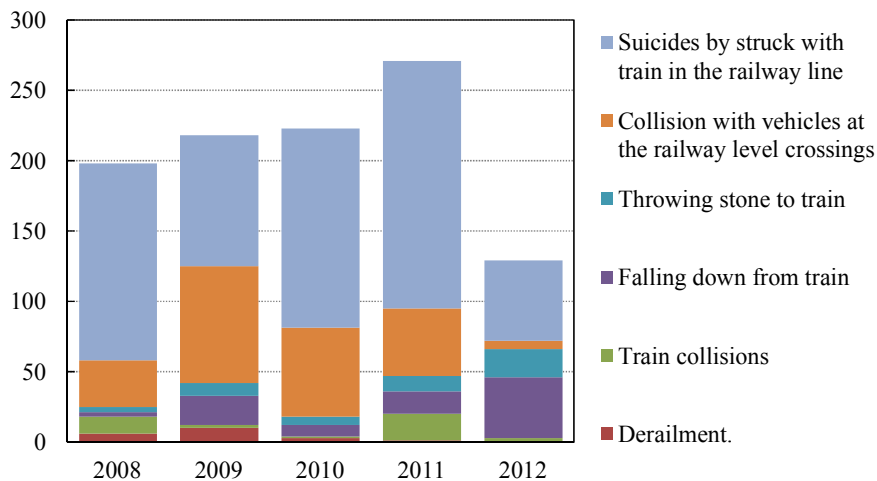
Figure 1.7.2 and Figure 1.7.3 show the reported number of fatalities and injuries due to the train accidents in the last 5 years. The total number of the fatalities had increased from 2008 to 2011. However it dramatically decreased from 141 to 38 between 2011 and 2012. The main factor of the fatalities was suicide through being struck by a train in the railway line, and its ratio was 84 percent in the last 5 years. The second factor of the fatalities was collision with vehicles at the railway level crossings and its ratio was 14 percent.

As shown in Figure 1.7.3, the number of injured shows a similar trend as the number of fatalities. The total number of injured had increased from 199 in 2008 to 271 in 2011, and dropped down to 129 in 2012. The main factor of the injuries was attempted suicide through being struck by a train in the railway line, and its ratio was 59 percent in the last 5 years. The second highest cause of injuries was Collision with vehicles at the railway level crossings (22 percent) and the third was falling from a train (9 percent) in the last 5 years.



Source: Sri Lanka Railways

Figure 1.7.2 Number Fatalities due to Train Accidents



Source: Sri Lanka Railways

Figure 1.7.3 Number Injured due to Train Accidents

1.8 Railway Institution and Administration

The SLR is under the purview of the Ministry of Transport. The SLR is the sole operator as well as regulator in Sri Lanka. The SLR functions under the General Manager. The General Manager reports to the Secretary of the Ministry of Transport. Table 1.8.1 summarises the number of staff of the SLR by sub-departments. The sub-department of Way and Works has the largest number of employees followed by Transport, Mechanical and Motive Power. While trade unions had a notable influence on railway policy due to their political activities, their attitude is gradually becoming cooperative according to the interview with the SLR.

Table 1.8.1 The Number of Staff of the Sri Lanka Railways by Sub-Department

Sub-Department	No. of Staff
General Manager's Office	198
CAR's Office	426
Traffic Costing Unit	13
Railway Stores	306
Protection Force	549
Technical Training Centre	35
Transport	2,971
Commercial Support and Marketing	58
Motive Power	2,341
Mechanical	2,385
Way and Works	6,021
Signals and Telecommunication	440
Total	15,743

Source: The Sri Lanka Railways

CHAPTER 2 Bus Transport

2.1 History of Bus Transport in Sri Lanka

Buses have been a core mode of transport after the independence although its share is gradually declining. For instance, buses accounted for 65% of passengers crossing the CMC boundary in 1985, 57% in 1995, 55% in 2004 and 47% in 2013.

In many developing countries, the bus transport business is market-driven and less restricted due to lack of government budget and qualified human resources for management and policy making. This often causes excessive competition among bus drivers and results in external diseconomy such as long queues at high demand bus stops, dangerous driving to compete with other drivers, and longer travel time per bus seeking passengers.

In contrast with other developing countries, it might be said that Sri Lanka tried a variety of alternatives of institutional forms from a fully nationalised organization, a state-owned company and a complete market oriented bus company. The history of the series of efforts on reformation of the bus transport sector is summarised in Table 2.1.1, and the historical trend of operational indicators is shown in Table 2.1.2.

Table 2.1.1 History of Bus Service Regulatory Schemes

Period	Bus Operators	Summary
-1958	Private Bus Companies Only	Quantity and quality licensing similar to the United Kingdom was enacted in 1951. However, the excessive competition deteriorated the bus service level.
1958-1978	Ceylon Transport Board (CTB) Only	Bus services were nationalised in 1958 aiming at improvement of service level. The CTB introduced a new rural service, long-distance service, night time service, and school services. While the quality of bus services was improved, the CTB was in financial deficit due to low fares, public service obligations and political pressure on generating employment.
1978-1990	Sri Lanka Central Transport Board (SLCTB), 9 Regional Transport Boards (RTB) and Private Bus Companies	The CTB was decentralised into SLCTB and 9 RTBs. Private bus services were also introduced. Deficits of the government operators increased due to the political will for not raising fares. The severe competition with private companies and financial deficits led to reduction of the number of buses and passenger kilometres. There was no subsidy for public service obligations.
1990-1996	SLCTB, 93 Peoplised Companies and Private Bus Companies	The 9 RTBs were divided into 93 RTBs in 1990 and privatised as Limited Liability Companies (LLCs). The central government retained a 50% share and the remaining was distributed among the company's staff. This process was called "peoplization". While the peoplised companies succeeded in reducing the number of employees, the segmented organization had serious inverse effects such as deterioration of the workshops and lack of management professionalism.
1996-	SLCTB, 11 Regional Bus Companies (RBCs) and Cluster bus companies (CBCs) and Private Companies	The segmented peoplised companies were consolidated into 11 RBCs or CBCs. The government increased ownership of RBCs by 40%. Although the government considered full privatization of the sector with international assistance, this prompted lawsuits by some RBC employees and public interest groups. The government intentionally restrained the subsidies aiming at privatization, and this resulted in reduction of service level. The number of staff was not significantly reduced as it is difficult to layoff government employees.
2005-	Sri Lanka Transport Board (SLTB) and Private Companies	The government re-nationalised the public sector bus services into the SLTB for integrating management of bus services and improving efficiency. To avoid political intervention on management of the SLTB, the SLTB board members have to be professionals from four sectors; transport, management, law, finance and/or engineering. While the SLTB succeeded in improving some operational indices such as bus kilometres per staff member, the total deficit is increasing as of 2011.

Source: The Study on Urban Transport Development for the Colombo Metropolitan Region by JICA, 2006

Table 2.1.2 Historical Trend of Operational Indicators

Operating Indicators		1978	1988	1996	2003	2005	2011
Operator of Public Sector Bus		CTB	RTB	Peoplised	RBC	SLTB	SLTB
Operated km (million)	Public	455	334	348	334	259	341
	Private	0	N/A	393	559	487	800
No. of Buses Operated (Daily Average)	Public	5,097	4,411	4,716	4,599	3,828	4,365
	Private	0	N/A	8,163	11,608	11,794	16,602
Passenger km (billion)	Public	20.4	15.4	20.3	17.4	12.7	16.3
	Private	0	N/A	20.6	29.4	25.6	42.0
Passenger km/bus/day	Public	10,951	9,573	11,769	10,392	9,068	10,260
	Private	0	N/A	6,929	6,930	5,943	6,930
Load factor (%)	Public	84.2	85.0	105.7	105.3	102.0	72.0
Bus km/staff/day	Public	21.0	18.1	26.1	22.4	20.1	27.1
Staff	Public	58,986	50,472	36,424	40,918	35,329	34,495
Deficit (Rs. million in '11 prices)	Public	1,536	5,712	3,290	4,504	5,000	5,615

Source: NTC, 2012; Urban Transport Development of the Colombo Metropolitan Region, 2006; Economic and Social Statistics of Sri Lanka 2006-2012

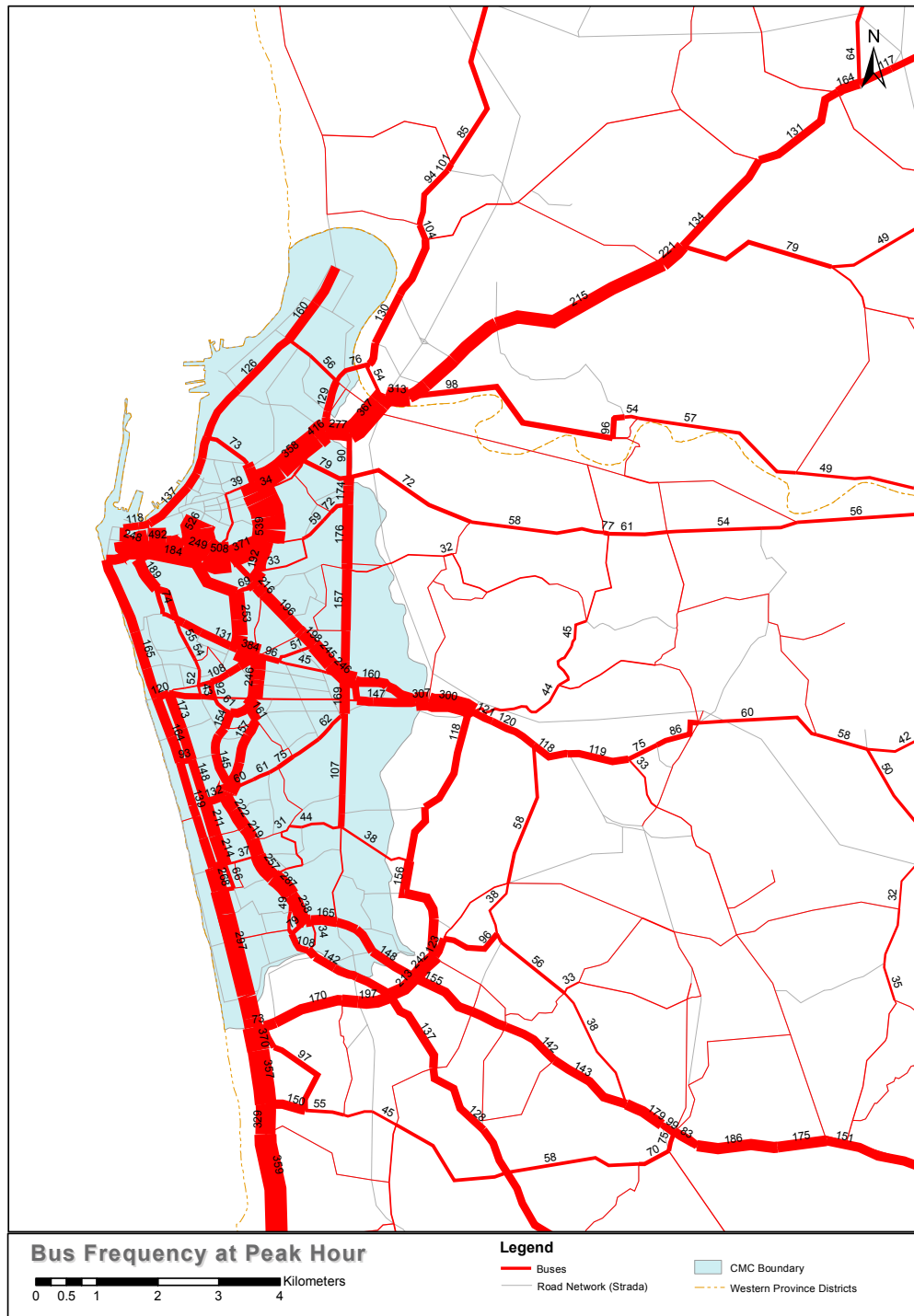
2.2 Bus Routes and Operations

2.2.1 Bus Routes of the Western Province

The Sri Lanka Transport Board (SLTB) and private bus companies operate roughly 680 intra-provincial bus routes and 400 inter-provincial bus routes in the Western Province according to the bus route information from the National Transport Commission (NTC). It is evident that one third of intra-province buses routes operated in the Western Province have one of their ends in the Pettah area of Colombo where three bus terminals are located. Although the bus routes are complicated for passengers to find the routes appropriate for their origin and destination, no maps for passengers are available at this moment.

There are also several initiatives to improve bus services of the region. The SLTB has started to procure 100 luxury low floor buses equipped with air conditioners for the routes in the Western Province. Routes to suburban cities located around 20-40km from Colombo Municipality such as Moratuwa, Kesbawa, Homagama, Kaduwela, Gampaha and Negombo were selected. Export credit from the Bank of Sweden is being utilised.

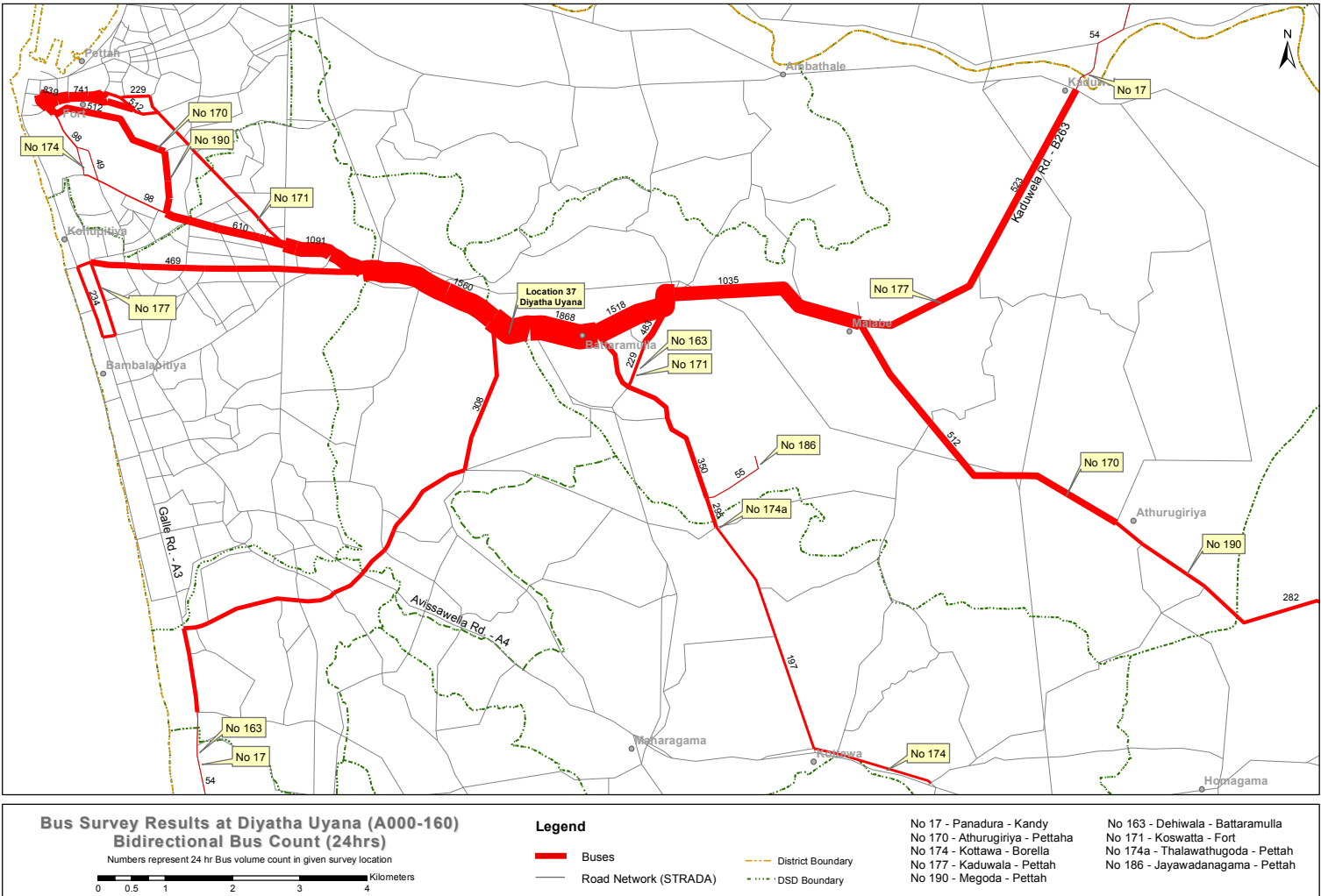
By utilizing bus route information from the SLTB and the Western Province Road and Passenger Transport Authority (WPRPTA), buses operating during peak hour are shown in Figure 2.2.1. The number of buses on the seven major radial corridors outnumber other roads. Kandy, Galle and Malabe corridors are the highest followed by High Level, Negombo, Horana and Low level corridors. A number of buses are operated around Pettah bus terminals.



Source: Time tables and bus operational information from the Western Province Road and Passenger Transport Authority (WPRPT), the Sri Lanka Transport Board (SLTB) and the National Transport Commission (NTC). Time tables and bus operational information were summarised and visualised by the CoMTrans Study Team.

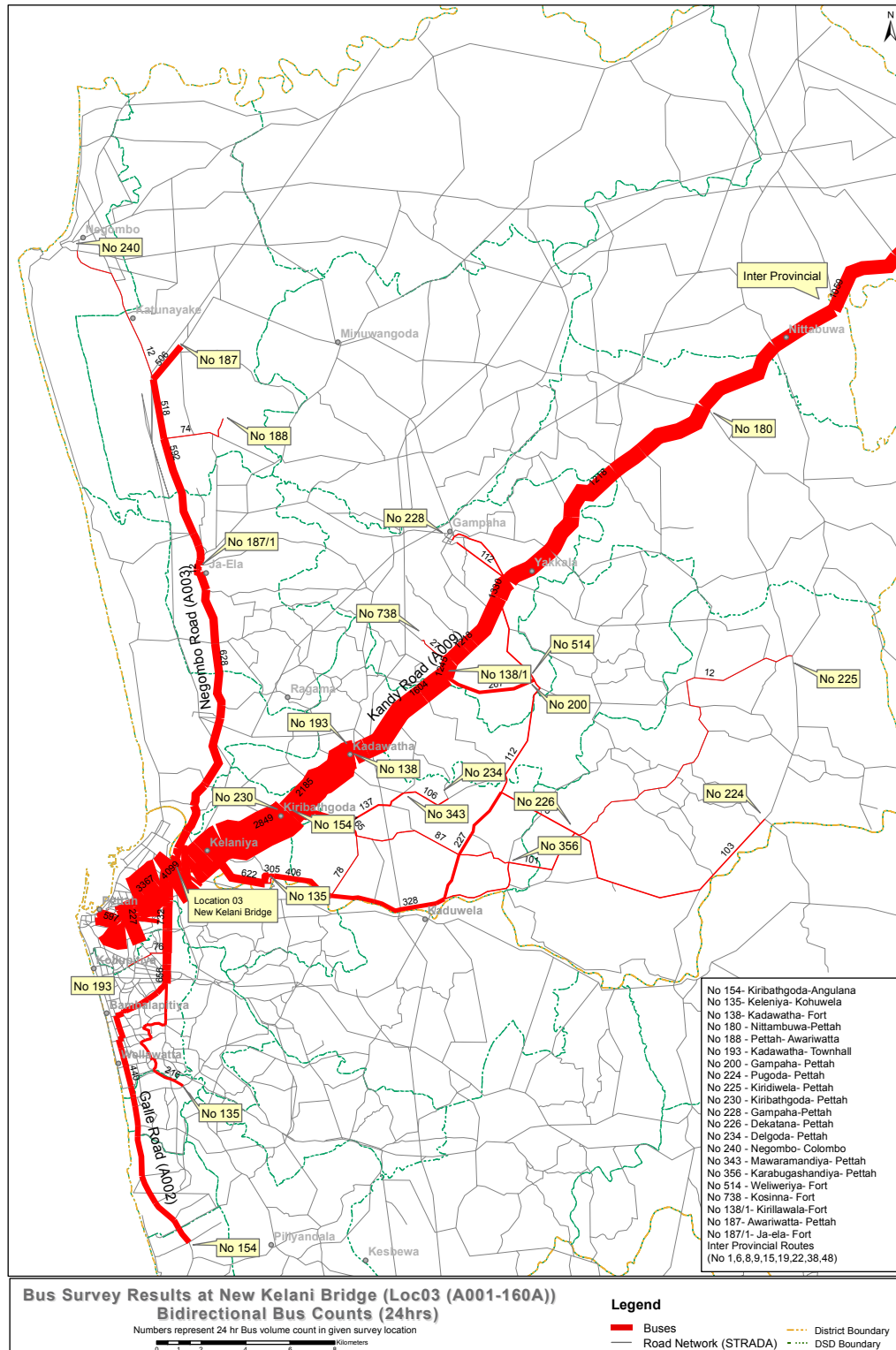
Figure 2.2.1 The Number of Buses Operated during Peak Hour in the CMC and Surrounding Areas

Bus routes of the seven major transport corridors are illustrated in Figure 2.2.2. The bus fleet count survey by bus route was conducted at the boundary of the Colombo Municipal Council (CMC) as a part of the screen survey of the Project. By combining bus route information from the SLTB and the WPRPTA, the number of buses operated per day at the boundary of the CMC is visualised. While the bus routes of Kandy, High Level, Horana and Galle corridors are not dispersed, Bus routes of Low level and Malabe corridors are from a variety of terminals, mainly from outside of the corridors.



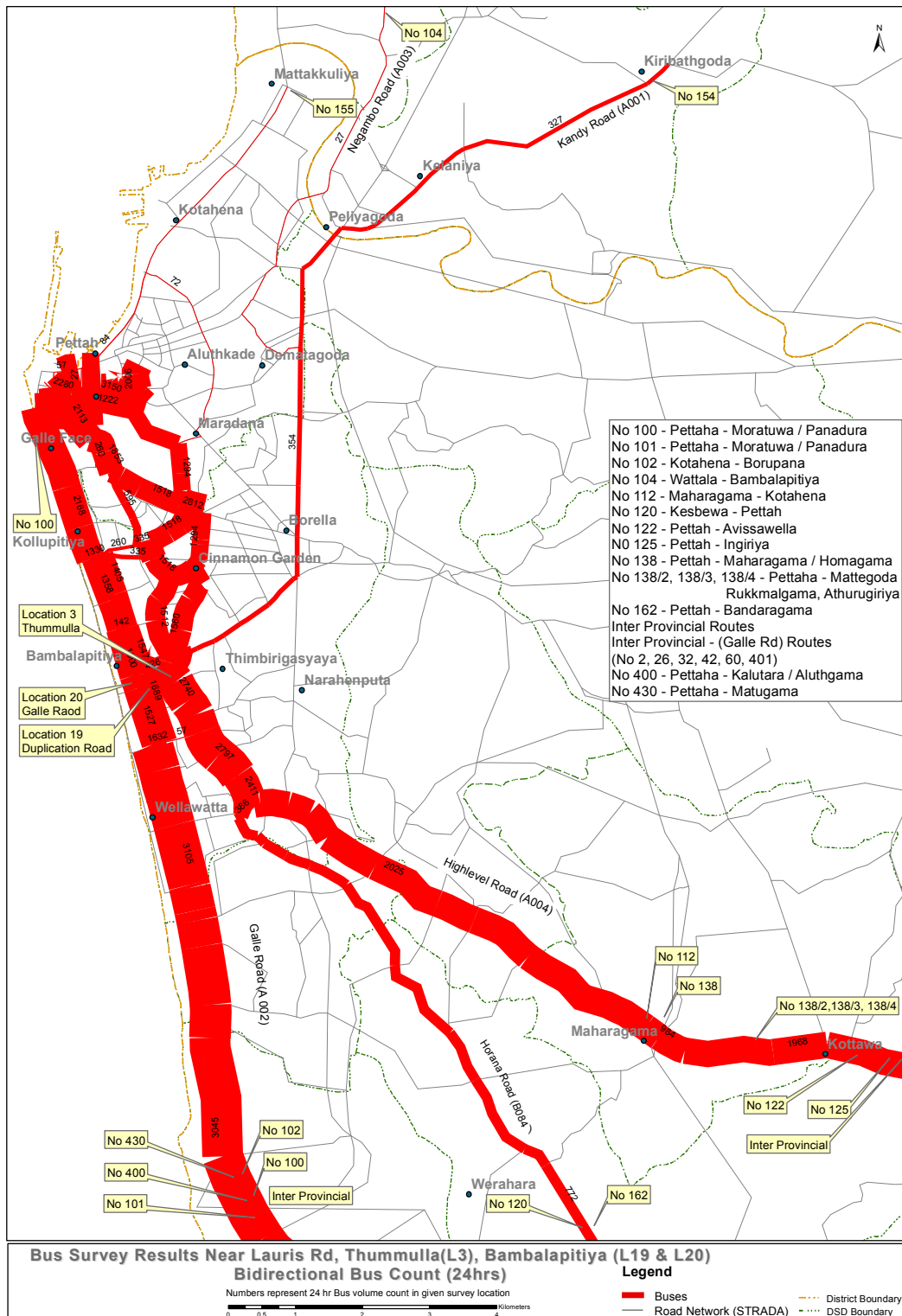
Note: The number of buses operated at the boundary of CMC according to the Screen Line Survey of CoMTrans was illustrated utilizing bus route information from SLTB and WPPRTA.

Figure 2.2.2 Bus Routes of Malabe Corridor



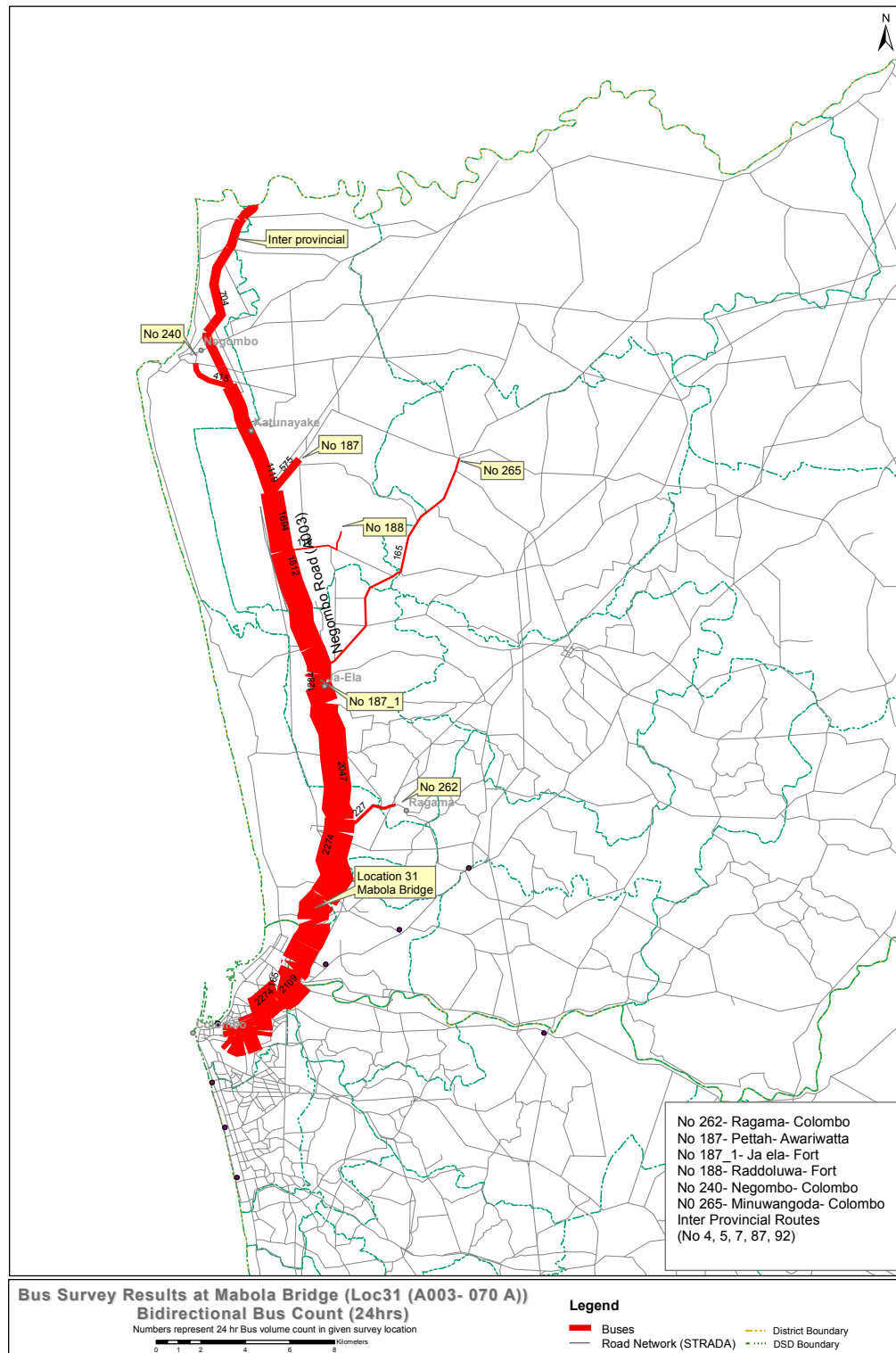
Note: The number of buses operated at the boundary of CMC according to the Screen Line Survey of CoMTrans was illustrated utilizing bus route information from SLTB and WPRPTA.

Figure 2.2.3 Bus Routes of Kandy Corridor



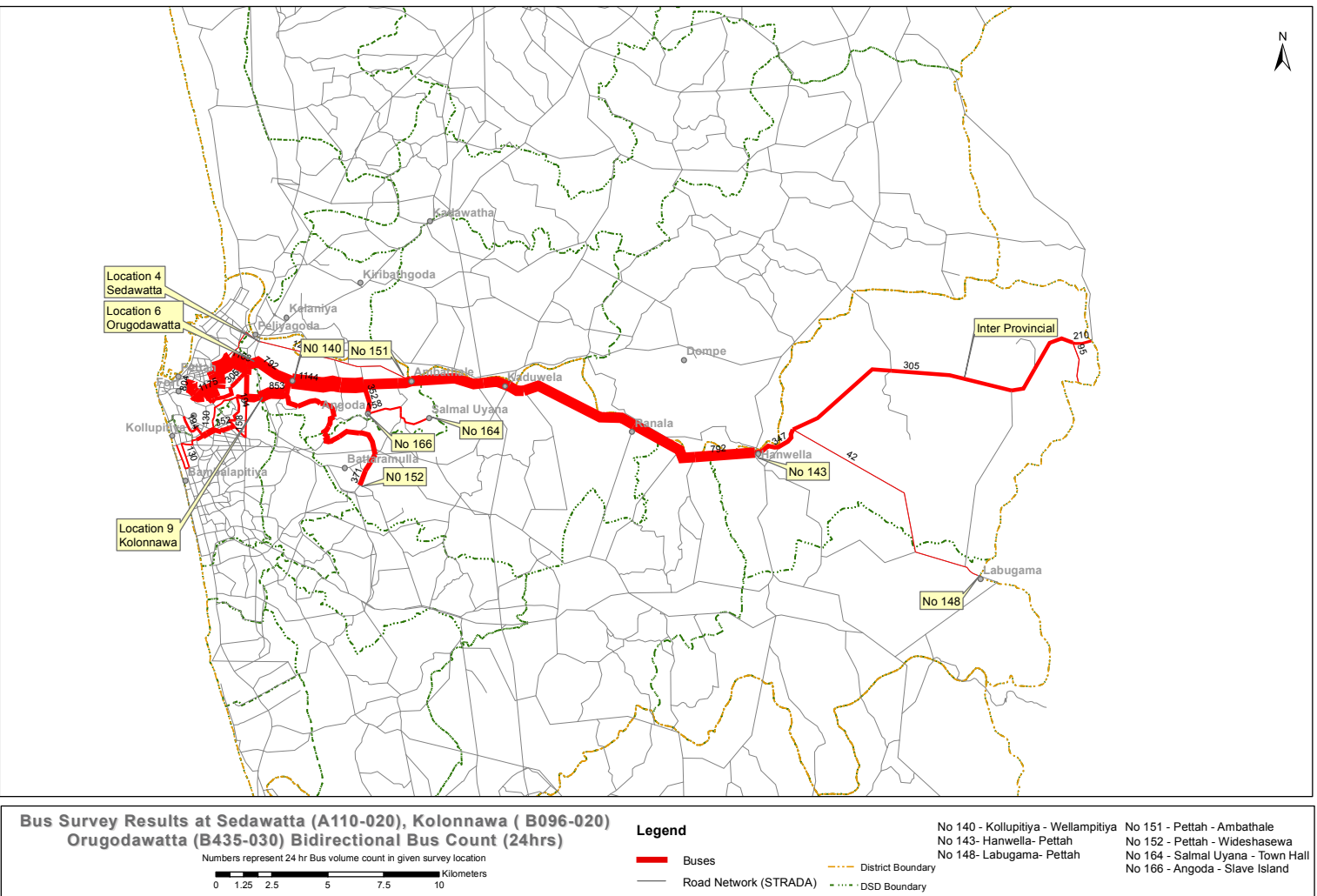
Note: The number of buses operated at the boundary of CMC according to the Screen Line Survey of CoMTrans was illustrated utilizing bus route information from SLTB and WPRPTA.

Figure 2.2.4 Bus Routes of Galle, High Level and Horana Corridors



Note: The number of buses operated at the boundary of CMC according to the Screen Line Survey of CoMTrans was illustrated utilizing bus route information from SLTB and WPRPTA.

Figure 2.2.5 Bus Routes of Negombo Corridor

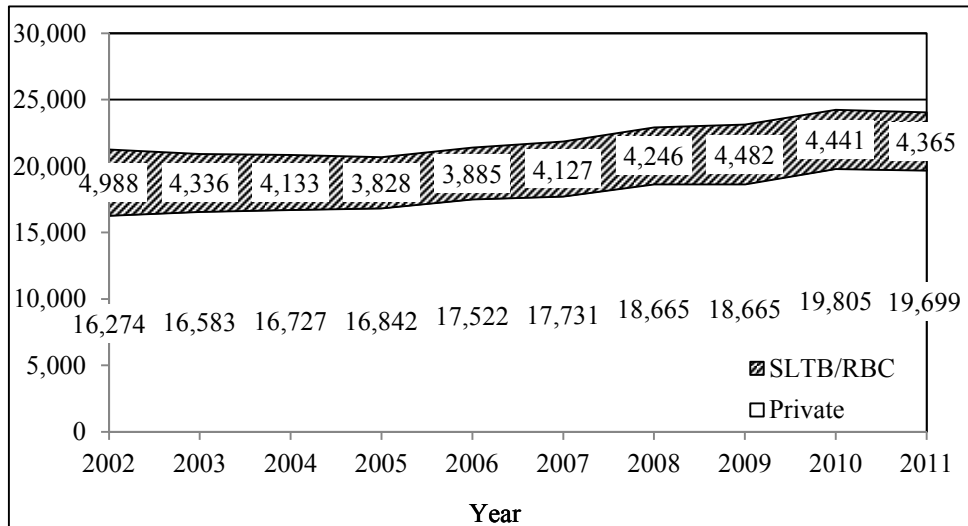


Note: The number of buses operated at the boundary of CMC according to the Screen Line Survey of CoMTrans was illustrated utilizing bus route information from SLTB and WPPRTA.

Figure 2.2.6 Bus Routes of Low Level Corridor

2.2.2 Number of Buses

The major operational indices of buses are shown in Figure 2.2.7 to Figure 2.2.9. In terms of the number of buses operated in Sri Lanka, the private sector is gradually increasing its number. The SLTB increased the number of buses operated 4 years after establishment in 2005.

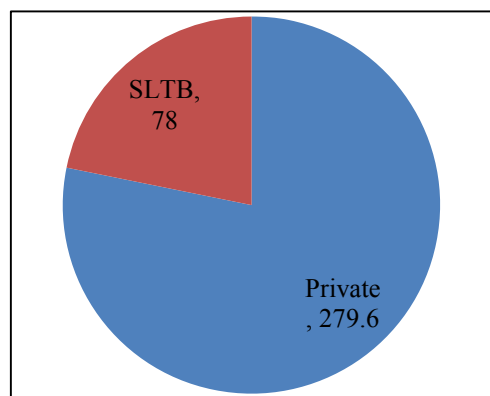


Source: Economic and Social Statistics of Sri Lanka 2006-2012

Figure 2.2.7 The Number of Buses Operated in Sri Lanka

2.2.3 Bus Kilometres

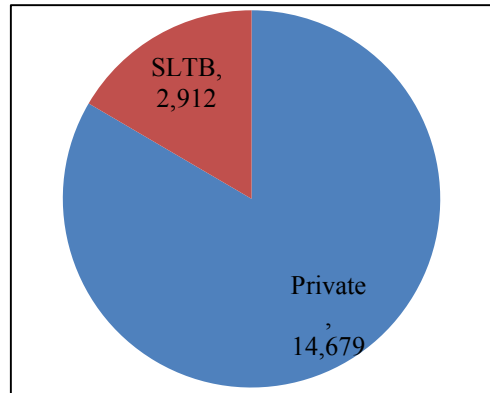
Bus kilometres and passenger kilometres are shown in Figure 2.2.8 and Figure 2.2.9. While the share of kilometres of private buses is approximately 78%, the share of passenger kilometres of private buses is roughly 83%. This means that load factors of private buses are generally higher than SLTB.



Unit: Million Kilometres in 2011

Source: Economic and Social Statistics of Sri Lanka 2013

Figure 2.2.8 Bus Kilometres in the Western Province



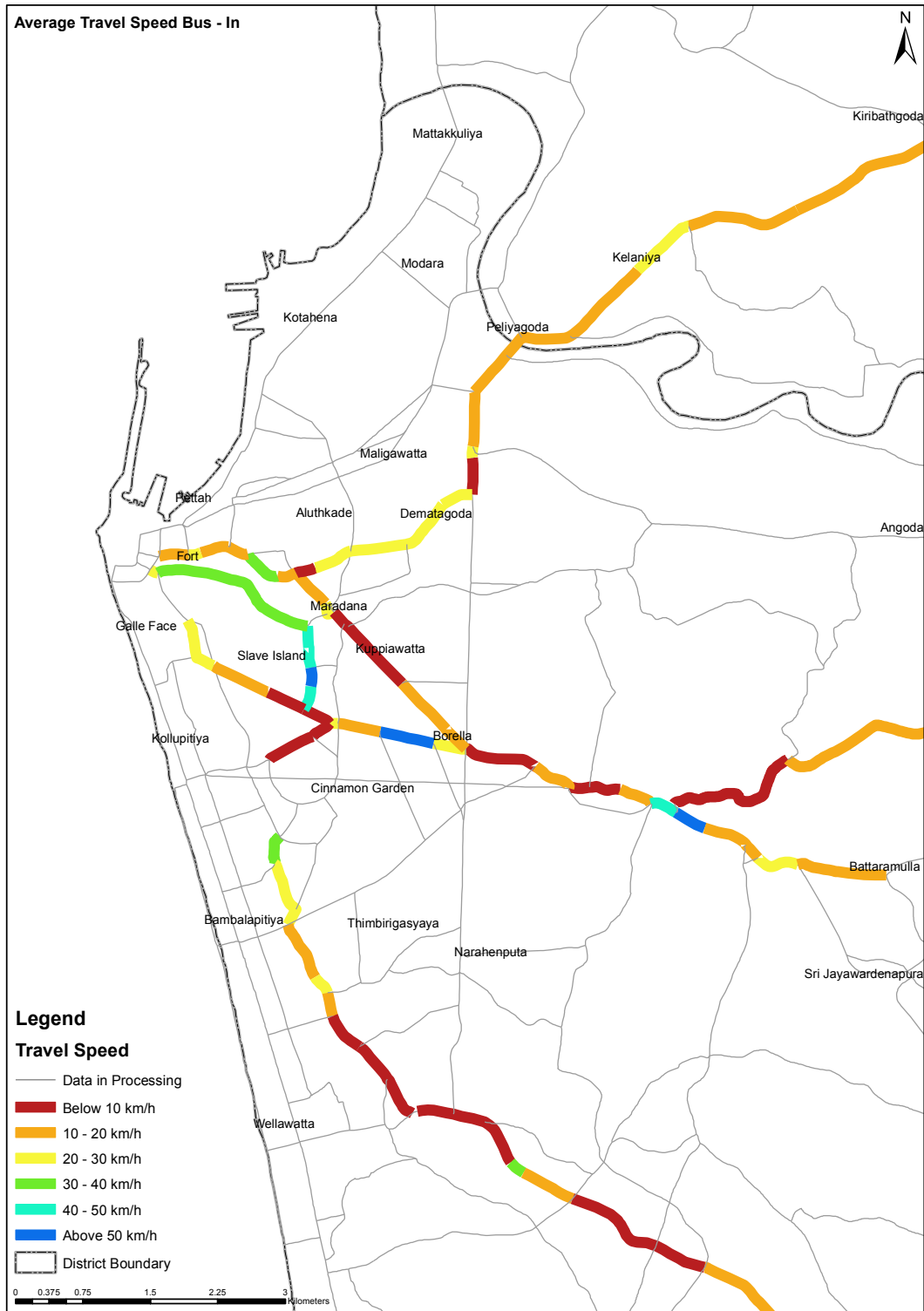
Unit: Million Passenger Kilometres in 2011

Source: Economic and Social Statistics of Sri Lanka 2013

Figure 2.2.9 Passenger Kilometres of Bus Transport in the Western Province

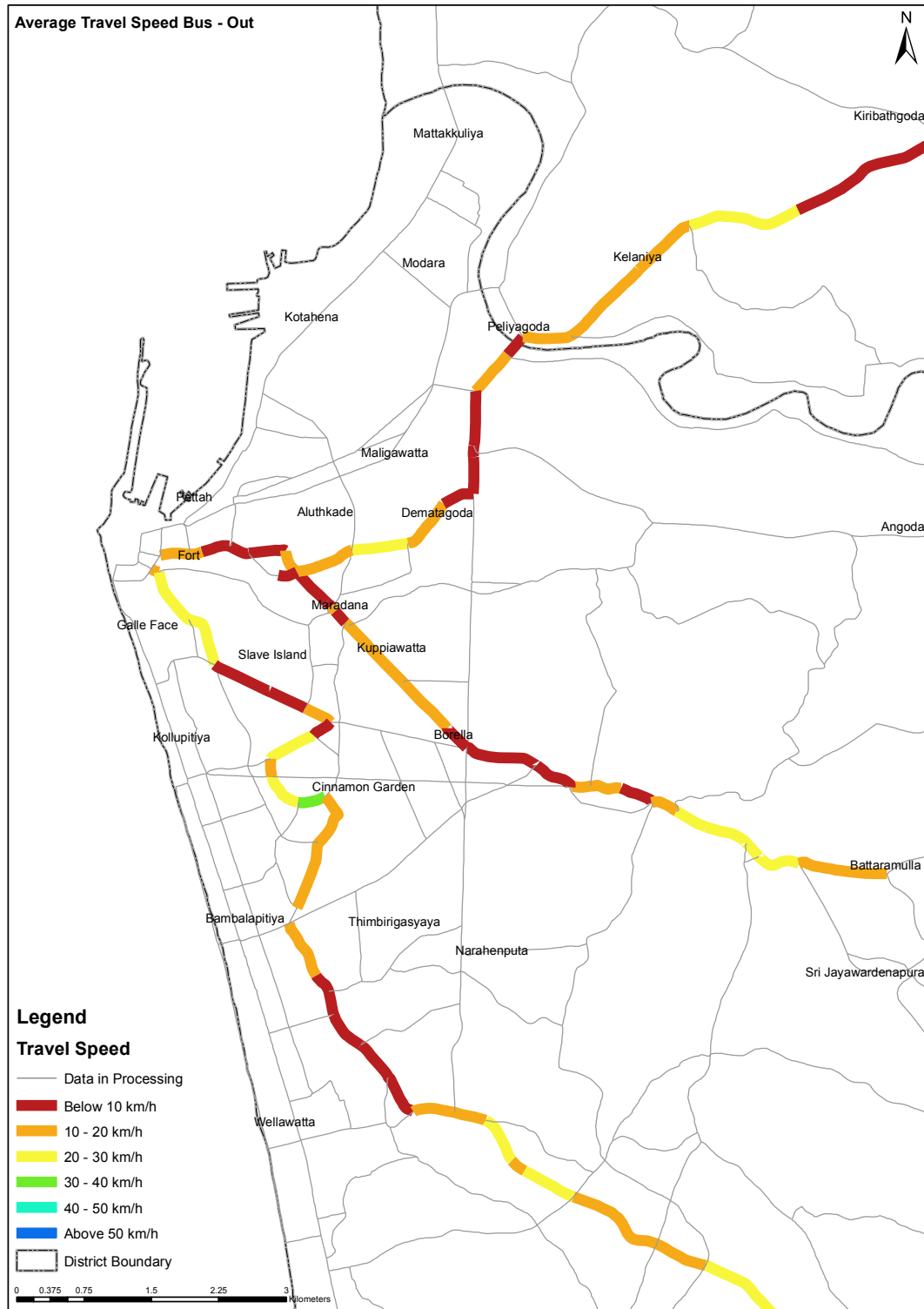
2.2.4 Bus Travel Speed on Major Transport Corridors

Travel speeds of buses by selected major corridors during morning and evening peak hours are shown in the Figure 2.2.10 and Figure 2.2.11. The figures show travel speeds of buses for roughly five weekdays by section in May 2013. The survey was conducted by boarding buses from the outskirts to Pettah in the morning approximately 8-9 AM and from Pettah to the outskirts in the evening approximately 5-6 PM. In most road sections, bus travel speeds are less than 20 km/h. Travel speeds are below 10km/h at Dematagoda, Maradana, Borella, Rajagiriya, Town Hall, Kirulapona and Nugegoda. In some sections, travel speeds of buses are slightly lower than those of private cars.



Source: CoMTrans Study Team, Bus Travel Speed Survey on Selected Corridors

Figure 2.2.10 Travel Speed of Buses from Outskirts to Fort Area during Morning Peak

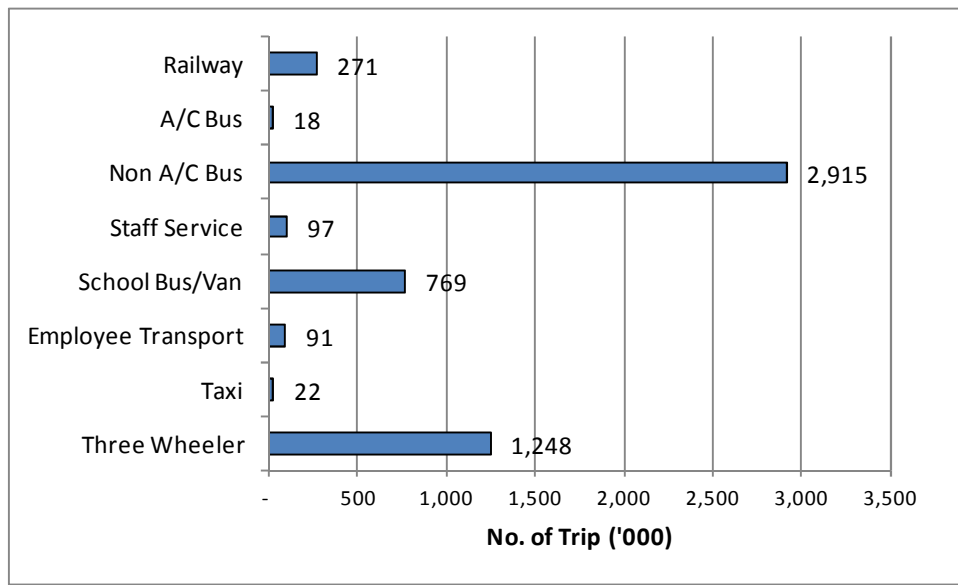


Source: CoMTrans Study Team, Bus Travel Speed Survey on Selected Corridors

Figure 2.2.11 Travel Speed of Buses from Fort Area to Outskirts during Evening Peak

2.3 Bus Passenger Profile

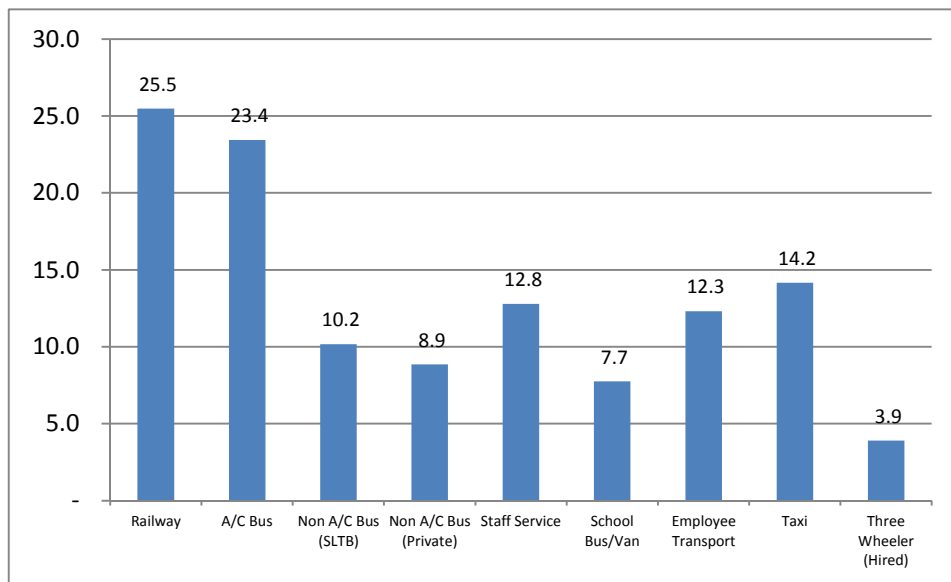
According to the Home Visit Survey results, non-air-conditioned bus is the most popular mode of transport in the Western Province followed by three wheeler, school bus/van and railway. Employee transport and staff service are slightly less than 100,000 trips per day. The number of trips of air-conditioned buses and taxis are the lowest among all public transport modes.



Source: Home Visit Survey, 2013, the Study Team

Figure 2.3.1 The Number of Trips by Public Transport Mode in the Western Province

Trip distances by public transport mode are shown in Figure 2.3.2. Average travel distance of railway and air-conditioned buses are the longest among all public transport modes. Taxi, staff service and employee transport are in the range of 12-14 km. Non-air-conditioned SLTB bus, non-air-conditioned private bus and school van/bus are roughly 7-11km. The shortest trip distance is three-wheeler, roughly 4km.

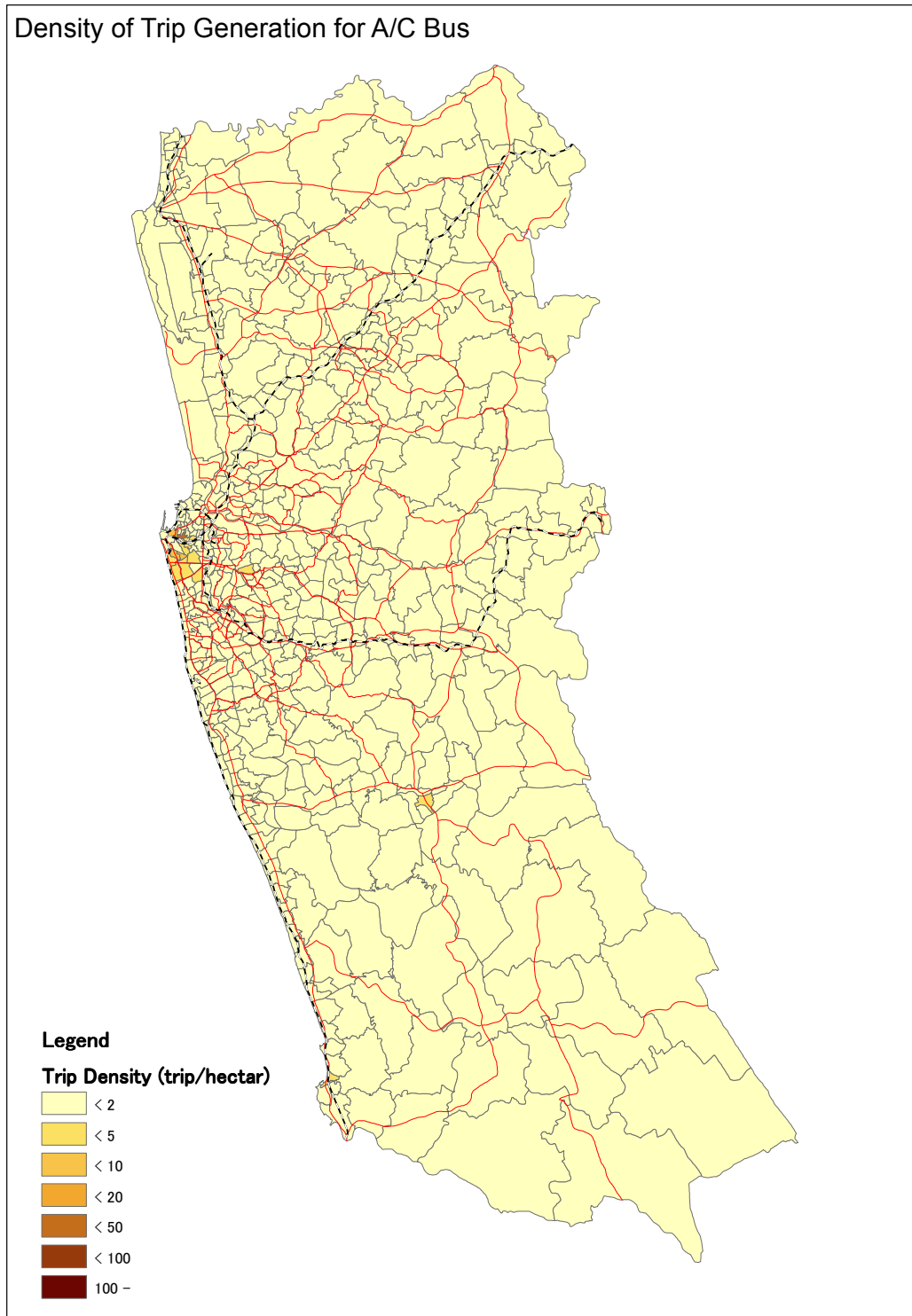


Source: Home Visit Survey, 2013, the Study Team

Figure 2.3.2 Trip Distance by Public Transport Modes

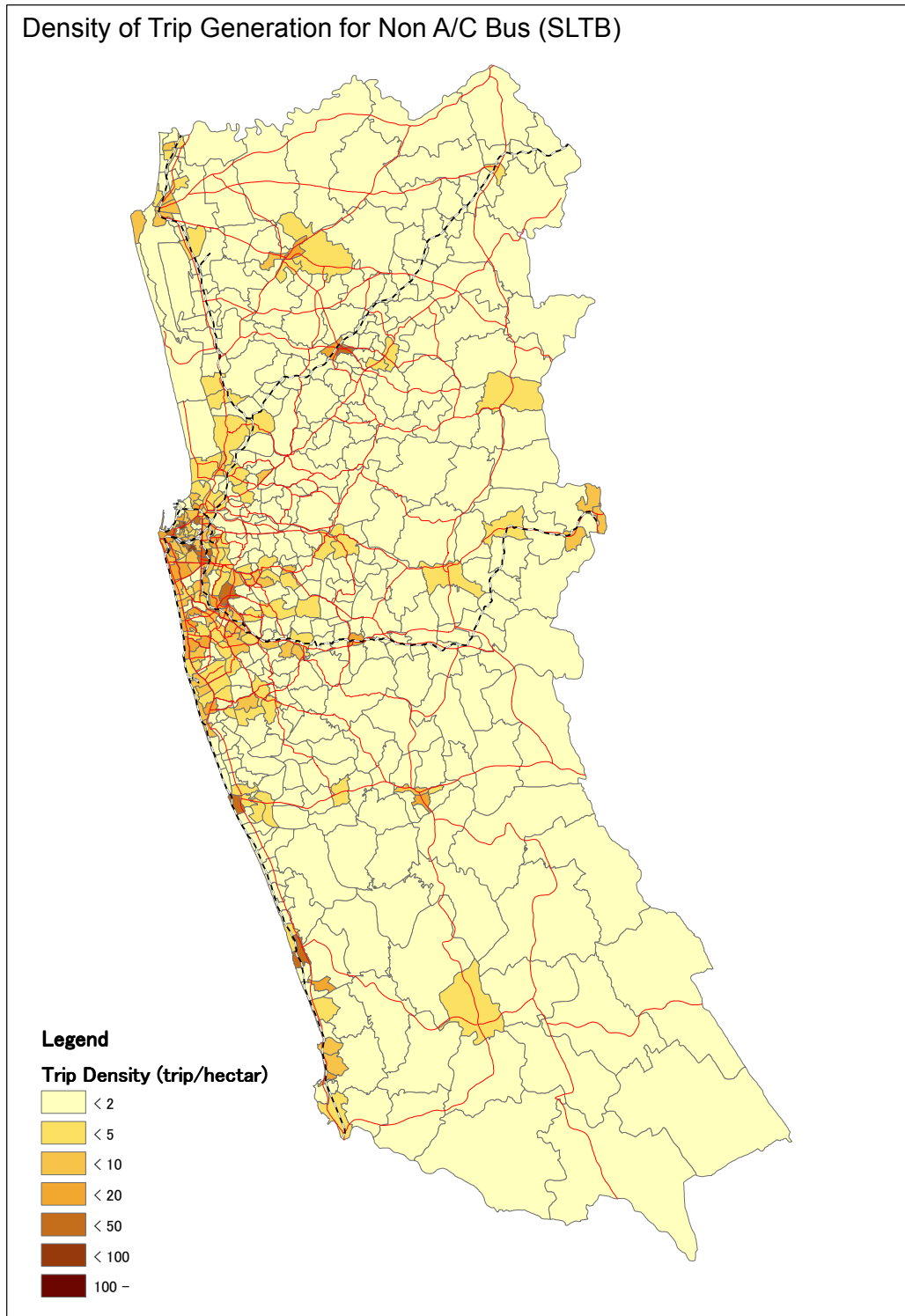
The trip density by representative public transport modes are shown in Figure 2.3.3 to Figure 2.3.5. It is evident that railway passengers are from zones close to a railway line. While non-air-conditioned private buses are the dominant public transport mode in most zones, the number of trips by non-air-conditioned SLTB bus is higher than non-air-conditioned private bus in some rural areas in the Western province. Air-conditioned bus, staff service, employee transport, school van/bus and hired three wheelers are generally concentrated in the CMA.

Figure 2.3.6 shows the capacity (number of buses times number of seats) and demand (number of passengers) of buses in the Screen Line Survey. On Negombo, Kandy, Malabe, High Level and Galle Roads, the demand exceeds 100,000 per day.



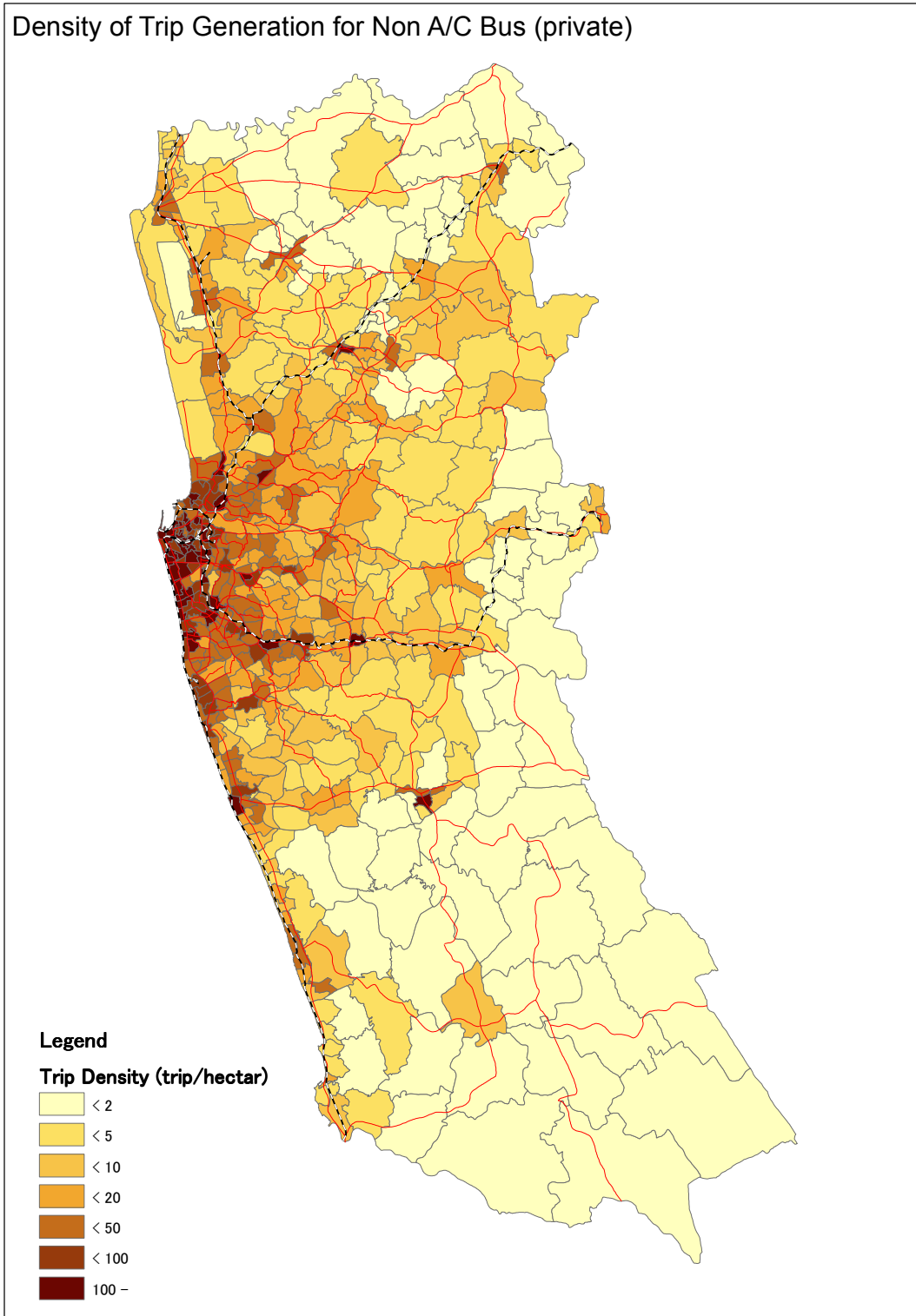
Source: CoMTrans Study Team

Figure 2.3.3 Trip Density for Trip Generation for A/C Bus



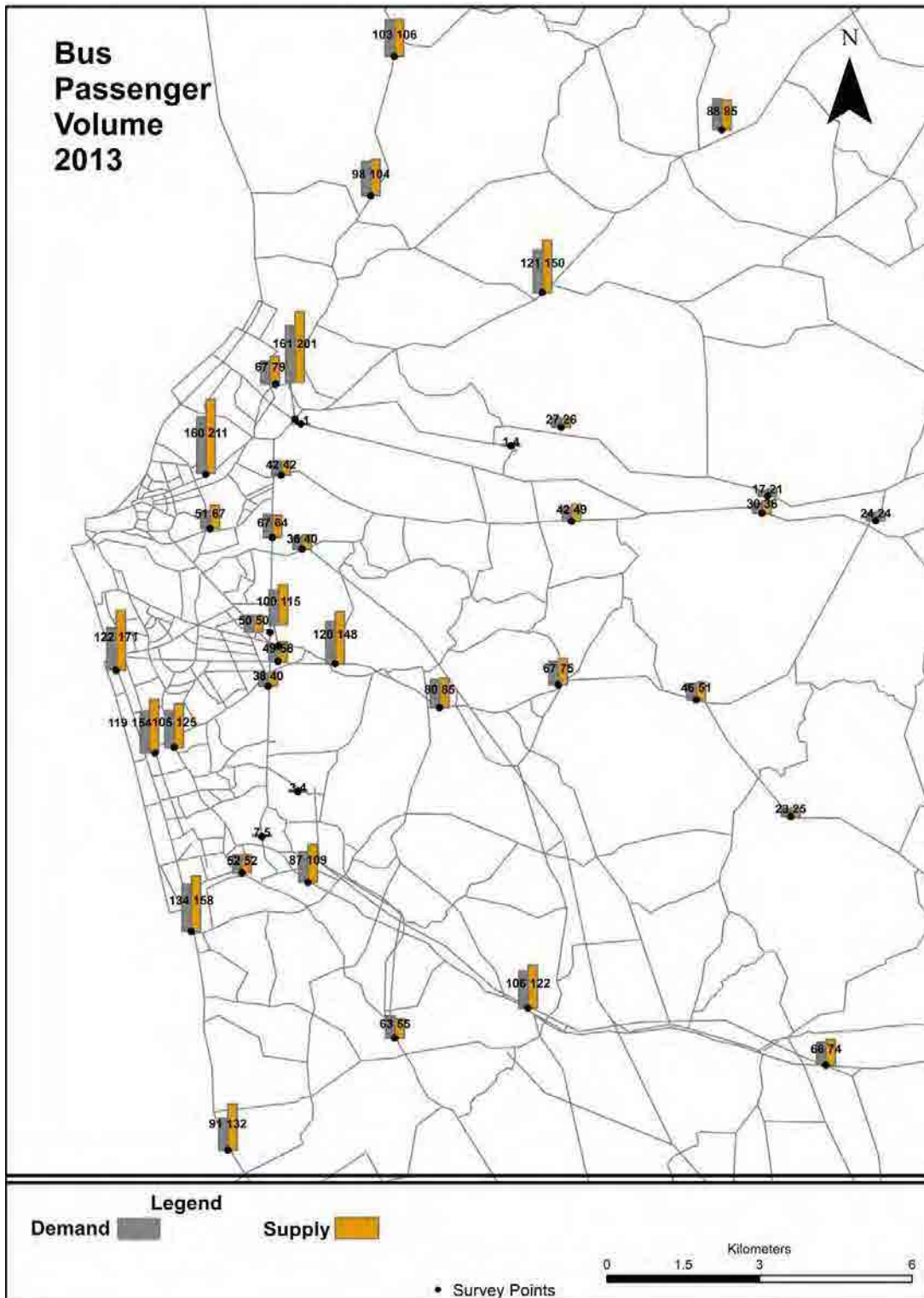
Source: CoMTrans Study Team

Figure 2.3.4 Trip Density for Trip Generation for Non A/C Bus (SLTB)



Source: CoMTrans Study Team

Figure 2.3.5 Trip Density for Trip Generation for Non A/C Bus (private)



Source: CoMTrans Study Team

(unit: passenger/day)

Figure 2.3.6 Bus Passenger Volume (Demand and Capacity) in Screen Line Survey

2.4 Load Factors of Bus Transport

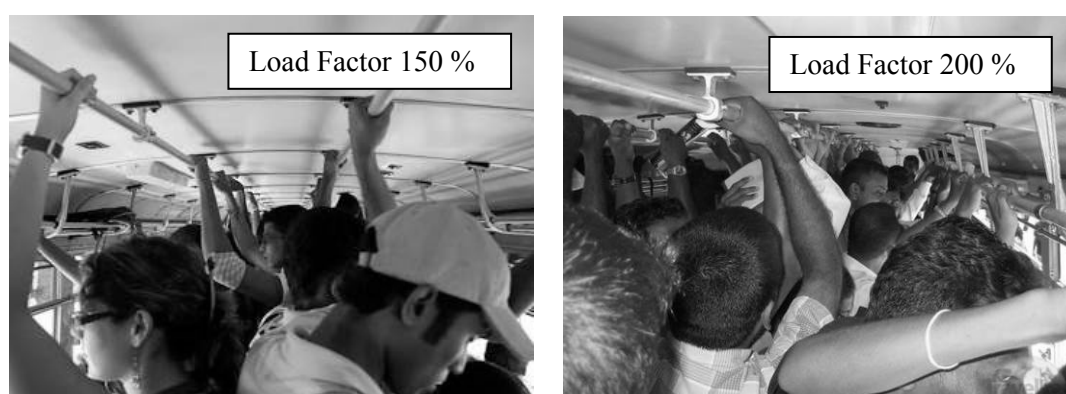
Buses are the major public mode of transport in Colombo. In the morning period buses are over-crowded on the inbound direction on almost all major corridors according to the Screen Line survey. The load factors on all the corridors indicate more than 100 per cent. In particular on Kandy, Low Level and Horana roads, the load factors are more than 150 per cent. In the evening peak period, buses are crowded on all the corridors except Sri Jayawardenepura Mawatha of which load factor was 87 percent.

Table 2.4.1 Bus Load Factor of Major Transport Corridors

Corridor	Road	Morning Peak Period (Inbound)			Evening Peak Period (Outbound)		
		CMC Boundary	5 km	10 km	CMC Boundary	5 km	10 km
Negombo Road		142	122	117	115	120	133
Kandy Road		116	142	171	120	108	143
Low Level Road	Awissawella Road	171	-	-	143	-	-
	Kolonnawa Road	127	-	-	127	-	-
Malabe	Kotte Road	130	126	127	111	123	156
	Sri Jayawardenepura Mawatha	138	-	-	87	-	-
High Level Road		106	121	134	124	133	108
Horana Road		166	174	-	147	169	-
Galle Road		101	-	-	102	110	-

(Unit: per cent) Bus load factor is estimated by dividing loading passenger by seating capacity. Cells of tables are coloured by load factor. Green is less than 120%. Yellow is 120-149%, and, pink is 150% or more.

Source: CoMTrans Screen Line Survey, 2012



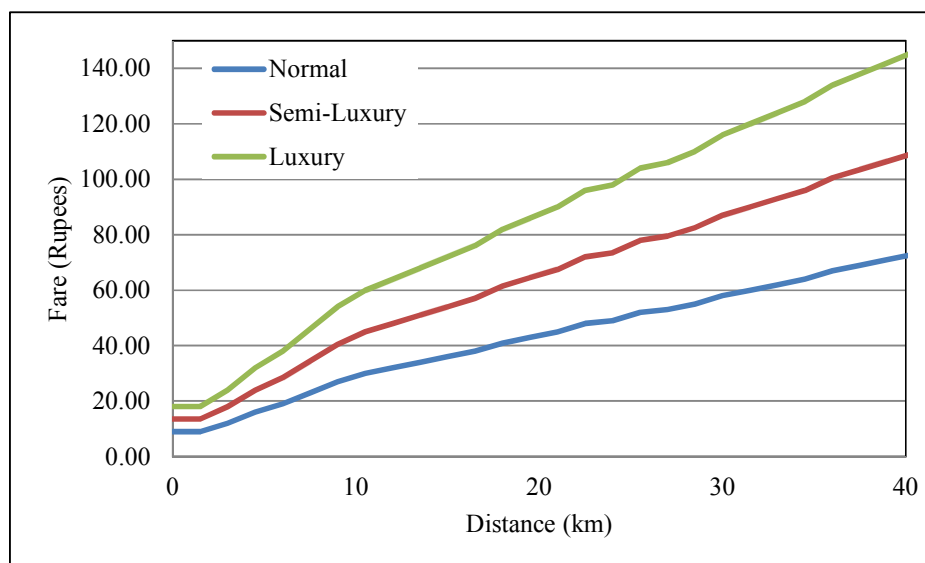
Source: CoMTrans Study Team

Figure 2.4.1 Images of Load Factors

2.5 Bus Fares and Financial Conditions

2.5.1 Bus Fares

There are three classes of buses services. The National Transport Commission defines service standards by class. The luxury class buses are equipped with air-conditioners. The semi-luxury buses are seat-allocated. Fare of luxury buses is two times normal bus fare, and, that of semi-luxury buses is 1.5 times normal bus fare as shown in Figure 2.5.1.



Source: National Transport Commission, Annual Fare Revision of 14 February 2012

Figure 2.5.1 Fares of Buses by Distance by Class in Sri Lanka

Bus fares in Sri Lanka and Asian lower middle income countries are shown in Table 2.5.1. While bus fares of Delhi Transport Corporation are almost equivalent to Sri Lankan fares, those of cities in South-East Asian Countries such as Jakarta and Manila are higher than the Sri Lankan.

Table 2.5.1 Fares of Urban Non-Air Conditioned Buses in the Asian Lower Middle Income Countries

Country	Country GDP per Capita	City	Bus Type	Minimum Fare	10 km	20 km
Sri Lanka	2,835 USD	Colombo	Bus (Normal, Non-Air-Conditioned)	Rs. 9.0	Rs. 27.0	Rs. 38.0
India	1,509 USD	Delhi	Delhi Transport Corporation (Non-Air-Conditioned)	Rs. 11.7 INR 5	Rs. 23.3 INR 10	Rs. 35.0 INR 15
Indonesia	3,495 USD	Jakarta	Minibuses (<i>Mikrolet, Kopaja</i>) for minimum	Rs. 25.8	Rs. 25.8 – 38.7	-

Country	Country GDP per Capita	City	Bus Type	Minimum Fare	10 km	20 km
			and 10km fare (Non-Air-Conditioned)	IDR 2,000	IDR 2,000 - 3,000	
Philippines	2,370 USD	Manila	Ordinary Buses (Non-Air-Conditioned)	Rs. 27.5 PHP 9.0	Rs. 55.8 PHP 18.25	Rs. 112.2 PHP 36.75

Note: Currency Rate was 1 Indonesian Rupiah (IDR) = 0.0129 Sri Lankan Rupee (Rs.), 1 Philippines Peso (PHP) = 3.0553 Rs., 1 Indian Rupee (INR) = 2.3327 Rs. as of 21 April, 2013 (Source: Central Bank of Sri Lanka)

Source: Sri Lanka: National Transport Commission, Annual Fare Revision on 14 February, 2012

Gross Domestic Products per Capita (current USD as of 2011): The World Bank

<http://data.worldbank.org/indicator/NY.GDP.PCAP.CD>

Delhi Metro; Delhi Transport Corporation http://www.delhi.gov.in/wps/wcm/connect/DOIT_DTC/dtc/home
Jakarta; The Study team

Manila; Newspaper Nation

<http://newsinfo.inquirer.net/inquirerheadlines/nation/view/20110113-314129/Metro-Manila-commuters-get-relieve-from-bus-fare-hike> Online. Internet. Accessed on 22 April, 2013

A governmental bus operator, the Sri Lanka Transport Board (SLTB), has a 10% fare commuter's ticket for school children, 30% for students of educational institutions and 65% for adult commuters as a public service obligation. However, there is no discount ticket for private buses except for several schemes assisted by the government such as school bus service, night bus service and rural bus service. As frequency of the SLTB buses is low for some routes, a commuter's ticket holder cannot help waiting for a long time.

Special passes are issued to members of the armed forces and police officers, where the cost of such passes is completely paid to the SLTB by the Police and the respective force. Trips made by these passes should be within 50km from the work place. Also SLTB provide special pass service for employees of media and other government organizations on request made through the ministry of transport. In this case the Organization pays the complete amount to the SLTB. SLTB has also recently launched a pilot project to issue new electronic prepaid cards and has already issued around 500 passes to travel from Mattegoda to Maharagama.

Table 2.5.2 Fare of Monthly Commuter's Ticket of the SLTB

Category of Season Ticket	Fare
School Children	10% of 21-day fare
Students of Other Educational Institutions	30% of 26-day fare
All Other Adults	65% of 26-day fare

Source: Sri Lanka Transport Board

2.5.2 Government Assistance on Bus Transport

(1) School Bus Service - Sisu Seriya

The government commenced a dedicated school transport project, called *Sisu Seriya* school bus, in 2005 with a view to provide safe and affordable public transport for school children and to alleviate traffic congestion during school opening and closing times. This service is dedicated for school children and teachers for security reasons. As of 2011, 220 school bus services were operated in the Western Province mainly for national schools. The government contracted with the SLTB or private bus operators to provide the service with 90% off regular fares for school children with a commuter ticket or 50% off regular fares for those without a commuter ticket. Instead of low fares, the government pays subsidies to the operators. The number of services in the Western Province has increased from 135 to 220 in the last 6 years.

(2) Rural Bus Service – Gemi Seriya

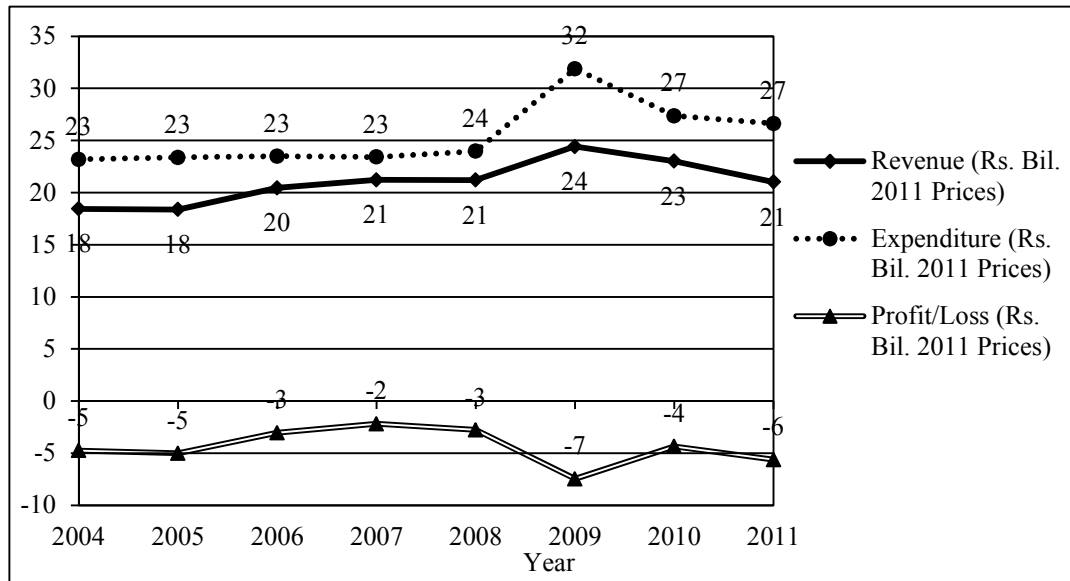
Gemi Seriya service or the rural service operates in the rural areas where more than 70 percent of the Sri Lankan population lives. People in these areas have to come to urbanised areas to fulfil their needs. *Gemi Seriya* rural service provides a reliable and economical passenger transport service for the villagers to reach the city centres for their daily requirements. The SLTB has an operation cost of around 35 to 45 Rupees per kilometre and the income from these routes are much less than that. Hence these are considered as non-economic routes and operation is carried out as a public service.

(3) Night Bus Service – Nisi Seriya

Nisi Seriya Service has been launched by the National Transport Commission to ease the night time transport of passengers so that they can reach their destination without any problem. The objective of this service is to provide reliable and safe transport service in order to travel by last and first bus to small and medium towns including early morning and late evening connections to trains. Currently 42 buses in the Western Province are operated under the program.

2.5.3 Financial Condition of the SLTB

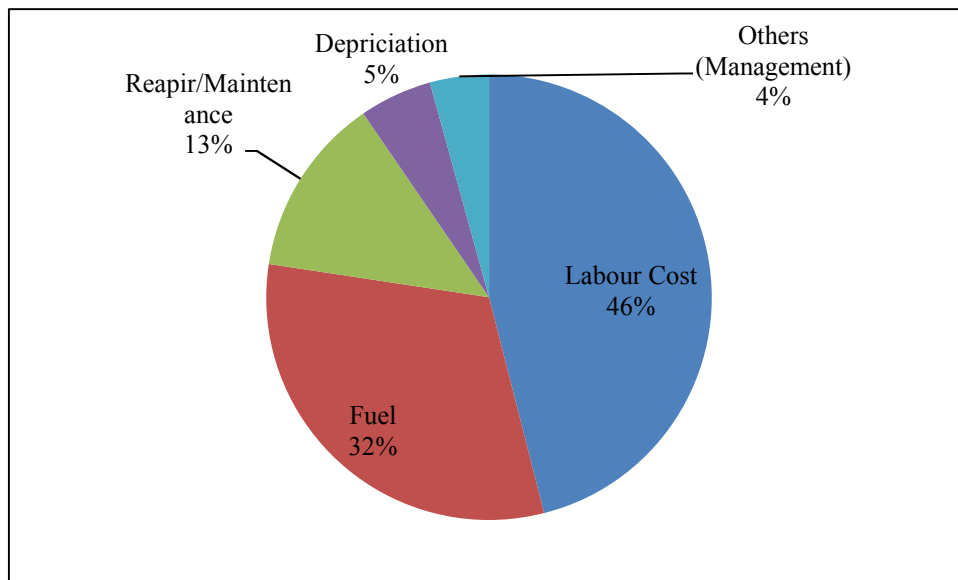
While some statistics mention that the revenue, cost and financial loss of the SLTB are increasing in current prices, those of 2011 prices are almost constant for the last 8 years. The increase in 2009 might be affected by termination of the conflict in Sri Lanka. The revenue covers around 78 per cent of the expenditures of the SLTB, and the annual financial loss was around 6 billion rupees in 2011.



Source: Economic and Social Statistics of Sri Lanka 2006-2012, Central Bank of Sri Lanka, adjusted by the Study team

Figure 2.5.2 Revenue, Expenditures and Profit/Loss of the SLTB (2011 Prices)

In terms of the composition of the expenditures of the SLTB, 46% accounts for labour cost followed by fuel cost (32%), repair/maintenance (13%), depreciation (5%) and others (4%). More than three fourths of the costs are from labour cost and fuel cost.



Source: National Transport Statistics Report 2011, National Transport Commission

Figure 2.5.3 Expenditure Composition of the SLTB (2011)

2.6 Bus Sector Administration and Operators

Bus services in the Western Province are regulated, operated and, implemented by several organizations. The organizations and their functions are summarised in the Table 2.6.1. With route permission issued by the Western Provincial Road Passenger Transport Authority, intra-provincial private buses are typically operated by individuals who own a single bus while there are some owners and companies who own more than one bus. The private operators hire a driver or drive by themselves. With regard to the function of private buses and the SLTB, unprofitable routes are not operated by private buses while the SLTB operates on both profitable and unprofitable routes.

Table 2.6.1 Bus Sector Organizations

Name of Organization	Level of Government	Purpose	Functional Responsibilities
National Transport Commission	Central	Regulator	Advise the Central Government on passenger transport policy and services; Grant permits in specified areas; Ensure service on unprofitable routes; Provide permits for inter-provincial bus services; Provide managerial expertise and assistance to Provincial Transport Authorities
Sri Lanka Transport Board	Central	Operator	Provide public bus services in Sri Lanka; Provide shelters/stations/terminals for SLTB buses; and Provide service for unprofitable routes and times.
Western Province Road Passenger Transport Authority	Province	Regulator	Regulate intra-provincial private buses and routes; Provide annual permits for each bus on a specific route; and Provide shelters/stations/terminals for private buses.
Road Development Authority	Central	Implementer	Provide bus stops along the routes.
Local Authorities	Municipal	Implementer	Provide bus stops along the routes.
Operator Federations	Private	Representation	Represent members' issues to the regulatory authorities; and Represent members during strike action.
Route Associations	Private	Route Oversight	Facilitate bus schedules on routes if a route timetable does not exist.
Private Bus Operators	Private	Operator	Operate both inter-provincial and intra-provincial private bus service.

Source: The Study on Urban Transport Development for the Colombo Metropolitan Region by JICA, 2006; modified by the Study team

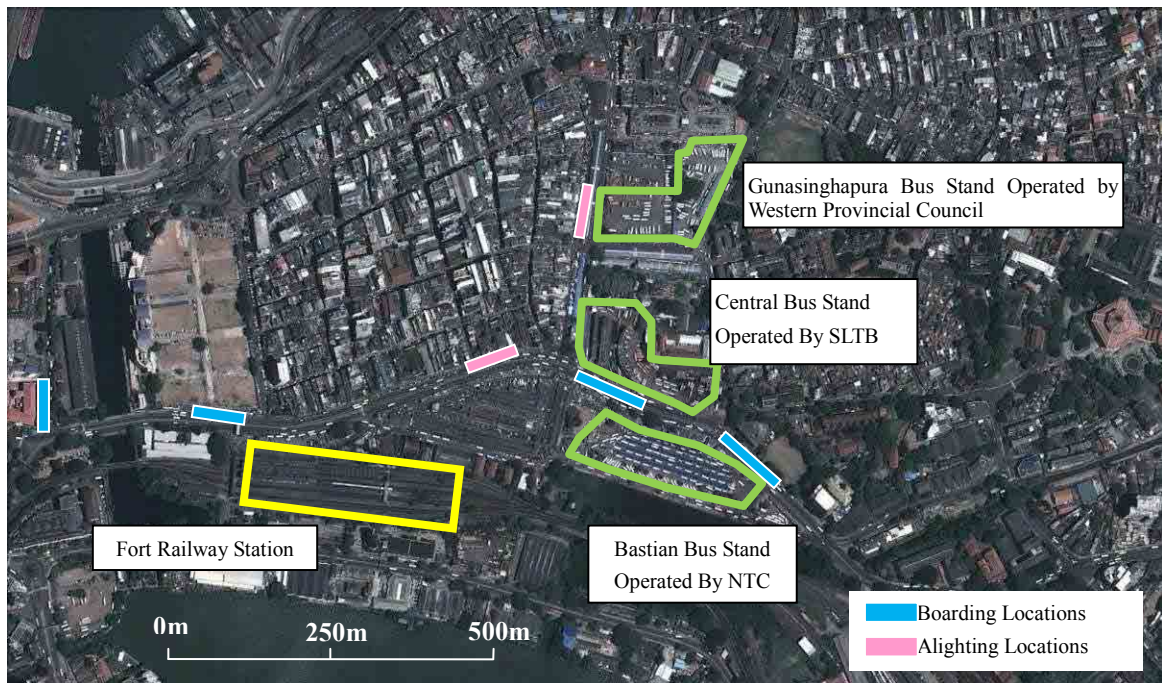
2.7 Bus Terminals and Bus Stops

There are a number of bus routes using bus terminals and bus stops in the Pettah area of Colombo.

Three bus terminals are operated by each bus regulator and operator. Colombo Central Bus Stand is operated by the SLTB only for the SLTB buses. The National Transport Commission (NTC) operates Bastian Bus Stand for private inter-province buses. The Western Provincial Council also operates Gunasinghapura Bus Stand mainly for a bus pool of intra-provincial buses. Passenger boarding and alighting locations of the intra-provincial buses are different by destination and bus route as shown in Figure 2.7.1. Roughly 11,000 buses arrive and depart in the Fort-Pettah area (Inter-province: about 3,300 and Intra-Province: about 7,500). The summary of the surveys at 3 bus terminals are shown in Figure 2.7.2. The number of buses departing from each terminal is roughly 1,000 to 1,200. The loading level of buses when they leave each bus terminal is not high. Especially, at the Gunasinghepura bus terminal, more than 90 percent of buses depart without passengers.

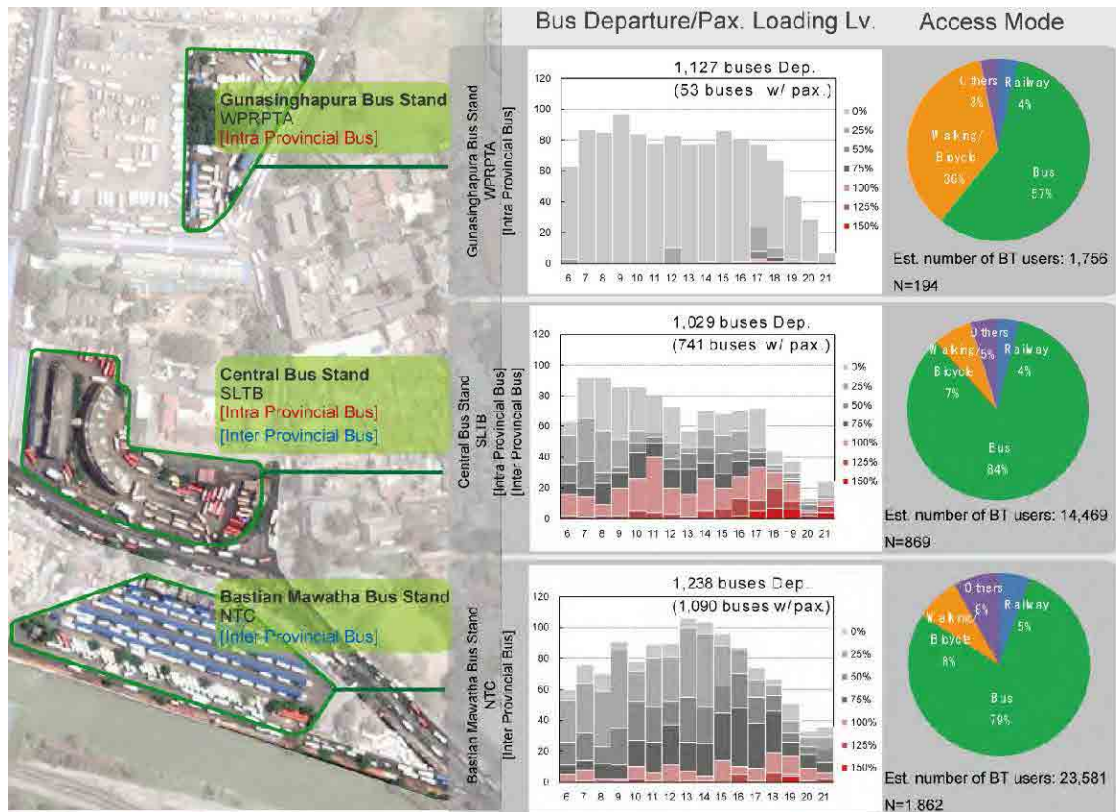
In addition, there are inter-modal transfer passengers at Colombo Fort Railway Station. This segmentation of public transport terminals and Fort railway station makes transfer between buses and the railway as well as between buses difficult. Furthermore, many transfer passengers need to cross arterial roads around this area.

Other major cities in the Western Province also have their own bus terminals. Some bus terminals such as Moratuwa and Gampaha are located adjoining the premises of the railway station square. Some bus terminals do not have enough space or facilities for handling many buses. For instance, Maharagama bus terminal, a key bus terminal where express buses utilizing the Southern Expressway depart from, is utilizing the median of an arterial road.



Source: Ministry of Transport and CoMTrans Study Team

Figure 2.7.1 Bus Terminals and Stops in the Pettah Area



Source: CoMTrans Study Team

Survey: 6:00~22:00, Nov.7 (Thu.), 2013

Figure 2.7.2 Locations and Summary of Surveys at 3 Bus Terminals

Table 2.7.1 The Number of Bus Stops by Facility Type by Corridor

Corridor	Two Bus Bays and Full Shelter	Two Bus Bays and Small Shelter	One Bus Bay and Small Shelter	Only Small Bus Shelter	Only Bus Bay	No Bus Bay, No Bus Shelter	Total
Colombo -Negombo	9		13		24	65	111
Colombo -Gampaha	9	1	4	10	0	88	112
Colombo -Kaduwela	4	1	0	7	7	71	90
Colombo -Kottawa	7	2	4	23	1	51	88
Colombo -Kesbewa	3	0	1	10	3	66	83
Colombo -Moratuwa	6		16		15	52	89
Total	38 7%	4 1%	38 7%	50 9%	50 9%	393 69%	573 100%

Source: Ministry of Transport

Note: Bus stops are counted by direction

CHAPTER 3 Paratransit and Other Road-Based Public Transport

3.1 School Van/Bus

The security of the buses is a concern for parents. Thus, private companies and individuals operate vans in Colombo area called “School Vans” dedicated for school children to go to schools catering to parents’ concerns regarding security. According to the survey conducted by the Road Development Authority (RDA) in 2011, the number of School Vans crossing the boundary of the Colombo Municipal Council (CMC) reached 1,900 vans per day per direction. The approximate cost within the CMC is around 3,000 rupees per month as of April 2013. Another option is sharing a three wheeler on a daily basis with several school children. The price depends on distance, and it is usually higher than school vans. The van service is, however, not regulated. Anyone with a driver’s license and a van can start this business. While there is a guideline on the school vans, it does not have legal binding power. As these vans park on the roadsides in front of schools at school opening and closing times, this is considered as one of the causes of traffic congestion in the morning peak hour and in the afternoon around 1:30-2:30PM.

3.2 Staff Service

Despite the increase in the number of passengers crossing the boundary of the CMC, the number of bus passengers is almost the same as that of 2004 according to the Screen Survey results. Instead, some people started to use other transport services due to the low service level of buses. A “Staff Service”, which is operated by a private company or an individual for transporting commuters from suburban areas to the Colombo city centre, is increasing in popularity, especially for female office workers who prefer secured service. The Staff Service usually utilises vans or minibuses with a capacity range of 8-30 persons. The service collects passengers in suburban areas and drops them off in front of their offices. There is, however, no restriction on the operation of staff service as of April 2013. The passenger characteristics and flow of the Staff Service shall be analysed utilizing the result of the Home Visit Survey.

3.3 Hired Three-Wheelers

3.3.1 Increase of Three Wheelers

Three-wheelers were introduced to Sri Lanka in the 1980’s. The increase in the number of three-wheelers in the Western Province is significant. According to the Department of Motor Traffic, the number of three-wheelers was 25,043 in 1999 and 96,650 in 2004. The number reached 213,045 as of 2011 according to the Divisional Secretariats, Central Bank of Sri Lanka. This is also having a significant impact on urban transport. According to the Screen Line Survey of the Study in 2013 and the traffic count survey in 2004 by the University of Moratuwa, the number of three wheelers crossing the boundary of the CMC increased from 65,000 in 2004 to 129,000* per day for both directions in 2013.

*Note: the 2013 Screen Line survey covers some semi-arterial roads which were not covered by the 2004 survey conducted by the University of Moratuwa. For comparison purposes, these locations are excluded from this number. The total number of three-wheelers crossing CMC boundary in 2013 including the abovementioned survey locations was 148,000 per day for both directions.

The increase in the number of three-wheelers can be explained by the needs of customers in a niche market of short distance trips and the ease to start a business due to loose restrictions and inexpensive initial cost. Different from other developing countries in South East Asia, minibus or paratransit services with passenger capacity of 8-20 are limited in Colombo except for the Staff Service and the School Van. Since large buses are not able to enter narrow streets, the three-wheeler caters for service between the house and railway stations or bus stops. There are three-wheeler stops or parking at the junctions of major corridors and minor streets in suburban areas. The three-wheeler driver stands at the junction and serves as a feeder service to villages on the minor streets. The driver is usually familiar with the residents of the villages. Three-wheeler driving is also one of the sources of employment for entry-level workers. The drivers can start their business with only a driver's license and a three-wheeler vehicle. They can also rent their three-wheeler. According to the driver survey of the Study on Urban Transport Development for the Colombo Metropolitan Region by JICA, 2006, earnings of three-wheeler drivers are significantly higher than the poverty line.

3.3.2 Safety Issue of Three Wheelers

However, disadvantages of the three-wheelers are not negligible. Safety is one of the major aspects to be considered for the three wheelers. Since there is virtually no restriction on three-wheeler taxi business, drivers tend to ignore traffic rules such as illegal turns to pick up customers and allow passengers to disembark from the right side of roads. However, they are not the main vehicles that caused fatal accidents according to the statistics of the traffic police. The three-wheeler was responsible for approximately 9% of fatal traffic accidents in Sri Lanka in 2011. This number is smaller than 20%, the share of three-wheelers in the total number of vehicles. Illegal turns, parking and movement of the three-wheelers affects traffic flow and reduces the capacity of the roads.

3.3.3 No Transparent Fare System

Another issue related to the three-wheelers is that it is not a customer-friendly mode of transport. While the number of three-wheeler taxis with meters is increasing, some three-wheelers are not equipped with meters and customers have to negotiate with drivers. The fare decision process is also not transparent. There are several three-wheeler operators' associations in the region. As the market is unregulated, the fare policy is also dependent on each association.

3.3.4 Regulatory Framework on Three Wheelers

This sector is less regulated and is market-driven. While an initial registration and an annual renewal of the three-wheeler license are required, there is no restriction on the number of three wheelers. The Western Province tried to regulate it several times. In 2002, the Western Province gazetted the Three-Wheeler Service Statute, No. 6 (2002). The statute established a three-wheeler service bureau within the Western Province Road and Passenger Transport Authority, to introduce passenger transport service permits, and to set the maximum limit of the number of three wheelers. However, it did not come into effect due to strong opposition by some operators and drivers. Although the Western Province amended the same Statute to enable the Provincial government to apply the policy in 2008, this also did not come into effect because of opposition from some operators and politicians. The Private Transport Service Ministry is now working with the associations of three-wheeler operators to work out a policy framework for the three-wheeler industry.

3.4 Taxis

3.4.1 Taxi Company

The taxi operation in Sri Lanka is not regulated or controlled by any law at present. There are many taxi operators. Some large operators operate as companies which own several hundreds of vehicles, and some medium scale operators operate with 10 to 30 vehicles whereas small operators are mostly individuals who own a few vehicles (less than 10) to run a taxi service.

The service area of many operators covers the whole island, while some are restricted to the Western Province. In addition, there are taxi services specifically operating for certain trips such as airport pickup and drop offs.

There are a variety of vehicles used for taxi service including, small cars (hatchback cars), large cars (sedans), and vans. It should be noted that Tata Nano cars are widely used as taxis in the country.

3.4.2 Taxi Operation

According to the interview survey of taxi operators by the Study Team in 2013; many taxi operators, around 60%, have opted to employ the drivers on a temporary basis; around 30% on contract basis and the remaining 10% on a permanent basis. In many instances the remuneration for the taxi drivers is paid as a commission. The commission percentages can vary from 10% to 20%. The taxi drivers can use the normal driver's licenses for taxi operation. Approximately 30% of the taxis in operation are owned by the companies or taxi operators and 70% of the vehicles are either leased or rented by the companies. The average of operation kilometres per taxi varies from 3,000 to 6,000 kilometres per month.

Currently, there is virtually no regulation specifically on taxi service such as a taxi service operation license. Some operators register their company at the registrar of companies under the registration of business names act (section 4(1) of the companies act No:7 of 2007). Taxi operators pay commercial assessment tax to the local authority they belong to similar to any other business.

Due to its relative novelty and scattered nature of operators, the taxi industry does not have any taxi related associations such as taxi industry associations, taxi driver associations or trade unions.

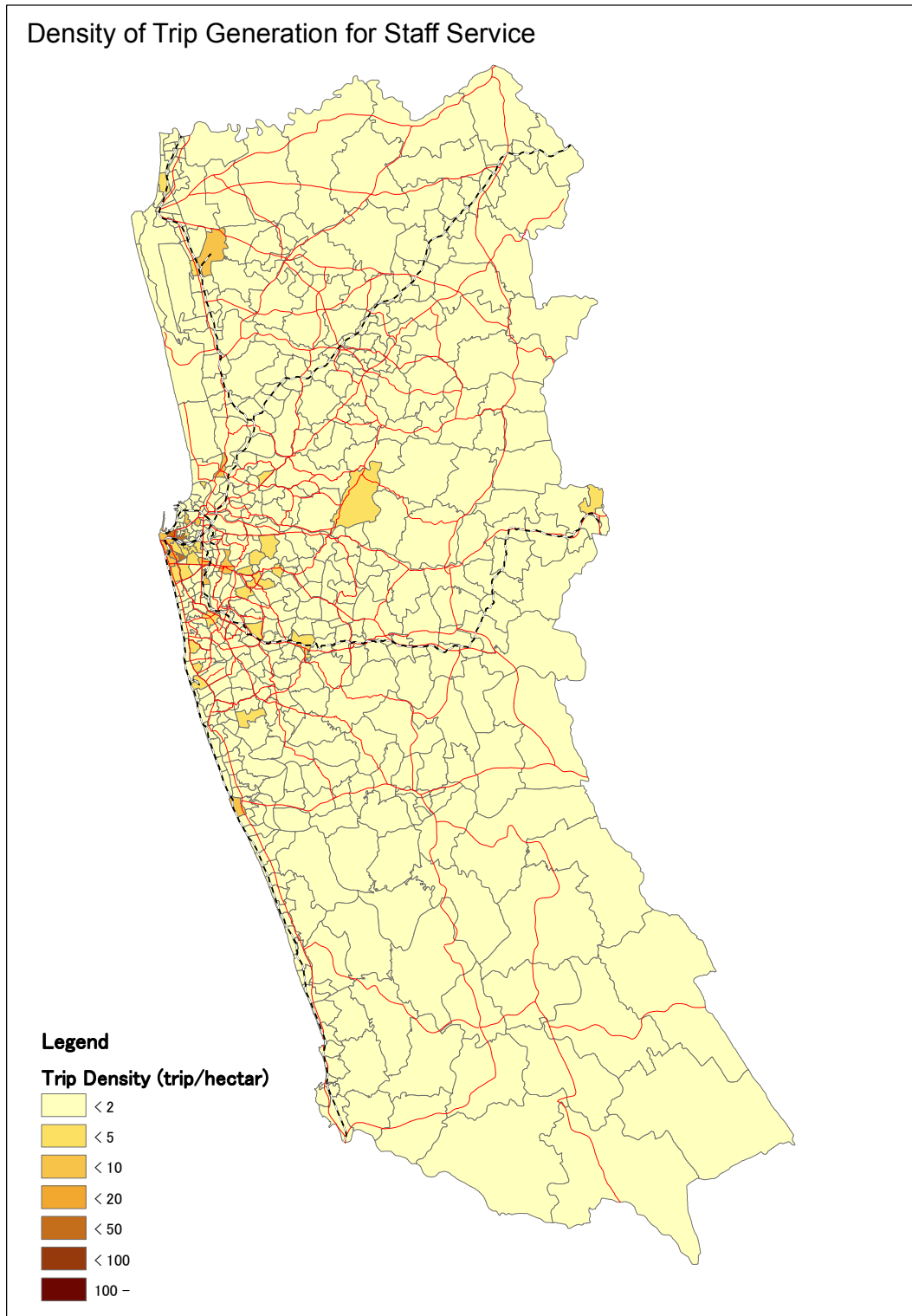
3.4.3 Taxi Fare

The taxi fare policy is decided by each operator and there is no governing law to regulate it. There are several methods which are used to set the taxi fares considering the service type. Many operators charge a fixed amount for the first 1 to 3 kilometres and a per kilometre rate thereafter. Some operators use a package system, which allows the users to travel up to a fixed number of kilometres within a certain number of hours for a predefined fee. In special cases such as airport drop offs and pickups, a fixed fee is charged per trip. These fares change from operator to operator according to the vehicle type and air-conditioned or non-air-conditioned characteristics and comfort level of the vehicle.

3.5 Trip Generation of Paratransit and Other Road-Based Public Transport

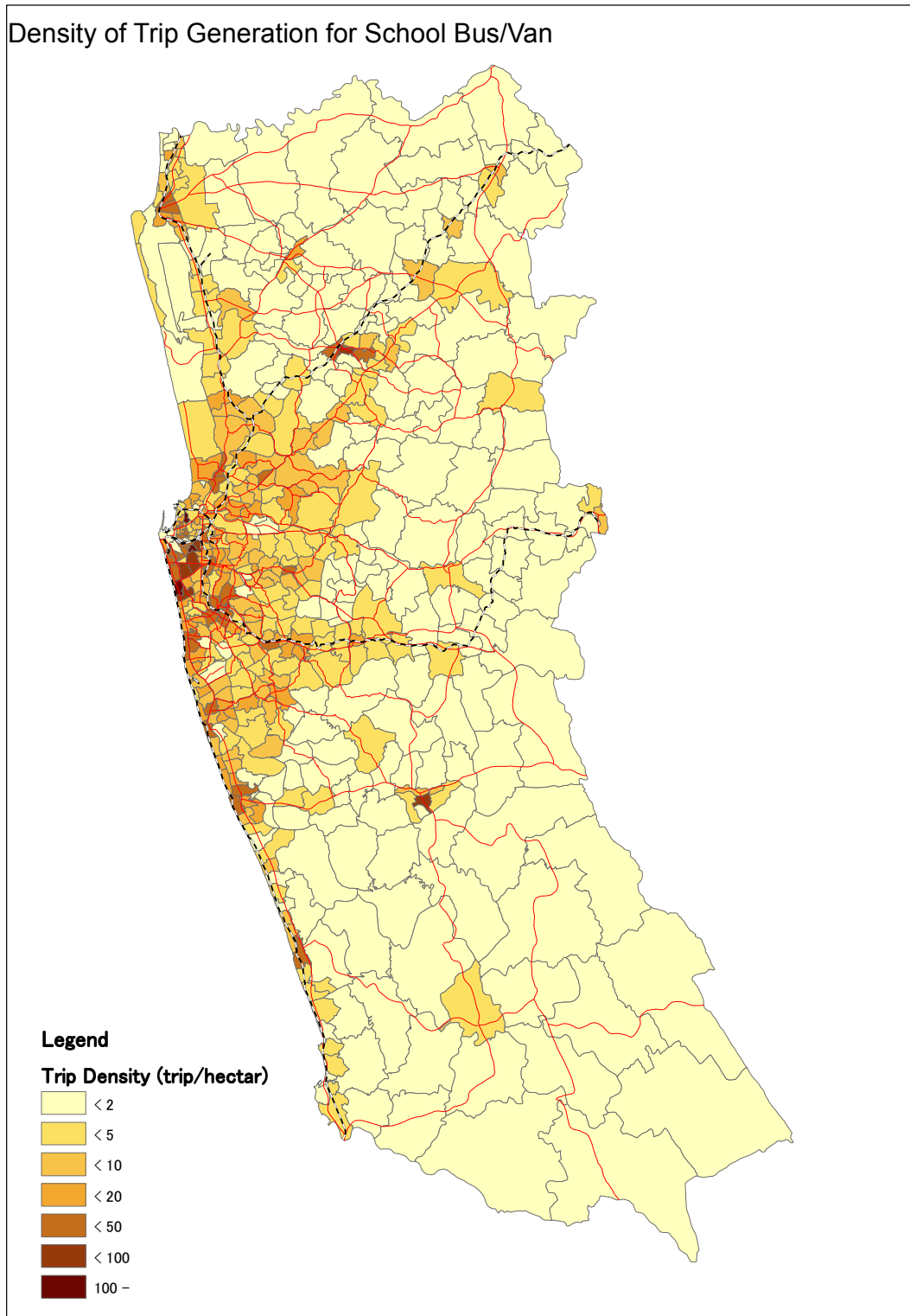
Figure 3.5.1 to Figure 3.5.4 show the density of trip generation for the paratransit and other road-based public transport.

As shown in Figure 3.5.2 and Figure 3.5.4, the density of trip generation for hired three wheelers and school vans is much higher than that of staff services and employee transports. The hired three wheelers concentrate in and around CMC. On the other hand, the school vans have sprawled not only around CMC but to CMA.



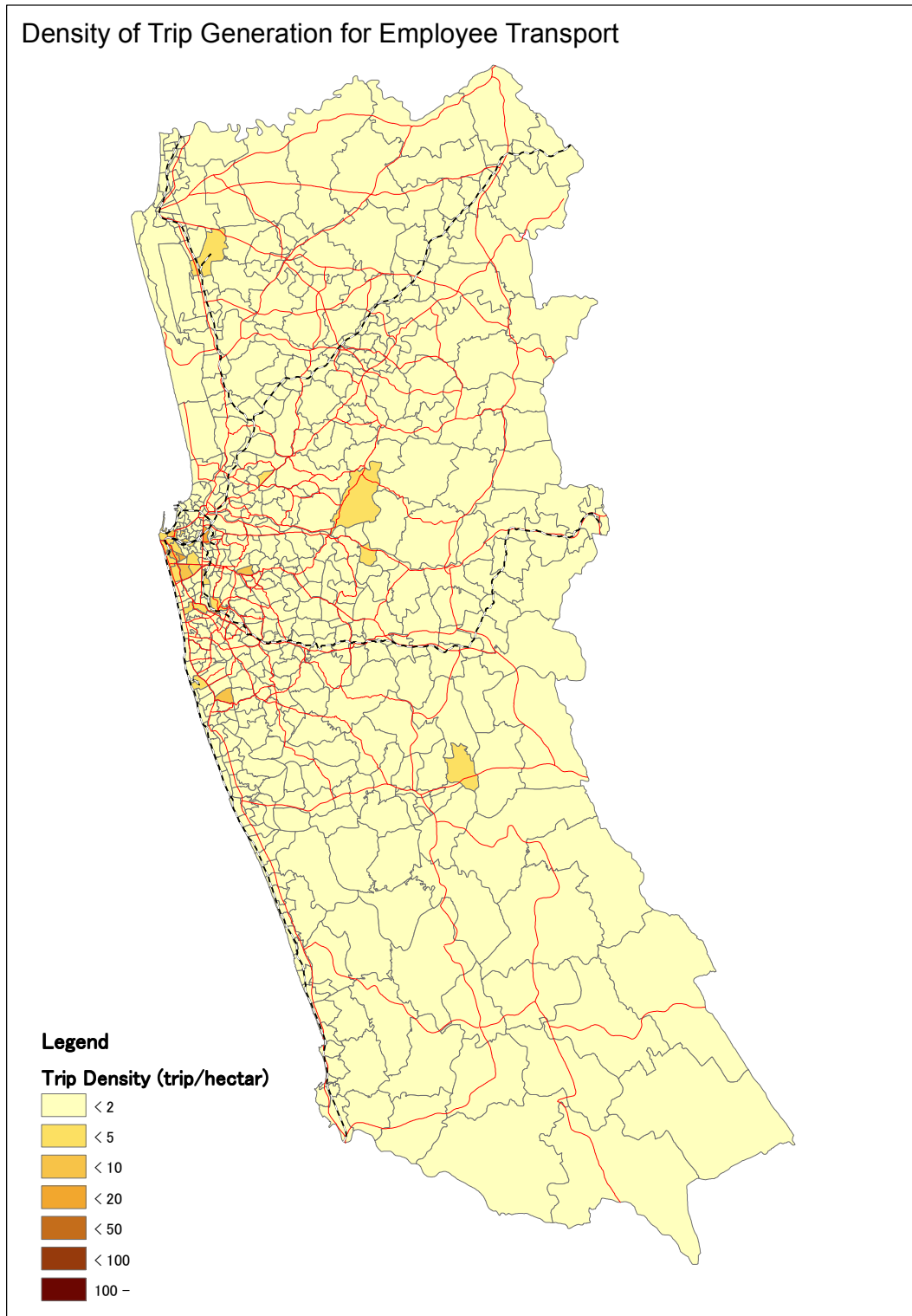
Source: CoMTrans Study Team

Figure 3.5.1 Density of Trip Generation for Staff Service



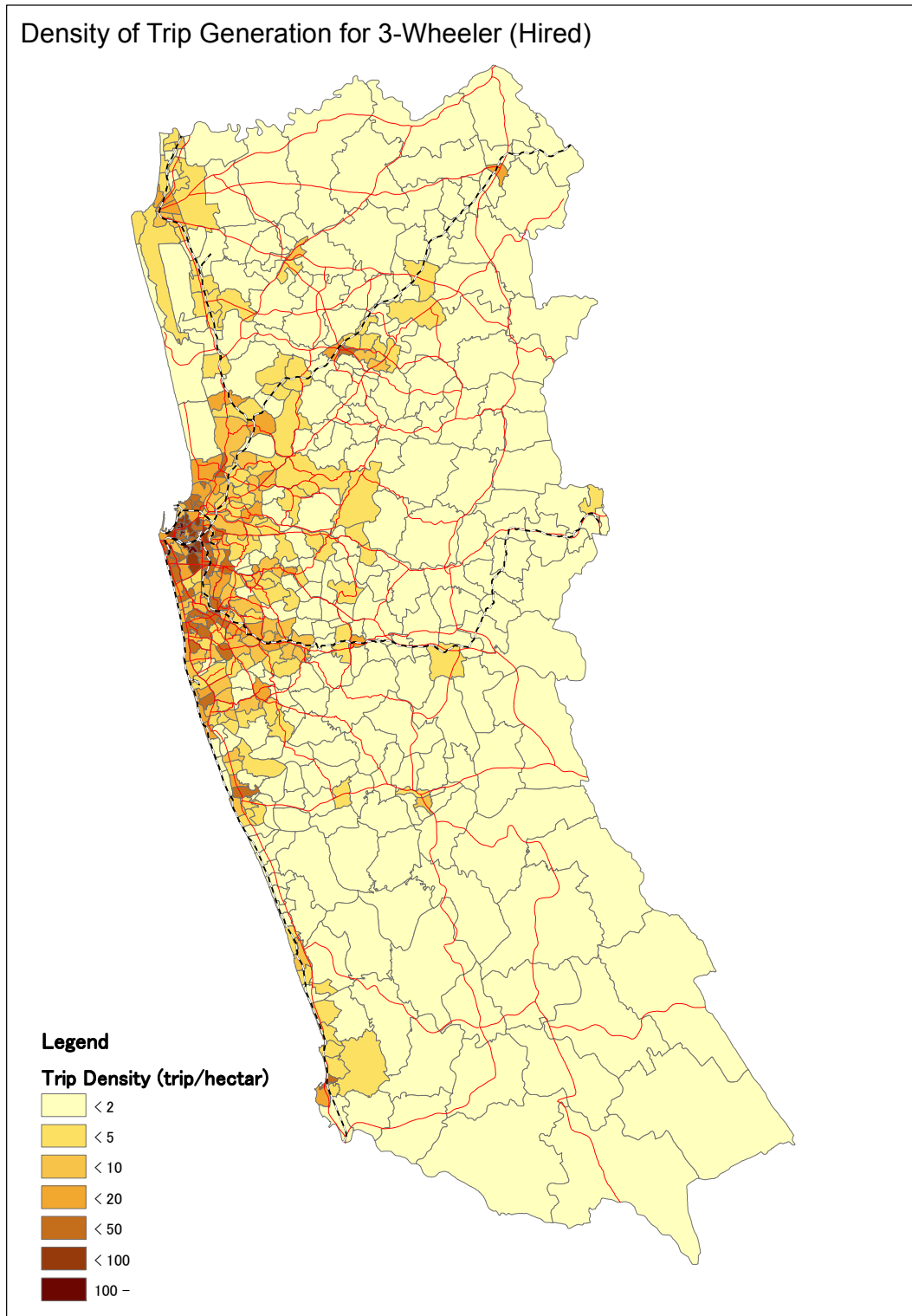
Source: CoMTrans Study Team

Figure 3.5.2 Density of Trip Generation for School Bus/Van



Source: CoMTrans Study Team

Figure 3.5.3 Density of Trip Generation for Employee Transport



Source: CoMTrans Study Team

Figure 3.5.4 Density of Trip Generation for Three Wheeler (Hired)