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Japan International Cooperation Agency

The Democratic Socialist Republic of Sri Lanka
Ministry of Plan Implementation, Ethnic Affairs and National Integration

**The Master Plan Study
For
Southern Area Development
In
The Democratic Socialist Republic of Sri Lanka**

Final Report

**Sector Report 4
Transportation, Telecommunications and Energy**

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February 1997

**Nippon Koei Co., Ltd.
International Development Center of Japan
System Science Consultants Inc.**

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List of Reports

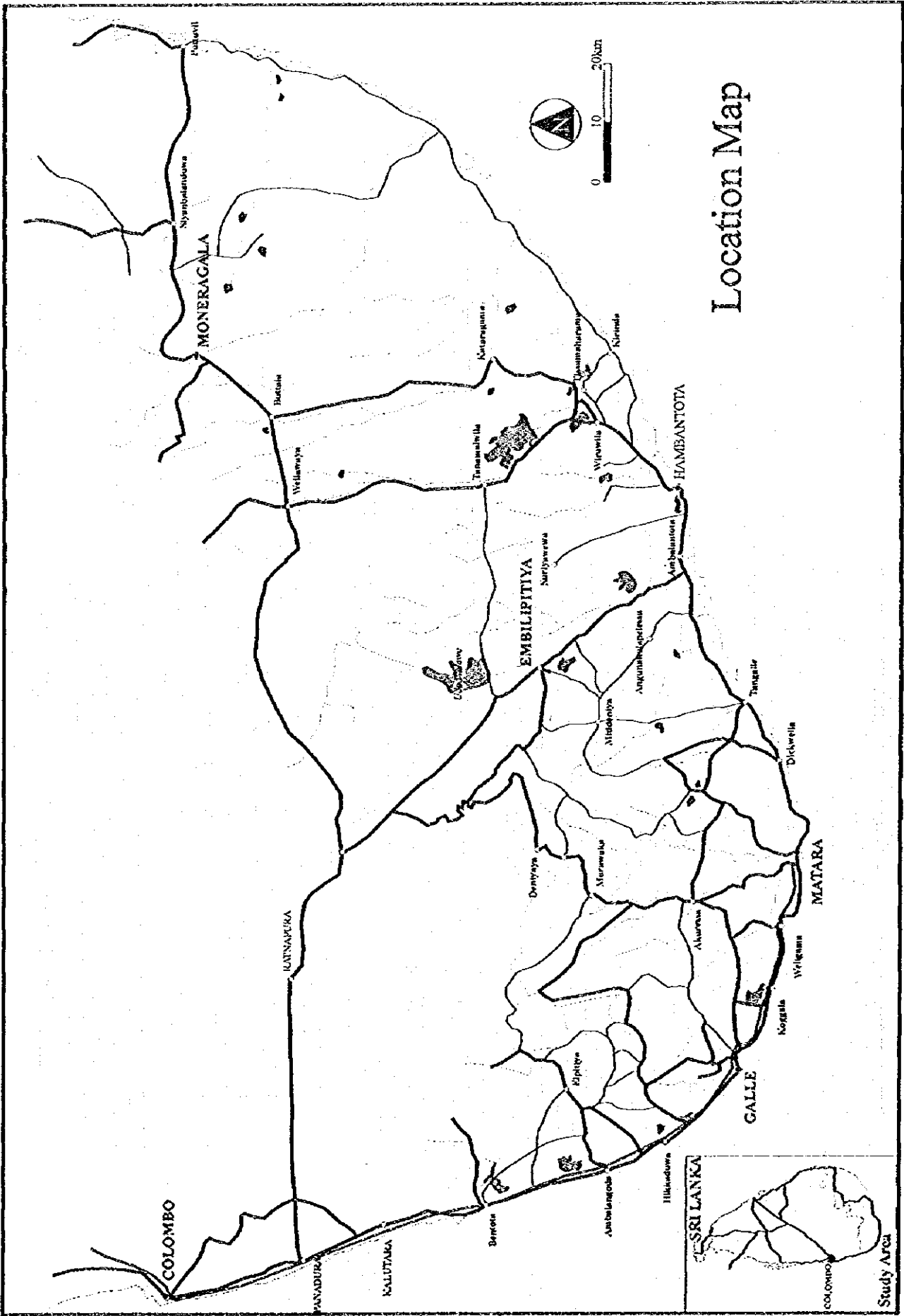
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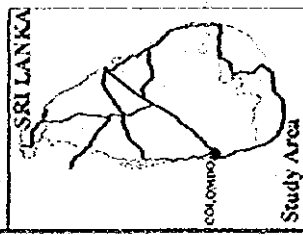
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Location Map



Study Area

**SECTOR REPORT 4 TRANSPORT, TELECOMMUNICATIONS AND
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ABBREVIATIONS

PART 1 TRANSPORTATION

ADB	Asian Development Bank
BII	Bureau of Infrastructure Investment
BOO	Build, Operate and Own
BOT	Build, Operate and Transfer
CSC	Ceylon Shipping Corporation
ECTC	Electronic Centralized Traffic Central
EIA	Environmental Impact Assessment
GDP	Gross Domestic Product
IBRD	International Bank for Reconstruction and Development
IMC-CPT	Inter-Ministerial Committee for Coordination and Planning of Transport
IMF	International Monetary Fund
IOA	International Development Association
IROP	Integrated Rural Development Program
JICA	Japan International Cooperation Agency
MIHS	Ministry of Health, Highways and Social Services
MMTA	Ministry of Media, Tourism and Aviation
MOF	Ministry of Finance
MTEWA	Ministry of Transport, Environment and Women's Affairs
NTC	National Transport Commission
OECE	Overseas Economic Cooperation Fund
PIP	Public Investment Program
RCRDC	Road Construction and Development Company
RDA	Road Development Authority
RTB	Regional Transport Board
SEDZ	South-East Dry Zone
SIOI	Secretariat for Infrastructure Development and Investment
SLCTB	Sri Lanka Central Transport Board
SLPA	Sri Lanka Ports Authority
SLR	Sri Lanka Railways
TSPC	
UNDP	United Nations Development Program

PART 2 TELECOMMUNICATIONS

ADB	Asian Development Line
BOT	Build, Operate and Transfer
CATV	Cable Television
DEL	Direct Exchange Line

DWLLS	Digital Wireless Local Loop System
EDCF	Economic Development Cooperation Fund
GDP	Gross Domestic Product
ICE	Incentive Computer Education
IDA	International Development Association
IRDP	Integrated Rural Development Program
ISC	International Switching Center
ISSN	Integrated Services Social Network
ITU	International Telecommunication Union
JICA	Japan International Cooperation Agency
NSC	National Switching Center
OECE	Overseas Economic Cooperation Fund
POTS	Plain Ordinary Telephone Service
SLT	Sri Lanka Telecom Corporation
SLTA	Sri Lanka Telecommunications Authority
SLTD	Sri Lanka Telecommunications Department
SSC	Secondary Switching Center
TSC	Tertiary Switching Center
WWW	World Wide Web

PART 3 ENERGY

ADB	Asian Development Bank
AIDAB	Australian International Development Assistance Bureau
BOO	Build, Operate and Own
BOT	Build, Operate and Transfer
CEB	Ceylon Electricity Board
CECB	Central Engineering Consultancy Bureau
CGCL	Colombo Gas Company Limited
CPC	Ceylon Petroleum Corporation
ECF	Energy Conservation Fund
IRDP	Integrated Rural Development Program
JICA	Japan International Cooperation Agency
LA	Local Authority
LECO	Lanka Electricity Company
MIPE	Ministry of Irrigation, Power and Energy
MOF	Ministry of Finance
NHDA	National Housing Development Authority
OECE	Overseas Economic Cooperation Fund
PPI	Private Power Investor

Abbreviation of Measures

Length

mm	=	millimeter
m	=	meter
km	=	kilometer

Area

ha	=	hectare
km ²	=	square kilometer

Volume

l	=	lit = liter
m ³	=	cubic meter
MCM	=	Mm ³ = million cubic meter

Weight

mg	=	milligram
g	=	gram
kg	=	kilogram
t	=	ton = MT = metric ton

Energy

kcal	=	kilocaloric
TOE	=	tons of oil equivalent
kW	=	kilowatt
MW	=	megawatt
kWh	=	kilowatt-hour
Gwh	=	gigawatt-hour
MVA	=	megawolt-ampere
MMBFOE	=	million barrels of fuel oil equivalent

Others

%	=	percent
°C	=	degree Celsius
cap	=	capita
mil.	=	million
no.	=	number

Transportation

SECTOR REPORT 4 TRANSPORT, TELECOMMUNICATIONS AND ENERGY

PART 1 TRANSPORTATION

CHAPTER 1 EXISTING CONDITIONS

1.1 Transport Policies and Related Organizations

1.1.1 Transport policies

(1) Overall transport policy

The transport network in Sri Lanka developed under the British administration primarily for the purpose of transporting plantation products to the port of Colombo. With the reasonably developed transport network already at the time of independence, maintenance and rehabilitation of roads and railways had been relatively neglected by the Government until 1979. The Government expenditure on the transport sector accounted for only 2% of total expenditure during this early period.

Since then, the Government has been placing increasingly strong emphasis on roles of the transport sector in the Nation's socio-economic development. At the same time, the Government has been deregulating the sector to encourage private sector participation. Since 1979, private bus operators have been allowed to compete with public services.

The Public Investment Program (PIP) for 1984-88 emphasized for the first time that the Government should set up medium- and long-term transport sector policies to meet the future transport demand. The Inter-Ministerial Committee for Coordination and Planning of Transport (IMC-CPT) was established to formulate transport policies. In 1988, the Government introduced a public enterprise reform program as part of the structural adjustment program guided by IMF and the World Bank. With support from the International Development Association (IDA), 83 state-owned enterprises were targeted for privatization including those of the transport sector.

The current government policy for infrastructure development is to promote private-public partnerships through BOO (build, operate and own) and BOT (build, operate and transfer) schemes. To facilitate this policy, the Secretariat for Infrastructure Development and

Investment (SIDI) was established within the Ministry of Policy Planning and Implementation. SIDI has subsequently been reorganized as the Bureau of Infrastructure Investment (BII) under the Board of Investment.

(2) Transportation planning and budgeting

Transport sector planning and programming in Sri Lanka have been carried out in a hierarchical structure with four institutional levels: the Ministry of Finance (MOF), IMC-PCT chaired by the Secretary of the Ministry of Transport, Environment and Women's Affairs, ministries in charge of highway, road, sea, air and urban transport, and implementing agencies responsible for different modes of transport. For budgeting, project proposals are first submitted to MOF by line ministries, reviewed by the Transport Section of the Department of National Planning, MOF, and approved by the Committee of Secretaries under the Cabinet. Cabinet papers are prepared by line ministries for approved projects, and the PIP is prepared. The budget for capital expenditures is discussed and approved by the Parliament.

A recent PIP points out that the transport sector is faced with two issues—huge capital investment and private participation—for transport infrastructure development. The current Public Investment Program (1995-1999) stated that goals and objectives of the transport sector are the following:

- 1) Provision of an efficient transport system capable of meeting the demands arising from accelerated economic growth;
- 2) Increasing the operational efficiency of all modes by raising productivity through the application of modern technology and rational utilization of resources;
- 3) Enhancing the complementary nature of each mode in relation to other modes;
- 4) Developing a system of movement of goods and people that would minimize environmental damage; and
- 5) Improving access, through transport facilities for rural areas, and thereby integrating the urban and the rural areas.

(3) Environmental consideration

Environmental law

The National Environment Act has established the formal procedure of environmental impact assessment (EIA). Following the scoping based on preliminary information, those projects subject to EIA are selected. The Central Environment Agency has been established to oversee and monitor the work done by executing agencies.

Social environment

Construction of new transport facilities may cause adverse effects on the social environment. Especially, resettlement and compensation may become unavoidable for land acquisition needed for new transport facilities. The Government has to set up clear rules for compensation and relocation so that new projects could be implemented without delay. Other possible social problems include those due to changing production and trading patterns, breaking of cultural and social affinities, penetration of immoral activities from urban areas, and disruption of family ties due to long commuting or attending school in urban areas.

1.1.2 Transport administration

(1) Road and road transport

Road and road transport administration consists of three levels of government bodies: Central Government, Provincial Council, and Pradeshiya Sabha. Within the Central Government, the Ministry of Health, Highways and Social Services (MHHS) is the administrative body for highways, and the Ministry of Transport, Environment and Women's Affairs (MTEWA) is in charge of road transport and railways.

The Road Development Authority (RDA), established in 1981, took over the Department of Highways in 1986 to become responsible for planning, investment programming and engineering for all roads in the Country. In 1990, however, RDA's responsibilities were reduced to include only the national highway network (class A and B roads), while other roads were devolved to Provincial Councils and municipal governments. The Provincial Road Development Authority implements maintenance and rehabilitation of class C and D roads within the province. Pradeshiya Sabhas have responsibilities to maintain class E roads. Budget for maintenance and rehabilitation comes from the Government through MHHS as well as from own funds of the provincial and municipal governments.

Until 1979, passenger transport was a monopoly of the Sri Lanka Central Transport Board (SLCTB) and nine Regional Transport Boards (RTBs) established in 1979. Private operations have grown rapidly since the deregulation in 1979. The National Transport Commission (NTC) was established in 1991 to grant permits to inter-provincial private buses, while Provincial Councils issue permits for private bus routes within respective provinces. Private bus companies now account for 75% of the total fleet, 40% of bus capacity and 50% of total passenger kilometers. Because of increasing competition with private companies, financial difficulties of SLCTB and RTBs became apparent soon. The Government therefore started to privatize SLCTB and RTBs and their depots became 93 "peoplized" companies during 1991-92. SLCTB has changed its function from bus operations to coordination of bus operations among the "peoplized" companies and to allocation of subsidies and buses. The Government provides subsidies for uneconomical routes and school bus services through NTC.

(2) Railways

The Ministry of Transport, Environment, and Women's Affairs is in charge of railways. The Sri Lanka Railways (SLR) is a department under the Ministry and employs about 17,500 people. SLR has suffered from poor financial performance due to competition from road transport. Consequently, SLR's revenue has decreased while costs increased. The Government passed the Sri Lanka Railways Authority Act of 1993, which intends to transform it into a more business-oriented organization.

(3) Ports and shipping

The Ministry of Shipping, Ports, Rehabilitation and Reconstruction is responsible for shipping and ports operation in Sri Lanka. The Sri Lanka Ports Authority (SLPA), which was established in 1979, manages and operates all major ports in the Country.

The Ceylon Shipping Corporation (CSC) was established in 1971 with initial capital contributed by the Government to operate sea transport services for passengers and goods. It became an autonomous government enterprise in 1990. CSC has serious financial problems as a result of fleet expansion and devaluation of the rupee. CSC's container handling decreased from 84,000 TEUs in 1989 to 52,000 TEUs in 1993.

(4) Airports

The Ministry of Media, Tourism and Aviation (MMTA) is responsible for operation and management of airports in Sri Lanka. The Airport and Aviation Services Company operates the Katunayake international airport as well as domestic airports.

The Air Lanka, which was established in 1979 as a state-owned company, is the only air liner providing international air services in Sri Lanka. It was listed for the privatization program, but final decisions have not been made. In 1994, private domestic airlines started operation by connecting domestic airports, but services have been suspended since September 1995 due to security reasons.

(5) Regulations on the transport sector

The Commissioner of Motor Vehicle is authorized to inspect all motor vehicles. Limits are specified on gross vehicle weights for certain types of vehicles. Motor vehicles must be registered and the owner of a vehicle should renew the vehicle license annually with third party insurance. Vehicles for carrying passengers should have a permit. A driving license is required when a person drives a vehicle on any class of highway.

There are laws regulating the operation of buses, either publicly or privately owned. The Government passed the Private Omnibus Services Act No. 44 that allows private buses to compete with public bus companies.

The Railway Ordinance No. 9 of 1902 is the only legislation on railway operation. The Minister of Transport has the right to make rules, set fares and charges. The General Manager of SLR has the right to reduce rates. The Government passed the Sri Lanka Railways Authority Act of 1993, but the Act has not been implemented.

(6) Investment

The share of public investment into the transport sector has increased from 6% of the 1981-86 PIP to 22% of the 1995-99 PIP (Table 1.1). PIP allocation to highways has been increasing over the last 15 years. Highways' share vis-à-vis other transport modes was only 19.9% in the 1981-86 PIP but increased to 49.5% in the 1995-99 PIP. Railways' share has been constant at about 31% of transport budget. Allocation to public bus and air transport has been reduced dramatically due to privatization. The share of ports and

shipping has fluctuated between 7.0% and 19.3% reflecting the construction work of the Colombo port. Allocation to air transport peaked in the 1985-89 PIP when the Katunayake international airport was expanded and modernized. Although the budget amount allocated to the transport sector appears large, it does not cover all needs. Budgetary cuts are common practice.

Table 1.1 Public Investment Program

Transport Mode	(Rs. million)			
	1981-86	1985-89	1990-94	1995-99
Highways	1,069	4,965	13,376	30,511
Railways	1,683	5,191	9,827	19,166
SLCTB/Public Bus	1,402	54	10	18
Ports and Shipping	696	1,076	2,250	11,892
Air Transport	520	4,004	766	20
Total	5,369	15,290	26,230	61,606
Total PIP	89,579	155,284	200,890	283,055
Transport as % of Total PIP	6.0	9.8	13.1	21.8

Table 1.2 summarizes revenues the Government collected from the transport sector.

Table 1.2 Central Government Revenue from Transportation Sector

	(Rs. million)				
	1980	1985	1990	1991	1992
Motor Vehicle:					
Licence taxes	55.5	149.3	261.8	19.9	22.8
Motor car transfer taxes	10.5	9.8	12.7	8.9	8.9
Registration and driving licence fees	25.5	95.7	134.4	105.4	142.0
Import duties on vehicles, aircraft and parts, vessels and certain associated transport equipment	371.0	734.6	1,553.0	1,865.1	2,032.9
Corporate Income Tax	118.0	410.2	456.8	349.5	403.7
Receipts of trading enterprises:					
Railways	358.9	464.5	679.5	808.4	885.0
Ports	1.7	0.6	—	—	—
Interest, profits and dividends	9.6	17.1	25.1	25.4	24.8
Sales and charges:					
Air navigation fees	0.2	78.4	3.1	0.5	1.9
Hire of Sri Lanka Air Force aircraft	0.5	0.8	14.5	4.9	4.8
Other current transfers-Railways	54.2	2.5	0.6	0.8	0.7
Repayments of loans and advances	4.0	8.6	—	—	—
Total Revenue	1,009.6	1,972.1	3,141.5	3,188.8	3,527.5

Source : Central Bank of Sri Lanka

The amount of revenues collected from the transport sector was Rs. 1.0 billion in 1980 and increased to Rs. 3.5 billion in 1992. Table 1.2, however, omits two major revenue sources: license fees collected by local governments and fuel tax transfer to the Government from the Ceylon Petroleum Corporation. If these are included, total revenue amounted to Rs. 7 billion in 1994, more than total public spending on the transport sector.

1.2 Existing Transport Facilities and Services

Existing transport networks in Sri Lanka are shown in Figure 1.1.

1.2.1 Roads

(1) Highway network

Compared to other Asian countries, Sri Lanka has a relatively denser and better-developed road network (Table 1.3). In Sri Lanka, all national highways are paved and 30% of total road length is paved. However, only 10% of paved roads are in good condition, a figure lower than that of India or Pakistan.

Table 1.3 Road Condition in Selected Asian Countries

Country	Road Density (km per million persons 1988)	Road in good condition (% of paved road)
Sri Lanka	536	10
India	893	20
Pakistan	229	18
Bangladesh	59	15
Nepal	139	40
Thailand	513	50
Indonesia	160	30
Philippines	242	31
Japan	6,007	85 more

Source : World Development Report, 1994.

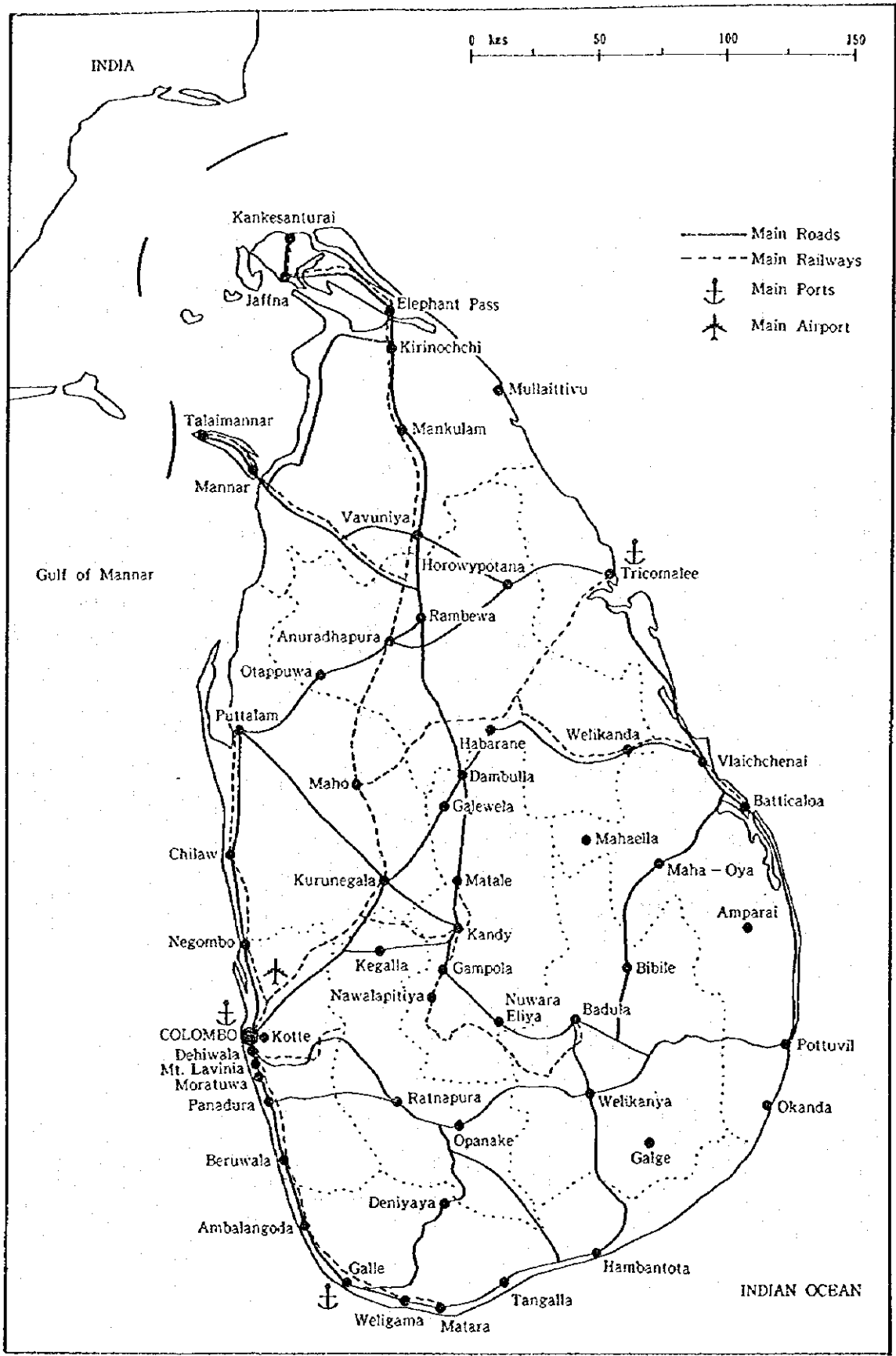


Figure 1.1 Transport Network in Sri Lanka

The road network includes 10,440 km of national roads, 15,300 km of provincial roads, over 52,000 km of local roads and 16,300 km of specialized agency's road (Table 1.4). Sri Lanka's provincial and local road networks are dense, accounting for 72% of total road length.

Table 1.4 Road Network of Sri Lanka

Road Classifications (Jurisdiction)	(Unit: km)		
	Paved	Unpaved	Total
National Roads (RDA)	10,442.42	-	10,442.42
Provincial Roads (Provincial Councils)	10,794.77	4,506.73	15,301.50
Local Roads (Local Governments)	7,010.24	45,233.53	52,243.77
Specialized Agency's Roads (Specialized Agencies)	2,505.14	13,860.60	16,365.74
Grand Total	30,752.57	63,600.86	94,353.43

Source: RDA

Roads can be categorized into six groups for administrative and functional purposes:

- 1) Trunk roads (class A) connecting provincial capitals and major ports (responsibility of RDA);
- 2) Main roads (class B) connecting towns which are district administrative centers (responsibility of RDA);
- 3) Important links with trunk roads (class C) (responsibility of Provincial Council);
- 4) Minor roads (class D) (responsibility of Provincial Council);
- 5) Rural roads (class E) (responsibility of Pradeshiya Sabha); and
- 6) Special agency's roads (Sri Lanka Plantation Corporation, Irrigation Department, Forest Department, and Mahaweli Authority).

Budget for the roads in the first five categories mostly comes through the Ministry of Health, Highways and Social Services. The last category of roads come under responsibility of respective ministries and agencies.

(2) Road network of the region

A summary of road length in Southern Area is shown in Table 1.5. Density of national highways (class A and B) is 0.28 km per km² in Galle and Matara districts and 0.15 km per

km² in Hambantota district, which are favorably compared with the national average of 0.16 km per km². Density of national and provincial roads (class A-D) is also higher than the national average of 0.40 km per km² in Galle and Matara, but lower in other districts. Road density in the region as a whole is therefore reasonable in comparison with the national average, yet the figures are much lower for Moneragala and Ampara districts.

Table 1.5 Road Length and Density in the Region

Province	District	Road Length (km)							Road Density (km/km ²)	
		Class A	Class B	Class C	Class D	Class E	Other Roads	Total	National Highway (Class A, B)	National and Provincial road (Class A-D)
Southern	Galle	97	365	323	326	53	1,404	1,164	0.28	0.70
	Matara	141	222	259	235		989	857	0.28	0.67
	Hambantota	115	271	248	241		977	875	0.15	0.34
Uva	Moneragala	204	138	159	142	35		678	0.08	0.15
Sabaragamuwa	Ratnapura	272	393	286	49			1,000	0.20	0.31
North-Eastern	Ampara	307	226	173	152			858	0.12	0.19
Total		1,136	1,616	1,418	1,145	88	3,369	5,433	0.15	0.29

Source: Study Team

(3) Road width

Width of major national roads in the region is shown in Table 1.6. Road width data above indicate that major national highways in the region cannot even secure two lanes in some sections. In addition to this problem, a number of bridges on the national and provincial roads are too narrow for traffic and structurally inadequate to sustain heavy axle load. Consequently, these sections and bridges have turned out to be bottlenecks for traffic flows.

Table 1.6 Road Width of National Highways in the Region

Route No.	Length (km)	Single Lane	Intermediate	2-Lane	Intermediate	4-Lane	Total (km)
		4<m	Lane 4~5.5m	5.5~7m	Lane 7~12m	>12m	
A2	317.8		108.61	26.15	160.10	22.93	317.79
A4	430.6		223.65	183.99	12.87	10.06	430.57
A17	143.9	56.64	87.29				143.93
A18	87.69			87.29			87.29
A22	34.12	34.12					34.12
A24	20.11		12.50	8.75			21.25

Source: RDA

(4) Accident rate

Road safety has been a serious problem in Sri Lanka. The number of accidents increased from 24,000 in 1985 to 37,500 in 1992. Sri Lanka's accident rate per vehicle is extremely high compared with that of developed countries in spite of accident prevention programs (Table 1.7).

Table 1.7 International Comparison of Traffic Accident Rate

Country	Vehicle per 1,000 *	Death per 1 million	Death per 100,000 vehicle
Sri Lanka	19.9	10.6	460.3
USA	746.7	154.5	20.6
UK	430.7	75.5	17.5
Japan	507.9	107.0	20.9

* Sri Lanka 1990

USA, UK 1992

Japan 1993

Source : White Paper on Traffic Safety

There are three main reasons for the high accident rate. One reason is physically inappropriate roads. Lack of road safety devices such as signs, marking and curve mirrors is the most serious weakness. In addition to that, physical features of roads are also inadequate, as characterized by narrow carriage ways, poor surface and lack of drainage. Second is lack of driver discipline, which is the prime reason for the high accident rate. It is essential that the Government provide proper safety education and training programs to the drivers. The third reason is mixed traffic of various road users. Typically, there are such various road users on the same road as motorized vehicles, pedestrians, animal carts,

bicycles and three-wheel vehicles running at different speed. Low-speed road users tend to block or disturb vehicle operation.

(5) Traffic demand

A traffic count survey has been carried out by RDA for class A and B roads. Collected data include details on vehicle classification at some survey points. No traffic count data are available for class C, D and E roads. Traffic volume on the national roads in the region recorded less than 2,000 vehicles per day (vpd) except for some sections (Table 1.8). Traffic volume on other roads was even lower than 2,000 vpd. Heavy vehicles accounted for approximately 30% of the total volume.

Table 1.8 Traffic Count Data in the Region

Route No.	Location (km)	Year of Count	Vehicle Composition (%)							Average Daily Traffic		Growth Rate	
			Car	Goods Vehicle			Bus	Medium Bus	Motor Cycle	Year	ADT	%	Period
				Light	Medium	Heavy							
A2	74	1992	22.20	25.50	14.50	0.40	14.00	10.70	12.70	1993	4,620		
	100	1991	23.80	17.50	8.50	7.60	10.50	12.50	19.60	1991	4,070		
	109	1994	19.10	19.80	20.10	0.60	14.50	9.90	16.00	1996	6,240	7.9%	1988-96
	141	1990	17.40	12.20	6.90	11.50	7.20	15.60	29.20	1996	4,615	10.4%	1988-96
	177	1992	12.50	22.40	17.80	0.00	17.40	9.20	20.70	1996	3,975	9.1%	1988-96
	225	1993	15.00	14.70	15.00	0.80	10.80	13.20	30.50	1994	2,940		
	257	1988	26.00	10.20	15.00	0.00	10.20	17.00	21.60	1996	1,606	4.4%	1988-96
	284	1994	13.40	18.20	19.60	0.00	15.00	7.20	26.60	1994	960		
306	1994	12.90	22.40	23.00	0.50	14.40	4.60	22.20	1994	890	6.6%	1988-94	
A4	225	1994	10.20	20.60	20.20	0.40	16.50	4.00	28.10	1993	1,050	7.7%	1988-93
	232	1995	15.37	11.68	26.83	0.51	16.67	3.70	25.24	1993	1,050		
	286	1995	13.32	12.45	34.06	0.00	11.79	1.09	27.29	1995	1,075		
A17	15	1989	12.00	9.90	11.30	0.00	8.50	15.90	42.40	1993	1,240		
	22	1991	14.10	13.90	14.40	0.00	8.50	14.30	34.80	1996	960	-5.1%	1991-96
	42	1990	13.40	13.00	15.80	0.00	3.40	9.20	45.20	1992	1,060	5.8%	1990-92
	85	1990	16.00	26.60	4.30	0.00	6.40	11.70	35.00	1996	225	18.8%	1990-96
A18	12	1994	19.60	11.40	23.10	0.50	18.50	11.20	15.60	1994	1,932		
	30	1989	18.80	18.40	27.80	0.60	8.00	13.10	13.30	1995	1,513		
	66	1988	24.30	12.30	12.40	0.50	4.90	21.20	24.00	1996	1,025	1.4%	1988-96
A24	5	1991	15.20	12.60	9.70	0.10	8.00	7.60	46.80	1991	1,830		

Source: RDA

(6) Road maintenance and rehabilitation

National highways

Road maintenance work is carried out through RDA's Maintenance, Management and Construction, and Contract Management divisions. The Maintenance, Management and Construction division is responsible for maintenance work using local funds while the Contract Management division carries out foreign funded projects.

Maintenance consists of routine and recurrent maintenance, periodic maintenance (sand sealing), and emergency maintenance (flood damaged area). RDA has been applying a standard maintenance program, which comprises mainly patching, sand sealing, and edge correction, for national highways. Total expenditure on these maintenance works was Rs. 478 million in 1993. Although the Government concentrates on maintenance and rehabilitation of the existing road network, only 1,000 km of the national roads, 10% of total length, has been rehabilitated.

Provincial and rural roads

Maintenance and rehabilitation budget for Provincial Councils comes from both central government transfer and their own budget. Maintenance of provincial and rural roads consists of patching and sand sealing. This, however, is not enough to prevent further deterioration of provincial roads because of insufficient budget allocation and technical staff. The Central Government plans to implement intensive maintenance programs soon. Although class E roads, under Pradeshiya Sabha, have extensive networks in rural areas, both maintenance budget and personnel are inadequate to keep them in good condition. Consequently, condition of class C, D and E roads has become very poor and urgent repairs are required before they further deteriorate into an impassable condition. According to the 1995-1999 PIP, the central government transfers for maintenance to the Provincial Councils reached Rs. 90 million in 1995 and will increase to Rs. 600 million over the next four years.

Integrated Rural Development Programs (IRDPs) covering the region have also implemented small programs for rural road repairs. The programs, however, are confined to respective IRDPs' administrative boundaries.

(7) Road construction industry

The Road Construction and Development Company (RC&DC), established in 1987, is a parastatal organization owned by RDA and the most significant company in the road

construction industry of Sri Lanka. RC&DC has been carrying out maintenance and improvement of national highways. Other local contractors have steadily improved their ability in recent years and some are now capable enough to compete with RC&DC. However, they are generally still constrained by insufficient technical capacity and financial resources, while RC&DC enjoys a healthy portfolio of projects.

1.2.2 Road transport

(1) Vehicle registration

Registered motor vehicles have increased rapidly since 1989 (Table 1.9). Their total number has almost doubled between 1985 and 1994. It is estimated that there were 1,162,313 registered vehicles in Sri Lanka in 1994, 52% of which were motorcycles. Commercial vehicles accounted for 22% of total. Fast growing categories are motorcycles and private buses, while the number of public buses has declined since 1992.

(2) Road passenger transport

Bus transport is the major mode of passenger transport in Sri Lanka, accounting for some 85% of passenger travels. Private buses have increased very rapidly since 1979 and they now account for 75% of total bus fleet and 40% of bus capacity. Present bus services in Sri Lanka fail to meet public needs, however; frequency is low and services are scarce during off-peak hours or on uneconomical routes.

The primary mode of transport in Southern Area is also bus services. Their general situation in the region is similar to that of the Country. Private buses have also become dominant there replacing public buses. There are 1,560 private and public bus companies and 2,432 buses in the region (Table 1.10). Almost 99% of bus companies are private and more than 60% of total fleet is privately owned. Private bus operations are very small-scale, however; all the companies are actually owner-cum-driver companies operating only one bus.

Table 1.9 Total Registered Vehicles

Class of Vehicles	1985	1990	1992	1993	1994	Estimated Growth	
						Rate (%) 1985-94	1990-94
Motor Cars	148,587	173,519	189,477	197,300	210,013		
Dual Propose Vehicles	1,121	19,622	38,909	47,882	57,680		
Sub-total (Cars)	149,708	193,141	228,386	245,182	267,693	7.53%	8.50%
Motor-cycles	161,373	391,732	516,205	570,136	606,924	18.01%	11.57%
Private Buses	348	738	1,435	1,730	2,206		
Hiring Buses	21,445	25,366	30,800	32,619	35,963		
S.L.T.B.	16,516	13,708	13,927	13,343	13,343		
Sub-total (Buses)	38,309	39,812	46,162	47,692	51,512	3.77%	6.65%
Lorry Proper	92,730	99,810	106,762	111,329	116,284		
Lorry Tractor	1,253	1,271	1,281	1,281	1,301		
Lorry Trailers	3,674	3,666	3,810	3,904	4,014		
Lorry Others	464	590	821	1,022	1,117		
Sub-total (Trucks)	98,121	105,337	112,674	117,536	122,716	2.84%	3.89%
Ambulances & Hearses	738	718	918	922	955		
Land Vehicles		137	147	151	151		
Tractors	54,856	66,407	75,010	80,729	86,705		
Trailers	20,618	22,659	23,545	24,473	25,657		
Sub-total (Others)	76,212	89,921	99,620	106,275	113,468	5.10%	5.99%
Total	523,723	819,943	1,003,047	1,086,821	1,162,313	10.48%	9.12%

Source : Department of Motor Vehicles

Table 1.10 Number of Bus Companies and Buses

Province	District	Bus Company			Bus		
		Public	Private	Total	Public	Private	Total
Southern	Galle	4	433	437	168	433	601
	Matara	3	333	336	144	333	477
	Hambantota	2	196	198	74	196	270
Uva	Moneragala	4	35	39	170	35	205
Sabaragamuwa	Ratnapura	5	427	432	245	427	672
North-Eastern	Ampara	3	115	118	92	115	207
Total		21	1,539	1,560	893	1,539	2,432

Source: National Transport Commission

Financial performance of the public bus companies is shown in Table 1.11. Unlike private companies which may operate only on profitable routes and earn marginal profits as long as they continue their operations, public bus companies are obliged to serve those routes with few passengers as well. About 60% of public bus operations are on subsidized routes. Table 1.11 shows that the public bus companies are run at a loss despite route subsidy they receive from the Government.

Table 1.11 Financial Performance of Public Bus Companies
(Rs. '000)

Province	District	Financial Performance			
		Revenue		Cost (b)	Net Profit (a)-(b)
		Total (a)	Route Subsidy		
Southern	Galle	149,972	11,007	193,340	-43,368
	Matara	136,702	5,409	158,474	-21,772
	Hambantota	66,649	12,094	81,168	-14,519
Uva	Moneragala	157,381	8,290	184,770	-27,389
Sabaragamuwa	Ratnapura	201,201	12,094	224,657	-23,456
North-Eastern	Ampara	67,123	4,106	75,158	-8,035

Source: National Transport Commission

(3) Road freight transport

Nationally, two-third of trucks are owned by private operators. The rest of fleet is owned by the Government, public agencies and cooperative societies. Private owners, organizing a truck association, determine tariffs collectively. There is no restriction to entry into this industry. Data are not available on the composition of the national truck fleet. It is estimated that less than 10% of the fleet is of multi-axle.

1.2.3 Railways

(1) Railway network

The Sri Lanka Railways (SLR) has a total track length comprising 1,500 km of broad gauge lines and a 59-km section of narrow gauge track on the Kelani Valley Line (Table 1.12).

Table 1.12 Sri Lanka Railways Network

Code	Line	Station Name	Length (km)
BROAD GAUGE			
01.	Main Line	Colombo Fort to Badulla	290
02.	Matale Line	Peradeniya Junction to Matale	33
03.	Puttalam Line	Ragama to Poriyanagawillu	143
04.	Northern Line	Polgahawela to Kankasanturai	339
05.	Talaimannar Line	Madawachchiya to Talaimannar pier	106
06.	Batticaloa Line	Maho to Batticaloa	212
07.	Trincomalee Line	Galoya Junction to Trincomalee	71
08.	Coast Line	Maradana to Matara	161
09.	Kelani Valley Line	Maradana to Homagama	24
	Mihintale Line	Mihintale Junction to Mihintale	14
	Sub-Total		1,393
DUAL GAUGE			
09.	Kelani Vallay Line	Colombo Fort to Kosgama	50
	(Narrow Gauge)	Kosgama to Avissawella	9
	Grand-Total		1,443

Source : SLR

Railway density in Sri Lanka is 2.2 km/100 km². Railway passenger traffic reached a peak of 4.1 billion passenger-km in 1979 and had since declined to 2,800 million passenger-km in 1993. SLR carried 18% of total passengers in 1979 but only 6% in 1993. Freight traffic also decreased from 22% to 8% of total during 1979 and 1993. SLR carried about 155 million ton-km of freight in 1994. Principal commodities handled by SLR are cement, petroleum products and flour. These three commodities accounted for 85% of the total ton-km.

In 1993, SLR's operating losses amounted to Rs. 1,000 million and the government budget transfer, consisting of recurrent and capital expenditure, to SLR reached Rs. 4,800 million (Table 1.13). SLR in cooperation with TSPC prepared a *Draft Business Plan* in 1991, which proposed reorganization of SLR, reduction of personnel, improvement of management, and rationalization of operation. The plan was an attempt to transform SLR into a more business-oriented organization. Subsequently, the Sri Lanka Railways Authority Act was passed in 1993, which intends to change SLR, a government department, into an autonomous organization. However, these proposals have not been implemented.

Table 1.13 Financial Performance of SLR

Year	(Rs. million)					Revenue/ Expenditure
	Expenditure		Capital		Revenue	
	Total	Recurrent	(CME 3-101)	(General)	Total	
1978	602.1	300.5		301.6	239.5	0.40
1979	988.0	420.3		567.7	312.1	0.32
1980	1,037.5	534.9		502.6	358.8	0.35
1981	1,104.7	644.8		459.9	408.9	0.37
1982	1,129.1	751.7		377.4	427.4	0.38
1983	1,252.0	887.2		364.8	447.9	0.36
1984	1,517.0	1,125.0		392.0	523.0	0.34
1985	1,476.5	529.9	479.9	466.7	488.1	0.33
1986	1,828.1	771.3	274.5	782.4	500.8	0.27
1987	1,596.4	834.9	298.3	463.2	506.4	0.32
1988	1,680.3	863.0	349.8	467.5	468.6	0.28
1989	2,314.0	883.1	358.4	1,072.5	462.4	0.20
1990	2,744.5	1,102.7	376.8	1,265.1	686.3	0.25
1991	4,391.8	1,199.8	636.9	2,595.1	816.6	0.19
1992	3,236.6	1,238.5	479.9	1,518.2	894.0	0.28
1993	4,422.0	1,236.9	550.0	2,635.1	833.3	0.19

Source : SLR

(2) Coast line

Rail transport in Southern Area is limited to only one line, the Coast line, operating between Colombo and Matara. It has a total length of 161 km from Maradana Station in Colombo to Matara. The first 27.5 km of the line is double track and the rest is single track. There are 58 stations and 291 structures on the Coast line. Although it is not so long—only 11% of total length of SLR network—the Coast line is the second most important line in Sri Lanka. It carries 26% of total passenger-km (Table 1.14).

Freight traffic on the Coast line is negligible, accounting for less than 1% of total tonnage. The number of trains running on the line is about 31 trains per line section per day, more than double the average of 16 for the entire network. Operation speed on the line is about 48 km/h on an average. The line generated Rs. 177.8 million of revenue in 1994 but spent Rs. 430.4 million in the same year.

Table 1.14 Distribution of Passenger Traffic by Line
SLR Passenger-Kilometer 1991 (Originating)

Line	Passenger-kilometer (million)			%
	Ordinary Tickets	Seasonal Tickets	Total	
Colombo Fort	399.7	20.9	420.9	15.8
Maradana	53.4	3.9	57.3	2.1
Main Line	482.0	446.9	928.9	35.0
Matale Line	75.0	21.0	96.0	3.6
Puttalam Line	34.0	76.4	110.4	4.1
Northern Line	154.8	15.8	170.6	6.4
Talaimannar Line	-	-	-	-
Batticaloa Line	55.3	0.05	55.4	2.0
Trincomalee Line	21.9	-	21.9	0.8
Coast Line	279.3	408.1	687.4	25.9
Kelani Valley Line	4.5	8.9	13.4	0.5
Workmen and Headquarters Seasonal Tickets	-	91.0	91.0	3.4
Total	1,560.4	1,093.1	2,653.5	100.0

Source: SLR

1.2.4 Ports and shipping

(1) Major ports

The port of Colombo handles about 90% of total tonnage in the Country, 50% of which is container transshipment (Table 1.15). Total handled tonnage was over 16.5 million in 1994. In 1993 the Colombo port was ranked at 31st worldwide as a container terminal. The Government intends to increase the port's container handling capacity to make it the "hub" port in South Asia.

Trincomalee is a good natural harbor located on the east coast. Volume handled in 1994 was 1.65 million tons and 52% of the volume was accounted for by imported wheat.

(2) Galle port

The port of Galle is the oldest port in the Country. The existing port, together with a fishing harbor on an adjacent site, was completed in 1971 after six years of construction. The facility of the port consists of two 130-meter berths, a 450-meter quay wall, a 15-meter

width of apron and a warehouse of about 6,500 square meters. There is one tug boat in service. Its berths are summarized in Table 1.16.

Handling has increased from 18,000 tons in 1982 to 303,700 tons in 1994 because of the import of clinker. Major cargoes handled by the Galle port are flour and clinker. These commodities accounted for 83% of discharged cargo tonnage. Of the total handled cargoes, however, 98% is discharge, and only less than 2% of the volume loaded.

Table 1.15 Total Handling by Port

	('000 ton, 1994)			
	Colombo	Trincomalee	Galle	Total
Tonnage Discharged				
Containerized	5,625.0	-	-	5,625.0
Break Bulk	1,959.6	6.2	76.0	2,041.8
Dry Bulk	603.2	1,119.5	211.8	1,934.5
Liquid Bulk	2,326.7	30.0	8.5	2,365.2
Total	10,514.5	1,155.7	206.3	11,966.5
Tonnage Loaded				
Containerized	5,116.6	-	-	5,116.6
Break Bulk	271.9	293.7	6.7	572.3
Dry Bulk	-	201.5	-	201.5
Liquid Bulk	240.3	-	-	240.3
Total	5,628.8	495.2	6.7	6,130.7
Total Tonnage Handled	16,143.3	1,650.9	303.0	18,097.2

Source: SLPA

Table 1.16 Berths of Galle Port

(as of 3 December 1994)						
Berth No.	Southwest Monsoon		Northeast Monsoon		Apron Width (m)	
	Length (m)	Draught (m)	Length (m)	Draught (m)		
Closenburg Jetty	1	130.0	7.3	130.0	7.9	7.2
	2	130.0	7.3	130.0	7.9	7.2

Source : SLPA

1.2.5 Airports

(1) International airport

The Katunayake international airport, located 32 km north of Colombo, is the only international airport in Sri Lanka. The airport is located close to the Katunayake Export Processing Zone, where factories produce light manufacturing goods suitable for air transport. The airport was expanded during 1989-1990 and now has a 3,350 x 45 m runway, new radio navigational aid, a new passenger terminal with a 42,000-ton capacity cargo building and a 5,000-m² floor area maintenance complex. The airport can handle all types of aircrafts. About 2 million passengers and 70,000 tons of air freight yearly go through the airport.

Access to the airport is currently served by the Colombo-Negombo road and by rail. The Government has decided to build an express highway from Colombo to Katunayake.

The total number of passengers reached 1.8 million in 1994 (Table 1.17). Air cargo handling has also increased since 1986. A 12% increase is estimated for 1995.

Table 1.17 Passenger Arrivals and Departures

Year	Katunayake		Talaimannar		Other Ports		Total	
	Arr	Dep	Arr	Dep	Arr	Dep	Arr	Dep
1975	125,988	139,554	35,220	21,542	1,005	1,313	166,725	174,370
1980	364,018	388,270	81,524	79,020	3,309	1,966	448,851	469,256
1985	543,397	585,213	-	-	1,927	1,735	545,324	586,948
1990	603,595	581,698	-	-	3,493	1,756	607,088	583,454
1991	646,869	712,073	-	-	2,706	2,366	649,575	714,439
1992	764,453	836,310	-	-	2,794	2,919	767,247	839,229
1993	813,535	823,841	-	-	3,551	3,134	817,086	826,975
1994	893,387	892,778	-	-	4,120	4,392	897,507	897,170

Source: Ceylon Tourist Board

Several domestic airlines began operations in 1994. The biggest is Lion Air, which accounted for 90% of passenger transport. However, since late 1995 domestic air services have been suspended due to security reasons. Statistics on Lion Air's operations are shown in Table 1.18.

Table 1.18 Domestic Airline Statistics

		Distance (km)	No. of Passengers	Fare (Oneway)
Colombo/Ratmalana	Battigalooa	250	115	2,400 (48)
	Araparal	200	137	2,400 (48)
	Trincomalee	370	304	2,000 (40)
	Koggala	100	62	1,500 (30)
	Weerawila	200	524	2,000 (40)
	Sigiriya	165	57	1,500 (30)
	Vavuniya	275	22	2,000 (40)
	Anuradhapura	220	129	1,500 (30)
Anuradhapura	Trincomalee	140	6	1,500 (30)
Trincomalee	Sigiriya	195	1	1,500 (30)
	Batticaloa	120	22	2,000 (40)

Source: Lion Air

Notes: Passengers in November and December 1994.
Airfare in Rs. In parentheses are in US\$.

(2) Domestic airstrips in the region

There are two domestic airstrips, Koggala and Weerawila, in Southern Area. Their facilities are summarized in Table 1.19.

Table 1.19 Summary of Airport Facilities

	Runway (m)	Surface	Apron	Terminal
Koggala	1,033x46	Bitumen	No	No
Weerawila	1,237x46	Bitumen	Yes	No

Source: Department of Civil Aviation, AIP

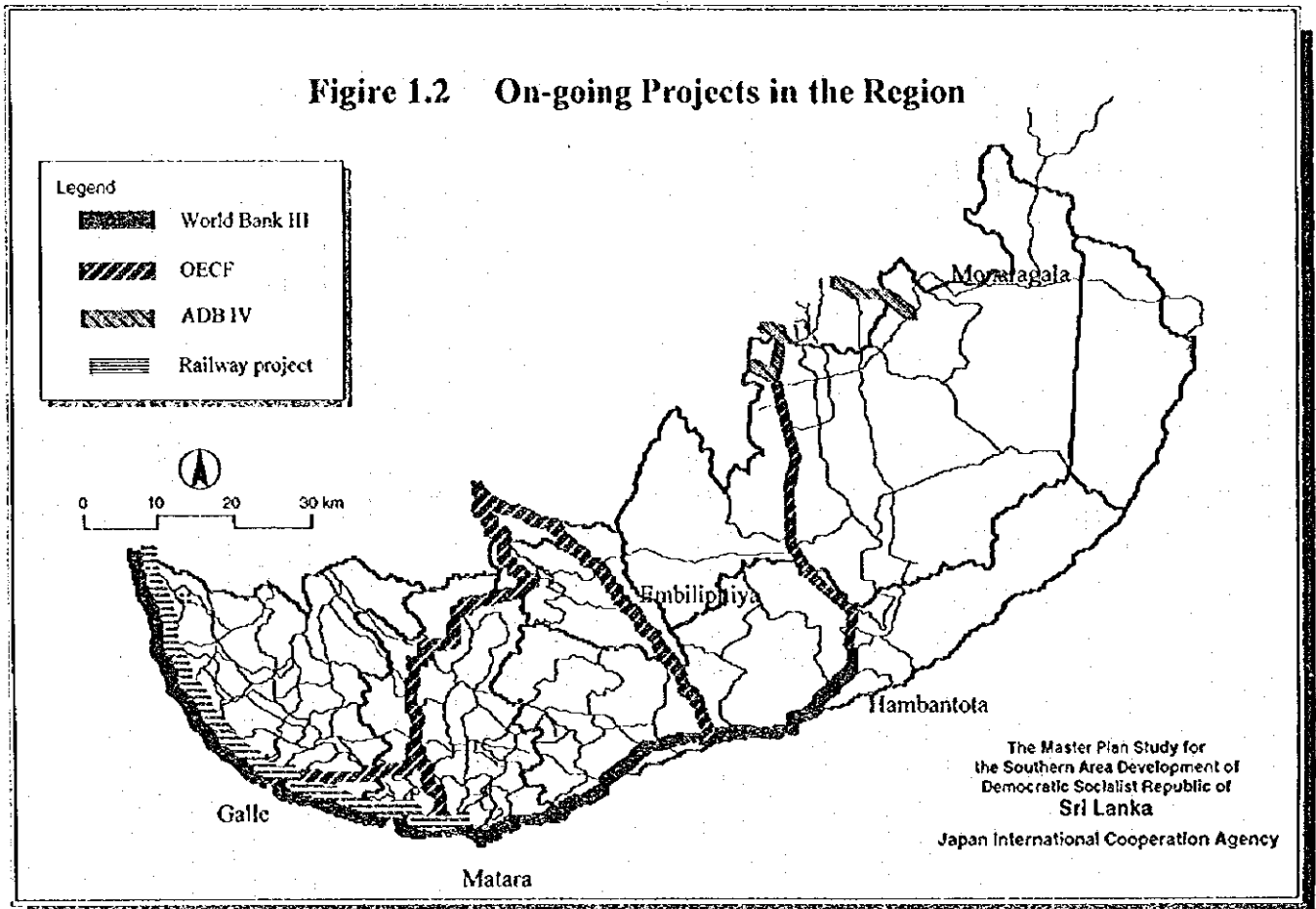
Since these airstrips are controlled by the Sri Lanka Air Force, no terminal or passenger facility has been provided. Maintenance of the runway surface has also been neglected.

1.3 On-Going Projects in Southern Area

1.3.1 Roads

Various donor agencies have financially supported RDA for improvement and rehabilitation of the national highways. By contrast, they have paid little attention to the maintenance and rehabilitation of provincial and rural roads. Currently, ADB is the only funding agency that

assists local road projects in Southern province. Donor-funded projects in the road sector are indicated in Figure 1.2 and described below.



(1) National highways

World Bank project

The World Bank has been supporting maintenance and rehabilitation of national highways. The Third Roads Project, which includes upgrading and rehabilitation of roads and road passenger transport facilities, has been carried out in the region. Road sections covered by the project are listed in Table 1.20.

The project consists of road rehabilitation of 175.5 km on A2 and its branch, and repair of thirteen bridges on A2. Construction work started in December 1994 and will be completed in 1997.

Table 1.20 Road Sections in Southern Area under the Third Roads Project

Package No.	Road Section	Length (km)
WB/3/3	Galle-Matara	44.0
	Matara-Akuressa	21.0
	Matara-Hakmana	24.0
	Total	89.0
WB/3/4	Matara-Dickwella	21.0
	Dickwella-Hambantota	59.0
	Beliatta-Tangalla	6.5
	Total	86.5

ADB project

ADB has proposed a project (ADB IV) to rehabilitate about 200 km of the national highways based on the priority list prepared by RDA. In Southern Area following sections are expected to be included in this project: 1) Beragala-Wellawaya (A4); 2) Moneragala-Badulla (A22); and 3) Wellawaya-Kumbalwela (A23).

OECE project

OECE agreed on rehabilitation of 1,700 km and maintenance of 9,000 km of national highways by DBST/SBST and sand sealing, a project to be implemented between 1993 and 1998. The project also provided a facility to purchase equipment according to work progress. However, the project was delayed for various reasons and its scope of work had to be curtailed to achieve only about 75% of original targets. It finally started in 1995 and will be completed by 1998.

Kuwait bridge project

RDA has a plan to rehabilitate main bridges on national highways. The list of candidate bridges includes three bridges on the A2 road. Total project costs will be Rs. 580 million.

(2) Provincial roads

ADB has provided funds for the rehabilitation and construction of 290 km selected farm-to-market roads in Southern province under the Southern Province Rural Development Project. In addition to this project, ADB has carried out a study with its technical assistance facility to prepare a project package which leads to upgrading and improvement of class C and D roads in Southern province.

Southern Province Rural Development Project

The project aims at raising income and improving the quality of life for people through the creation of employment opportunities by strengthening the private sector. The project has economic and social infrastructure components which include the rehabilitation and construction of farm-to-market roads. Provincial and rural roads have been rehabilitated under this project.

Southern Provincial Roads Improvement Project

ADB, together with other funding agencies, has been providing assistance almost exclusively for the improvement and rehabilitation of the primary national highways. Little external assistance, however, has been given to the secondary network. To rectify the situation, this proposed project will focus on rural roads in Southern province under ADB's technical assistance scheme to follow up the previous project.

1.3.2 Railways

Railway Rehabilitation Project

OECP is financing the Railway Rehabilitation Project, which includes civil works and workshop improvement. Under this project, rehabilitation work has started on the Colombo-Galle Coast line sections consisting of following components:

- Track rehabilitation, Colombo-Galle;
- Ballasting 150 mm below sleepers;
- Replacement of timber sleepers with concrete ones;
- Continuous long welding of rails;
- Construction of side drains; and
- Renewal of the Maradana-Bambalapitiya section (10.0 km) to increase the maximum speed from 80 km/h to 120 km/h; track beyond Bambalapitiya will be rehabilitated by utilizing new sleepers and ballast.

Bridge rehabilitation

There used to be 11 bridges on the Coast line to which temporary speed restrictions applied due to precarious condition. Among them, four shorter bridges are already under repairs. Rehabilitation work on Panadura and Kalutara bridges has started with assistance of KFW Germany. The remaining five longer bridges should be rehabilitated during the next decade. These bridges are Induruwa, Dodanduwa, Gintota, Kataluwa, Polathumodera, Bentota South, Balapitiya, Unawatuna and Ambalangoda.

Signaling system

The signaling system of the Coast line is more than 100 years old. It should be replaced with a color light signaling system to accomplish line capacity. An agreement has already been entered with NMA Signalling of Netherlands to replace the present mechanical system with a colour light system between Kalutara and Galle.

Matara-Walagala extension

The Government some time ago decided to carry out Matara-Kataragama rail extension, with its own internal funding if no foreign source was available. Subsequently, it also decided to construct a bridge over Nilwala Ganga at Matara and a 17 kilometers of track between Matara and Walagala. Land acquisition has been completed for the Matara-Walagala section. To complete this project, the amount of investment will be Rs. 900 million.

CHAPTER 2 CONSTRAINTS AND POTENTIALS

2.1 Development Issues

2.1.1 Overall issues

(1) Lack of transport policy and priorities

Importance of the transport sector for the Nation's socio-economic development has been increasingly recognized, and the Government is in the process of preparing transport sector strategy with the World Bank assistance. Considering the existing transport system in Sri Lanka, the government supports are still vital for initiating transport developments and guiding transport operations. Budget allocated by the Central Government to the transport sector has increased over years, yet total funds have not reached the required level.

(2) Unorganized transport administration

Transport administration in Sri Lanka is dispersed among a number of ministries and agencies. The Central Government takes responsibility for major roads, railways, ports and air transport facilities. Local and rural roads, since the devolution in 1990, have come under Provincial Councils and local governments. The provincial government issues permits for private buses within the province while the National Transport Commission issues inter-provincial route permits. Transport organizations suffer from insufficient financial and staff capacities. Weak coordination among transport modes has only reinforced inefficiency of the present transport system because goods and passengers are not always using the most economical mode. Coordination between rail and road transport is particularly required both for passenger and freight traffic.

(3) Poor maintenance and rehabilitation

Road density in Southern Area appears reasonable in comparison with the national average, but physical conditions of roads and bridges have deteriorated due to poor maintenance. The Government has given emphasis on maintenance and rehabilitation of existing facilities, yet allocated budget cannot sufficiently cover even the national highways and railways. Provincial and rural roads have been neglected for many years to have proper maintenance.

The Coast line of SLR is faced with problems of antiquated railway tracks, signaling systems, locomotives and rolling stock. Despite the patronage of 687.4 million passenger-km or 26% of the SLR total in 1991, improvement on the Coast line is constrained by poor financial performance of SLR. Although the Coast line has received assistance from OECF in the form of track and workshop rehabilitation, the funds are not enough to cover costs of all required improvements.

(4) Poor access to the region

Southern Area, especially Moneragala and Hambantota districts, is characterized by poor accessibility to and from Colombo by road, rail and air. National highways, which are the primary mode of transport and the primary means of access to the entire region, cannot provide efficient access owing to mix usage and weak physical features as well as traffic congestion in and around Colombo. Their physical condition has deteriorated because of poor maintenance and rehabilitation. Railway service available in the region is limited to only one line from Colombo to Matara and its operation is inadequate in frequency and capacity. Air transport is still negligible in the region. There are two domestic airstrips in the region but air freight and passenger service is not available due to security reasons.

(5) Poor private sector participation

The current PIP emphasizes the involvement of the private sector into transport infrastructure and service provision. Private sector participation in the transport sector can be categorized into two: 1) private operators carrying passengers and cargoes; and 2) private investors financing transport infrastructure through BOF or BOO schemes. To promote private bus and truck services, the Government should give incentives to private operators through tax exemption, low tax on spare parts, low interest rate financing, and fare increase. As for infrastructure provision, the Government has established BII (formerly SIDI) to enhance private participation.

Construction of transport facilities is hampered by the limited capacity of local private contractors. This is particularly serious with provincial and local roads that require massive work for maintenance and rehabilitation.

2.1.2 Transport modes

(1) Roads

Poor mobility

Southern Area is equipped with a fairly well-developed road network except for remote villages. The problem is poor mobility. Mobility on the road is severely constrained in the region by poor maintenance of surface, weak and insufficient physical features and mixed traffic.

Outdated design standards

Design standards for roads and bridges were first set during the British colonial period when load situations were entirely different. Thus, with most roads and bridges now existing in Sri Lanka, surface and structure designs are not appropriate to carry today's heavy axle load. Weak pavement and deficient bridge structure require frequent repair. Road alignment is no longer suitable to accommodate today's fast moving vehicles.

Insufficient rural road access

Responsibility for rural roads, usually class E roads, has been devolved to the local governments. The local governments, however, do not have sufficient funds and staff to carry out this responsibility. As a result, condition of rural roads has generally deteriorated in a short period and some have even become impassable due to complete lack of maintenance. Road accessibility to villages has thus become a problem especially in remote areas.

Tollroad construction and operation

The Southern Highway is proposed as an access-controlled tollway and, when completed, it will become the first inter-city tollway in Sri Lanka. Management and operation of a tollway differs from that of an ordinary road, especially in financial management. In view of this difference, RDA may not be the appropriate organization to manage and operate the Southern Highway.

(2) Road transport

Existing bus services have failed to meet passengers' needs. The "peoplized" companies have been struggling with poor financial performance and have not provided proper services. A large number of private buses operate only during peak hours and are reluctant to run off-

peak and night bus services. The Government finds it difficult to enforce timetables prepared by Provincial Councils on the private bus operators to comply. Private truck operators are also reluctant to supply transport services to remote areas due to poor condition of rural roads. The accessibility problem is thus further aggravated for remote villagers, who cannot transport agricultural produce to market.

(3) Railways

SLR's share in land transport has been steadily declining. One reason is that SLR has failed to provide reliable services to passenger and freight traffic. SLR has problems of old railway facilities and equipment and yet cannot replace them due to financial difficulty. Its inadequate workshop has left a considerable portion of its fleet, both locomotive and rolling stock, out of service. Consequently, SLR cannot provide fast and reliable service to the customers.

The Coast line has a potential to recover its share from road transport because the running speed on A2 has decreased very rapidly. If the current rate of motorization continues, A2's road space will soon be occupied fully by private vehicles and trucks. Part of passenger traffic will then shift to the railway if SLR can supply fast and reliable services at low fare.

(4) Ports and shipping

JICA carried out a feasibility study on the port of Galle in 1991. The development of the Galle port was proposed based on a projection that the Colombo port alone would not be able to handle all container cargo in the future. The study assumed that the Colombo port could not be expanded further and all future overflow of containers would be forwarded to Galle. Estimated overflow of container cargo was 226,000 TEUs for 1997 and 713,000 TEUs for 2005. Based on these estimates, the study proposed constructing three container berths (14 m deep and 1,050 m long), two general/bulk berths (14 to 12 m deep and 510 m long) and an oil berth (7.5 m deep and 120 m long) as well as a 1,300 m long breakwater. The master plan then assumed that the cost of the 1,300 m breakwater and channel dredging would be borne by the Government. The total construction costs for the recommended plan were estimated at US\$ 592 million for the long-term development and US\$ 343 million for the short-term development including US\$ 126 million to be subsidized by the Government.

SLPA, however, later changed its policy and came to support a plan to develop the Colombo port beyond the existing breakwater to expand its transshipment function. This policy change has entirely undermined the whole plan of the Galle port development. In spite of this major policy decision, however, functional division has not been clearly drawn between the port of Colombo and other major ports including Galle. The 1991 master plan for the Galle port development, therefore, needs to be reviewed in the light of the on-going study on the expansion of the Colombo port on the one hand and taking into account Southern Area's new development needs and potentials as described in this Plan on the other.

(5) Airports and air transport

Policies for domestic air transport have not been established. The Katunayake international airport will be improved to facilitate transfer of passengers between international and domestic flights. However, improvement of domestic airport facilities in its association would involve major policy decisions related to international and domestic tourism and industrial development. The Koggala and Weerawila airfields are currently operated by the Sri Lanka Air Force and no passenger terminal building exists there.

2.2 Future Traffic Demand Forecast

In order to lay out the future transport network for Southern Area, traffic demand was forecast for national highways, railways, ports and airports. The results are summarized below. The forecasts incorporate Southern Area's development scenario adopted in this Plan. The forecasts also indicate the levels of investment required to meet future demand for the modes.

2.2.1 National highways

General traffic growth rates are first estimated on the basis of past growth of traffic and vehicle registration and future growth projected for population and income. A general growth rate is estimated for each of three phases as identified in this Plan. The general growth rates are then adjusted for individual roads on the basis of development potential.

Existing traffic volume on the major national highways was estimated on the basis of historical traffic count data which include detailed vehicle composition. The traffic count data show that major national highways carry 200 to 6,000 average daily traffic (ADT) or 225 to 8,300 passenger car equivalent units (PCUs). The data also indicate that the annual

average growth rate of traffic volume ranged from about 1% to 10% depending on the highway and the location of traffic count (Table 1.8).

Total vehicle population data show that the annual average growth rate was 10.5% during 1985 and 1994 (Table 1.9). On the other hand, auto fuel consumption, diesel plus petrol, increased at a rate of 4.8% annually during 1985-94. This rate was much lower than that of total vehicle population growth.

A number of studies provide indicators of past growth and of expected future growth. One study shows that income elasticity of demand for transport is around 1.2 to 1.5 in Sri Lanka.

According to this Plan's projections on regional economic and population growth, the region's economy is projected to grow at 7.7% annually during the planning period (1996-2015) while its population will increase 1.2% per year. Therefore per capita income will increase at 6.5% annually during the period. If a low income elasticity of demand for transport of 1.2 is assumed, this would translate into a traffic growth rate of 7.8% per year. However, considering that the growth of vehicle population and petroleum consumption has been around 5-6% and that, as past data show, traffic growth may differ considerably among routes and locations, the maximum general growth rate of 7% per year is assumed to err on the conservative side.

The Plan divides the 20-year planning period into three development phases and sets different growth rates for them: Phase I (1996-2000) with 6%; Phase II (2001-2010) with 8.5%; and Phase III (2011-2015) with 8%. The 7% general growth rate will therefore be modified according to the development phases and their particular emphasis on some development potentials. Taking into account major productive sectors' development strategy and projects, the general growth rate for the three development phases is assumed at 5%, 6% and 7%, respectively. The rates are further adjusted for each of individual national highways as shown in Table 2.1.

Table 2.1 Projected Traffic Growth Rate by Route and by Phase

Route	-1997	Projected Traffic Growth Rate (%)		
		Phase I (1997-2000)	Phase II (2001-2010)	Phase III (2011-2015)
A2				
Bentota-Matara	6	6	7	7
Matara-End	4	4	6	7
A4	6	6	7	7
A17	4	4	5	5
A18	2	2	6	7
A24	4	4	5	5
General Growth Rate		5	6	7

The estimated future traffic volume on national highways is shown in Table 2.2.

The existing national road capacity is calculated on the basis of the Highway Capacity Manuals and compared with future traffic volume on the national highways (Table 2.3). The results show that future volume will exceed the current capacity on the Bentota-Matara section while the current capacity will be sufficient for other sections.

2.2.2 Railways

SLR prepared a *Draft Business Plan* and restructuring program in association with the World Bank in February 1991. It includes future traffic demand forecast both for passenger and freight traffic. The Coast line's demand forecast is shown in Table 2.4.

The study includes both basic and optimistic forecast for the Coast line. Growth rates of passenger traffic demand are 1.5% and 1.9%, respectively. Freight traffic will grow at 1.4% under optimistic forecast until 2008 and 0% for basic forecast. The results show that the railway will carry part of both passenger and freight traffic in the region, yet SLR should limit its investment to the improvement of the existing facilities due to the low growth rates projected for railway demand.

Table 2.2 Future Traffic Volume

Route No.	Location (km)	Average Daily Traffic		Traffic Volume							
		Year	ADT	1997		2000		2010		2015	
				ADT	PCU	ADT	PCU	ADT	PCU	ADT	PCU
A2	74	1993	4,620	5,833	7,522	6,947	8,959	13,665	17,624	19,166	24,719
	100	1991	4,070	5,773	7,176	6,876	8,547	13,526	16,813	18,972	23,582
	109	1996	6,240	6,614	8,806	7,878	10,489	15,497	20,633	21,735	28,938
	141	1996	4,615	4,892	5,888	5,826	7,013	11,461	13,795	16,075	19,348
	177	1996	3,975	4,214	5,493	5,018	6,542	9,872	12,870	13,846	18,051
	225	1994	2,940	3,307	3,944	3,720	4,437	6,662	7,946	9,344	11,144
	257	1996	1,606	1,670	2,081	1,879	2,341	3,365	4,192	4,719	5,880
	284	1994	960	1,080	1,357	1,215	1,526	2,175	2,733	3,051	3,833
306	1994	890	1,001	1,297	1,126	1,459	2,017	2,613	2,829	3,665	
A4	225	1993	1,050	1,326	1,663	1,579	1,981	3,106	3,896	4,356	5,465
	232	1993	1,050	1,326	1,771	1,579	2,109	3,106	4,150	4,356	5,820
	286	1995	1,075	1,208	1,605	1,439	1,911	2,830	3,760	3,969	5,273
A17	15	1993	1,240	1,451	1,569	1,632	1,765	2,658	2,874	3,392	3,668
	22	1996	960	998	1,139	1,123	1,281	1,829	2,087	2,335	2,664
	42	1992	1,060	1,290	1,317	1,451	1,481	2,363	2,413	3,016	3,080
	85	1996	225	234	235	263	264	429	430	547	548
A18	12	1994	1,932	2,050	2,889	2,176	3,066	3,896	5,491	5,465	7,701
	30	1995	1,513	1,574	2,166	1,670	2,299	2,992	4,117	4,196	5,774
	66	1996	1,025	1,046	1,235	1,109	1,311	1,987	2,347	2,787	3,292
A24	5	1991	1,830	2,316	2,291	2,605	2,578	4,243	4,199	5,415	5,359

Source: RDA for the actual data. Forecasts by the Study Team.

Note: PCU denotes Passenger Car Unit.

Table 2.3 Peak Hour Traffic Volume and Road Capacity

Route No.	Location (km)	Traffic Volume		Peak Hour	Road Capacity**
		ADT	PCU	Traffic Volume* (ADT)	(PCU)
A2	74	19,166	24,719	1,879	1,320
	100	18,972	23,582	1,792	1,320
	109	21,735	28,938	2,199	1,320
	141	16,075	19,348	1,470	1,320
	177	13,846	18,051	1,372	1,320
	225	9,344	11,144	847	1,760
	257	4,719	5,880	447	1,760
	284	3,051	3,833	291	1,760
	306	2,829	3,665	279	1,760
A4	225	4,356	5,465	415	1,540
	232	4,356	5,820	442	1,540
	286	3,969	5,273	401	1,540
A17	15	3,392	3,668	279	1,240
	22	2,335	2,664	202	1,240
	42	3,016	3,080	234	1,240
	85	547	548	42	1,240
A18	12	5,465	7,701	585	1,660
	30	4,196	5,774	439	1,660
	66	2,787	3,292	250	1,660
A24	5	5,415	5,359	407	1,500

Source: Study Team

Note: * Peak-hour traffic volume is calculated on the basis of the existing traffic pattern on A2.

** Road capacity is calculated according to the Highway Capacity Manual. The road width is shown in Table 1.6.

Table 2.4 Demand Forecast for the Coast Line

		1997	2008
Passenger (million passenger-km)	Basic Forecast	735.1	867.3
	Optimistic Forecast	756.7	927.2
Freight (million ton-km)	Basic Forecast	20.6	20.6
	Optimistic Forecast	63.1	76.4

2.2.3 Airports

UNDP-assisted studies on the upgrading of the Koggala and Weerawila airstrips were carried out by the then Ministry of Finance, Planning, Ethnic Affairs and National

Integration in 1992 and 1994, respectively. The studies covered demand forecast, economic evaluation and engineering design and proposed future development of the two airstrips. The demand forecast should be modified on the basis of project proposals developed in this Plan.

(1) Air cargo

The UNDP study's estimate about the Koggala airstrip shows that in 1999 the maximum incoming cargo volume will be 60 tons per month or 720 tons per year and 36 flights out will be required. The cargo consists mainly of garments produced in the Koggala EPZ.

Cargo volume is correlated with GDP to estimate future cargo volume. Using data over the last nine years, the equation is derived as:

$$Y = 0.93 \times X - 80086.90, \quad (r^2 = 0.99)$$

where Y = air cargo handling at the Katunayake international airport (ton), and
X = GDP (at 1982 constant prices).

National total air cargo volume estimated using this equation is then divided among regions proportionately to their GDP shares. Southern Area's regional cargo volume is further divided among districts based on their population shares in 1995. The results are shown in Table 2.5.

Table 2.5 Air Cargo Volume from Southern Area
(Unit: ton/year)

	Proportion*	1995	2000	2005	2010	2015
Sri Lanka		76,109	153,075	201,561	305,795	461,132
Southern Area	100.0%	7,702	15,782	22,857	38,102	60,224
Galle	36.3%	2,797	5,730	8,299	13,835	21,867
Matara	28.7%	2,214	4,536	6,569	10,951	17,308
Hambantota	19.8%	1,526	3,126	4,528	7,548	11,930
Others	15.2%	1,167	2,391	3,463	5,772	9,124

Source: Study Team

Note: *Population shares in 1995.

The results show that total air cargo demand in the region will far exceed previous estimates. Currently, however, potential air cargo is all transported by road. It is not clear how much of the future export cargo will shift to domestic air freight services. It may be a question of cargo fare and reliability of services provided by the domestic airlines.

(2) Passenger transport

Domestic air transport is categorized into tourist and business trips. Since no domestic flight service is available, it is difficult to get a reliable estimate for passenger traffic. The data from Lion Air suggest that long-distance air transport may be in great demand by travelers (Table 1.18). To identify competitiveness of air transport against road transport, travel time is estimated for those alternative travel means to reach several destinations in the region (Table 2.6).

As seen in Table 2.6, air traffic has an advantage over road transport if condition of national highways would not improve much. When the Southern Highway, an access-controlled highway, is completed, the advantage will diminish and air travel will remain competitive only for those trips to Koggala, Hambantota and Moneragala areas. This is particularly the case for the vicinity of the Weerawila airport.

Table 2.6 Comparison of Travel Time

(Unit: minute)

Destination	Travel Time			Time Saving vis-a-vis:	
	National Highway A2	Southern Highway (proposed)	Air Flight	National Highway A2	Southern Highway (proposed)
	Galle	159	95	110 (30)	39
Koggala	179	115	90 (30)	89	25
Matara	219	109	130 (30)	89	-21
Hambantota	322	212	110 (50)	212	102

Sources: SIDI, Pre-feasibility Study on the Potential for Private Financing of the Southern Highway Project.
 Ministry of Policy Planning and Implementation, Upgrading of the Koggala Airstrip, Dec 1992.
 Ministry of Finance, Planning, Ethnic Affairs and National Integration, Upgrading of the Weerawila Airstrip, Dec 1994.

Notes: Starting point of national highway is Panadura.
 () actual flight time. 30 minutes each is assumed for procedures at airport.

In estimating future air passenger traffic without any comparable data in the past, it is assumed that initially 30% of the visitors to the region will come by air and that the ratio will increase to 40% by 2015. Total passengers are then divided between the Koggala and Weerawila airports at the ratio of 30% and 70%, respectively, until 2000, and 20% and 80% afterwards up to 2015. This allocation takes the trend of hotel investment in consideration. The results are summarized in Table 2.7.

Table 2.7 Summary of Air Passenger Traffic Estimates

	UNDP Studies			JICA Study Team		
	1995	2000	2015	1995	2000	2015
Tourist Arrivals						
Sri Lanka	477,200	791,100	-	285,930	680,000	980,000
Southern Area	-	-	-	104,000	192,000	600,000
Air Passengers						
Koggala	14,049	29,086	-	9,360	17,280	72,000
Weerawila	13,400	26,245	-	21,840	40,320	168,000

Sources: Ministry of Policy Planning and Implementation, Upgrading of the Koggala Airstrip, Dec 1992.

Ministry of Finance, Planning, Ethnic Affairs and National Integration, Upgrading of the Weerawila Airstrip, Dec 1994.

The estimates clearly indicate that proposals to upgrade the airstrips made in the previous studies can be justified in the light of this Plan which is based on multi-sectoral and long-term assessment of the region's development potentials. A future expansion of the Weerawila airstrip, in particular, may be required if air passengers increase as estimated above. Development of domestic airline services, however, depends much on the formulation of a national air transport network and on the quality of services provided. An integrated development plan dealing with both domestic airport improvement and the airline industry is a national prerequisite.

CHAPTER 3 DEVELOPMENT STRATEGY

3.1 Policy on Inter-Modal Functional Allocation

The most important transport mode in the region is road transport, which accounts for more than 90% of both passenger and freight transport. Road transport will remain the most dominant in the region carrying more than 90% of passenger and freight traffic in the future as well. The Coast line is currently utilized for commuter traffic between the region and Colombo. This implies that the railway has an advantage over road with respect to urban passenger transport. However, there has been no clear policy regarding the modal allocation of functions between road and railway. The crucial policy question should be how to retain and utilize social advantages of the rail transport in the face of inevitable motorization. The Government's guidance would be necessary to ensure that the railway system continue serving some social functions. By contrast, other transport modes, air and coastal shipping, have played a minor role, yet domestic air transport should become supplemental but integral part of the overall transport system. Air transport should concentrate on long-distance business and tourist passenger traffic.

3.2 Private Sector Participation

3.2.1 Promotion of the private sector

Private sector participation should be promoted not only in the field of transport service provision but also in infrastructure investment. The first type of participation is particularly relevant to the road transport subsector. The Government should give incentives to private operators in the forms of tax exemption, lower tax on spare parts, finance at lower interest rates, and increased and differential fare structure. In addition to these general measures, a special scheme should be introduced to provide better transport services to remote villages. Under this scheme, prospective private operators (particularly enterprising youths) are trained on basic management and technical skills and given concessionary loan arrangements to purchase vehicles for the service.

The Government has called prospective private investors for transport infrastructure projects in the region. The list includes Galle port development, Southern Highway, and domestic air port development projects. The Bureau of Infrastructure Investment (BII) was established in 1996 as a successor to SIDI to promote private sector involvement in infrastructure provision.

As for the road construction industry, the number of private contractors capable of road maintenance and rehabilitation is very limited. There is one major road contractor for national highways but the company's capacity is insufficient to meet the bulk of demand for provincial and local roads construction. The private contractors should be encouraged particularly to take up maintenance and repair works of provincial and rural roads.

3.2.2 Strengthening road transport services

The Government should take initiatives to improve the road transport industry. Reorganization of "peoplized" bus companies into 11 regional bus companies has already been proposed to improve their financial performance by creating scale economies and sharing personnel, spare parts and other resources. The bus fare structure needs to be improved introducing differential pricing in combination with government subsidies. Private bus companies should also be reorganized to improve services. To provide better amenity to bus passengers, bus terminals should be built at appropriate places. Priority should be given to some connecting points between bus and rail services, and major cities in the region. The terminals should be maintained with the revenue in the form of license fees and entrance fees collected by the Government.

There is no commercial distribution center in the region. However, demand for transporting goods and commodities will increase as Southern Area accelerates its economic growth. To build an efficient system of transportation, the region may require one or a few commercial distribution centers at some appropriate locations in the future. A center typically consists of a truck terminal, storage facilities and wholesale markets for vegetables, fruits and fish.

3.3 Transport Administration

Coordination among transport agencies needs to be improved with regard to investment priority, modal mix, pricing and sound competition to ensure better allocation of limited resources. As a prerequisite, a comprehensive national transport policy should be prepared by an inter-agency task force at the national level.

The road transport administration has been decentralized to provincial and local governments for class C, D, and E roads but budget and staff capacity are not sufficient for them to carry

out the responsibilities. As for tollway maintenance and operation, RDA may need to be restructured to take up the tasks for the proposed tollways.

SLR has to reorganize itself to become a business-oriented enterprise. A first step would be to transform it into the Sri Lanka Railways Authority as already proposed.

3.4 Development of Transport Facilities

3.4.1 Future economic activities and transport network

To promote economic growth in the region, transport infrastructure should provide efficient services particularly to agriculture, industry and tourism. Transportation is also a prominent factor to influence the development of urban centers. In this Plan, these sectors envisage their future development as follows.

(1) Agricultural development

Value added from crops and livestock is expected to increase from Rs. 19,522 million in 1995 to Rs. 37,300 million in 2015. As a major new extension, rainfed agriculture development is expected in dry and intermediate zones, especially in Hambantota and Moneragala districts. Potentially, about 40,000 ha of new land can be brought under cultivation.

(2) Industrial development

The number of manufacturing employment in the region is projected to expand from 121,600 in 1995 to 213,000 in 2015. Various projects are proposed in this Plan to promote industrial development in the region of which the following two are particularly relevant to transport planning:

- Industrial Districts for Small- and Medium-Sized Industries, and
- Integrated Urban Industrial Development Project.

(3) Tourism development

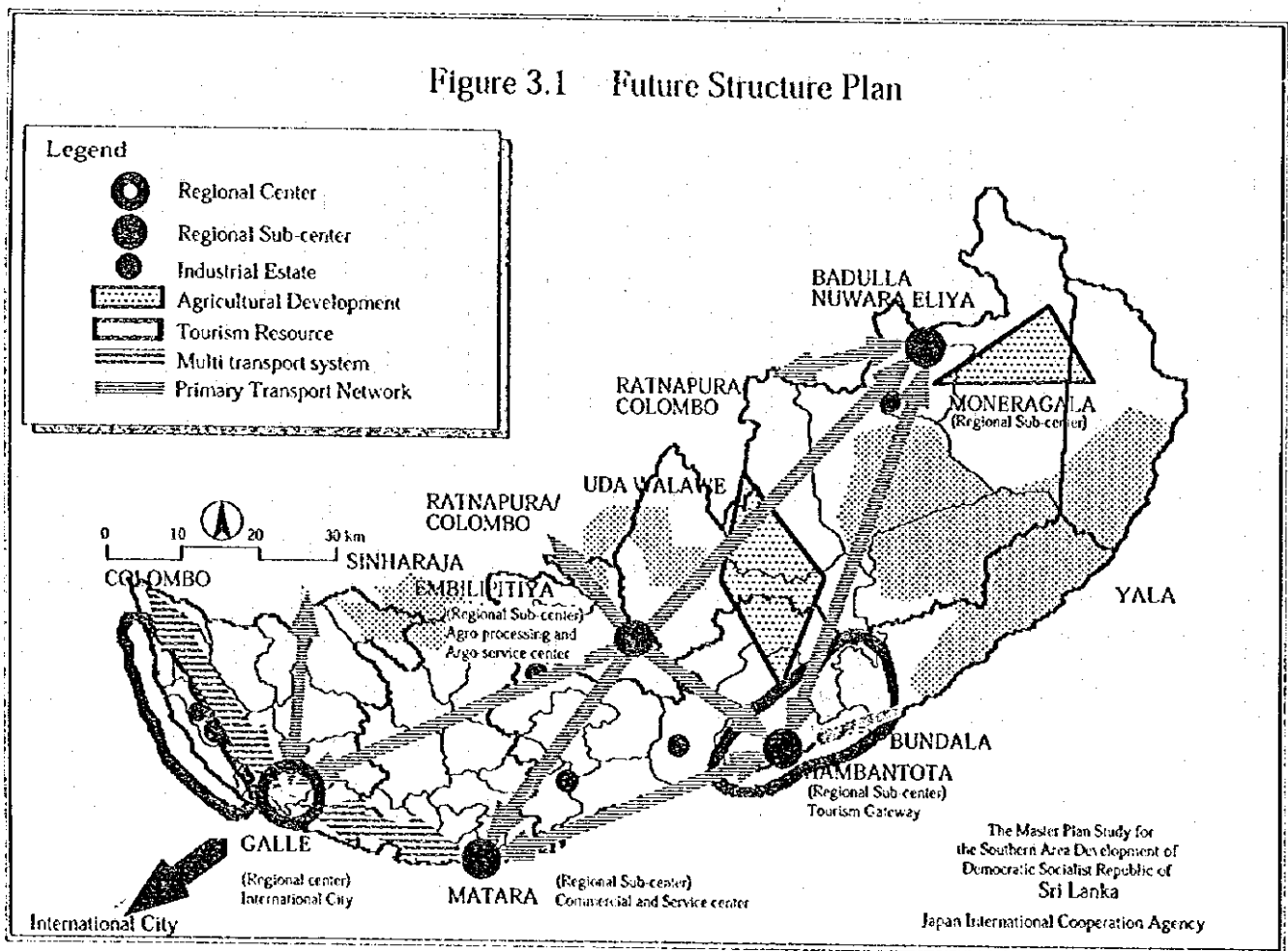
The future demand forecast shows that foreign visitors to Southern Area will significantly increase from current 104,000 annually to 600,000 in 2015. The tourism development

strategy therefore recommends the improvement of national highways, as the primary access means to the region, and the upgrading of the Weerawila airport and the railway.

(4) Urban centers

This Plan has identified five strategic urban clusters in the region as the centers with enhanced various urban functions. They are Galle (international center), Matara (regional sub-center), Embilipitiya (agro-processing and agro-service center), Hambantota (tourist center), and Moneragala (agro-center). Each cluster is assigned a distinct role to play in regional growth. These clusters should be mutually linked with good road connections.

Taking these sectors' future scenarios into consideration, an appropriate future structure of the regional transportation network is devised as shown in Figure 3.1.



3.4.2 Strengthening access to Colombo

One fundamental problem of the region is poor access to and from Colombo. The insufficient infrastructure has been a reason for little foreign direct investment into the region and its underdeveloped industry. New transport facilities are required to overcome this situation and transform the region's economic structure into a more advanced one.

(1) Southern Highway

To provide a faster access from Colombo to the region, an express highway with a four-lane dual carriage way has been proposed by the Government. This highway will reduce travel time by 40-50% and improve access to Colombo.

(2) Railway

An OECF-funded project has been started for track rehabilitation of the Coast line to achieve a maximum speed of 120 km/h between Colombo and Galle. For the remaining section between Galle and Matara, SLR has prepared a detailed proposal for a rehabilitation project. To achieve high-speed operation, however, SLR should also improve bridges, signaling systems, locomotives and rolling stock as well. Doubling track on the Coast line will be a future option.

(3) Domestic airports

Domestic airport facilities should be selectively improved on the basis of careful assessment of international tourism trends and the development of export-oriented industries in the region.

3.4.3 Strengthening interregional road network

(1) Maintenance and rehabilitation

The condition of the existing transport facilities in the region has been deteriorating because of poor maintenance and rehabilitation. With limited budget and personnel available, maintenance and rehabilitation should have priority over other transport sector projects. To improve road transport as the prime mode of transportation in Southern Area, a better road maintenance administration would be a prerequisite for provincial and rural roads. More

financial and human resources need to be allocated to local governments especially at the provincial and district levels. For maintenance and repair of rural roads, participation of local communities should be encouraged. This should be supported with a provision of basic equipment and technical guidance to be organized at the divisional level. At the same time, financial resources of governments at different levels should be augmented by introducing user charges, gasoline taxes, license fees, import levies and a toll road system. Provincial Councils may be allowed to levy some of them, and the Government may introduce specific purpose taxes pegged to the transport sector.

(2) New national highways

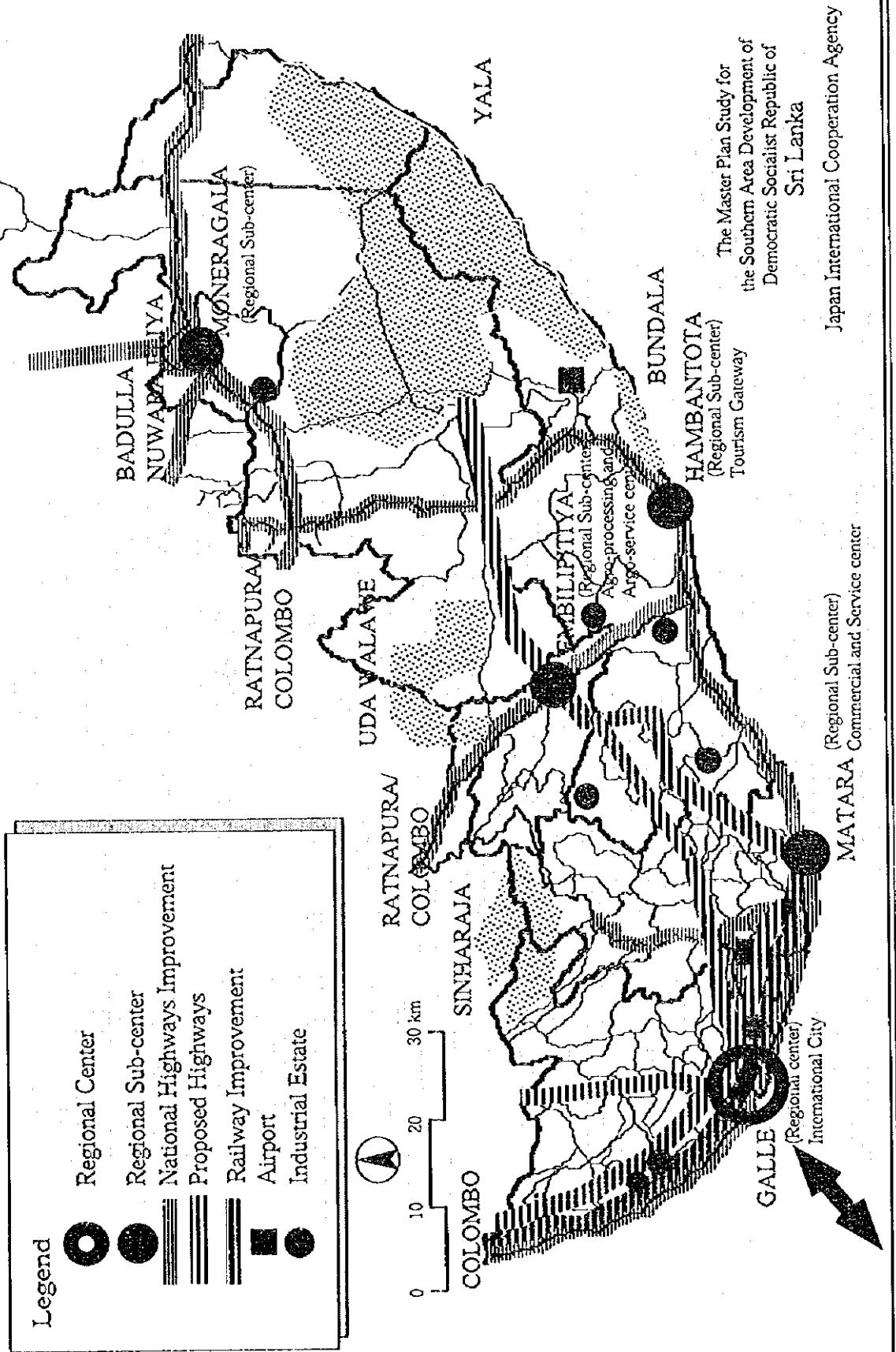
Several proposals are made to improve interregional linkages. They include establishment of intraregional road artery, new linkage between Galle and Embilipitiya, and between Galle and Ratnapura. These additional roads will strengthen the road network within the region.

3.4.4 Improvement of international access point—Galle port

The Galle port should be developed as a major international access point in the region. It should also be an integral part of the Galle city development plan which aims at establishing Galle as an international city. The Galle port development could be a key infrastructure development in the region to transform the regional economic structure. Aside from the existing master plan prepared in 1991, a more realistic development plan for the Galle port should be prepared as a matter of urgency.

Summarizing the above considerations and requirements, a future transport network is proposed as depicted in Figure 3.2.

Figure 3.2 Future Transport Network



CHAPTER 4 MEASURES

4.1 Institutional Measures

4.1.1 Strengthening existing transport administration

The present transport administration lacks coordination between road and rail both for passenger and freight traffic. Transport costs generally increase because of the resultant distorted modal splits and unreasonable price structures. A better coordination with a clear transport policy is in need to make the transport system efficient. The multi-modal planning function should be strengthened to devise sectorwide policies at the national level.

Road maintenance and rehabilitation have been carried out by three levels of government organizations. However, these organizations are faced with shortages in expertise, technical staff, and equipment. Consequently, their implementation capacity is invariably limited. The Government should increase the staff of these implementing agencies and organizations and provide technical training to them. Emphasis should be placed on rural road repairs that are currently undertaken by the provincial and local governments.

SLR's railway services have been poor for a long time due to financial difficulty and inefficient operations. The Government passed the Sri Lanka Railways Authority Act in 1993 to redirect SLR to a more business-oriented organization. The establishment of the Sri Lanka Railways Authority will thus be the first step to be taken in the railway sector.

4.1.2 New organization for tollway development

A new organization may be needed for planning, design, construction and operation of toll roads because their operations require highly specialized financial and managerial capacity. It may be a parastatal vested with power to issue bonds to raise fund for toll road construction.

4.1.3 Private sector participation

To promote private investment in the transport sector, the Government should establish clear investment regulations, procedures, and policy towards private participation. The Government should also nurture close public-private relationship to assist the private sector to grow and mature. As for bus transport, the private bus operators will play a dominant

role while the public bus companies will be chiefly responsible for services socially required. Other public transport companies should be privatized as already proposed.

The Government should pay attention to the possible formulation of a joint investment company initiated by a public and private sector consortium. It will reduce the risks of private investors and promote private investment into the region.

4.2 Projects Proposed by the Government

There already exist a number of projects and ideas with respect to Southern Area developed by various government agencies. The technical subcommittee on access under the National Steering Committee for this Study has compiled the *Project Sketches for Southern Area Development Program*. The projects listed in the document, however, are at varying stages of implementation. Some are already under way and others still wait for feasibility studies. In addition to this document, each relevant ministry has provided information on the projects it considers to implement in Southern Area. In order to review past efforts, the currently proposed projects are listed below with a short description.

4.2.1 Highways

(1) Southern Highway

A pre-feasibility study was carried out by local consultants in 1992. The study identified four alternative routes from Colombo to Matara. RDA has subsequently carried out an additional study on the inland route in view of minimizing relocation problems.

The Government has proposed that the Southern Highway be constructed through private participation. Given this directive, SIDI prepared *Pre-feasibility Study on the Potential for Private Financing of the Southern Highway Project* in 1993. The report reviewed four alternative ways for the financing of the Southern Highway: public sector investment, build-transfer with operation, public/private tolled highway, and BOT. The report also pointed out that the existing traffic volume on A2 might not generate enough toll revenues to finance the highway. Therefore, it recommended that "significant land development at the interchanges and in the vicinity of the road will improve the financial outlook for the project." The land development may consist of commercial districts and shopping areas, industrial parks and office buildings, housing development, hotels and amusement facilities.

(2) Southern Highway Extension to SEDZ (Intra-Regional Artery Road Establishment)

The Southern Highway will provide a fast access to the western half of Southern Area from Colombo. Despite this facility, however, the most backward areas of the region, the southeast dry zone (SEDZ), will remain at a disadvantage in terms of accessibility to and from Colombo. To overcome this situation, an intra-regional artery road to SEDZ has been proposed. Existing sections from Matara to Moneragala through Tanamalwila will be upgraded to a class A road.

(3) Colombo to Ratnapura Highway

A pre-feasibility study was done by local consultants for the Colombo-Ratnapura highway along with the Outer Circular Highways in 1991 and 1992. The project requires a feasibility study and a detailed engineering design to follow up the pre-feasibility.

4.2.2 Railway

(1) Development projects of the Coast line

SLR considers four projects on the Coast line as follows.

Galle-Matara rehabilitation

SLR seeks funds for the rehabilitation and improvement of the Galle-Matara section. OECF's support is expected to extend to this section.

New signaling system

The Coast line signaling system is divided into two parts. The section from Colombo Fort to Panadura is a double-track line equipped with an electronic centralized traffic control (ECTC) system. The rest of the line still operates with a mechanical signaling system which is over hundred years old. SLR has a plan to replace the mechanical signaling to an ECTC system to provide safe and reliable services throughout the line.

Double track

SLR has set first priority on the double tracking of the Panadura-Matara section. A feasibility study has already been done and construction work is scheduled to commence between Panadura and Kalutara with Rs. 10 million local funds. However, the

appropriated funds cannot cover the whole project costs. Another feasibility study is required for extending the double track from Kalutara further to the region.

Galle station direct entry

SLR has a plan to build a short-cut rail section and a new station on it in Galle in order to operate rapid trains bypassing the existing station.

Galle port connection

The Galle port is currently connected to the Coast line only from the Galle side. SLR has a plan to connect the railway from the Matara side also to allow easy handling of railway cargoes. The project includes dry port facilities for containers.

(2) Matara-Kataragama rail extension

A feasibility study for the railway extension from Matara to Kataragama was completed in June 1991 by Korean Consultants International. The proposal included 110 km of total length with a design speed of 120 km/h and 16 stations. Total capital costs were estimated at Rs. 2,500 million and running costs at Rs. 1,300 million per year. SLR has completed part of this project up to Walasgala, 17 km east of Matara.

4.2.3 Ports and shipping

(1) Galle port development plan

The Government, in pursuit of private investor involvement in the Galle port development, called for tenders on a BOT basis. In August 1995, the Government announced that the project would be awarded to a UK-China consortium group. The selected consortium should subsequently submit a revised feasibility proposal within six months from the date of a Letter of Intent.

(2) Expansion of Colombo port

Container traffic is expected to steadily increase for the next two decades on the Indian subcontinent and in Sri Lanka. The Colombo port with its present capacity will not be able to cope with this strong container handling demand. To become the hub port in the South Asian region, the Colombo port should improve its management and operation, and be capable of better telecommunications, banking and financial services. Against this

backdrop, improving cargo handling capacity is a matter of urgency to attract container ships. The Government, in cooperation with JICA, has recently carried out a study ("Study on the Development of New Port of Colombo") to explore the possibility of expanding its container handling capacity. The study proposed the South port development to achieve a capacity of 2 million TEUs. It also pointed out that the North port development would become necessary depending on the future demand of cargo throughput.

4.2.4 Airports

(1) International airport development

The Airport and Aviation Services has a plan to develop the Colombo international airport further. The plan includes an expansion of apron, construction of a new domestic terminal and boarding bridges, and improvements on the terminal building. When the improvements are completed, passengers can transfer to domestic flights at the international airport.

(2) Domestic airport development

A feasibility study on the upgrading of the Koggala and Weerawila airstrips was prepared by local consultants some time ago. Its forecast of passengers shows that tourists coming into Southern Area will be the main part of the future increase in demand. The proposals include betterment of runways and construction of passenger terminals. Investment costs are estimated at Rs. 46 million for Koggala and Rs. 49 million for Weerawila.

4.3 Anchor Projects/Programs

4.3.1 Galle Port Development (Stages I and II)

The Galle port should be developed as a major international access point for Southern Area. It should also be an integral part of the Galle city development plan which aims at establishing Galle as an international city. Galle port development could be a key infrastructure development in the region to transform the regional economic structure.

This Plan recommends the following steps for its development. As the first stage, the Galle port would be developed as a regional port equipped with general and bulk cargo berths and an oil berth and with a supplementary capacity to handle container cargo. The

breakwater can be designed with a minimum length initially but with a possibility for future full-scale extension. The second stage development would be designed later keeping pace with the increase in total handling.

4.3.2 Southern Highway

The proposed highway will be an access-controlled, 4-lane dual carriage way toll road with five interchanges. It can reduce travel time between Colombo and Galle to almost half, 90 minutes. The highway can carry heavy containers and bulk cargo safely. Marking the commencement of the project, construction of embankments started from the Matara side in January 1996.

4.3.3 Intra-Regional Artery Road Establishment

An intra-regional artery road is proposed to link Matara, Embilipitiya, Tanamalwila, Wellawaya and Moneragala as an alternative Southern Highway extension to the southeast dry zone (SEDZ). It would improve access to rural areas particularly in SEDZ. Probably 90% of rural areas in SEDZ, excluding the Yala National Park, would fall within one-hour time distance from this future artery road. It would contribute to improved marketing and social services delivery as well as complementary development of different areas along the road.

4.3.4 Coast Line Improvement and Upgrading

This is a sequel to the on-going OECF-funded project and, through rehabilitation, aims at achieving a maximum speed of 120 km/h on the entire line. The project includes the rehabilitation of railway bridges.

4.3.5 Rural Road Improvement

To improve condition of rural roads under severe financial and manpower constraints, local communities should be encouraged to participate in their maintenance. This program would provide 1) simple machinery and tools for road works, 2) training for community leaders on how to organize villagers, and 3) technical guidance for graveling, drainage improvement and repair/maintenance of rural roads. These activities may be undertaken at the Pradeshiya Sabah level. Depending on the performance of self-help efforts, asphaltting

of rural roads may be further implemented in the next stage by the Provincial Road Development Authority.

4.3.6 Koggala and Weerawila Airfields Upgrading

This project intends to upgrade the Koggala airfield to Class D and the Weerawila airfield to Class 3C.

4.4 Local Projects/Programs

4.4.1 Bypass Roads (Galle, Matara)

The interregional traffic passing through city centers causes traffic congestion, pollution and accidents. To mitigate such situations, national highways should have alternate routes to avoid city centers. Priority is given to Galle and Matara.

4.4.2 Rehabilitation and Maintenance of the National Highways

The World Bank and OECF have carried out major highway rehabilitation projects covering sections of A2, A4, A17, and A18. The World Bank projects consist of the rehabilitation of primary roads, bridge strengthening and replacement, and new construction of roadway. The OECF project aims to carry out rehabilitation and maintenance of class A and B roads, except those covered by an IBRD/ADB funded project. On the basis of these projects, this project provides asphalt concrete overlay and sand sealing.

4.4.3 New Road Construction

The existing highway network in the region does not necessarily provide easy access to major economic centers. Some new roads will effectively improve this situation.

Route A: Interchange on the Southern Highway—Akuressa—Deyiyandara—Middeniya—Embilipitiya—Tanamalwila—Kataragama

This proposed highway will be 4-lane dual carriage way, the same standard applied to the Southern Highway. The highway would become a part of the national highway network.

Route B: Galle—Nagoda—Pitigata—Ratnapura

The Galle city has very poor road connections to its hinterland and to other major cities. To promote the development of the city as the regional center, the road network around Galle should be strengthened to provide better access to the center.

4.4.4 Provincial Road Rehabilitation

This project intends to improve all class C and class D roads to ensure accessibility from a village to a center/markets. To minimize costs, appropriate road design and standard maintenance procedure should be first established for the class C and D provincial roads. The project includes the following components:

- 1) Provincial road master plan,
- 2) Standard drawing of road structure and road maintenance procedure,
- 3) Training of provincial staff, and
- 4) Road testing facilities.

4.4.5 Bus Terminal Improvement

This project consists of installation of bus parking lots, passenger shelters, toilets, and provision of bus information. The project can be financed with license duties paid by the shops around the bus terminal and license tax on private buses. The implementing agency will be the local government.

4.4.6 Community-Based Transport Services

This project intends to provide remote communities with adequate transport services. Basically private operators will provide the services but this project will assist them with training and concessionary loan arrangements. A basic training will be given to youths who are interested in providing rural transport services in the region. The training covers basic management skills and technical knowledge and skills necessary for rural bus operation. For those who have completed the training course, concessionary loans will be arranged for the purchase of vehicles.

4.4.7 Commercial Distribution Center

To make the regional transport system efficient, one or a few distribution centers will be needed where bulk of goods and commodities from and to the region are traded,

transshipped and stored. Such a center typically consists of a truck terminal, storage facilities and wholesale markets.

4.4.8 Technical Assistance to Provincial Council Department of Transport

Provision of transport services has been handed over to the private sector that is playing a major role in the region. While government intervention to the private sector should be kept minimal, routine monitoring and inspection of its activities are still necessary to ensure public interests. The Department of Transport of Provincial Council, therefore, has to bear broader responsibility for monitoring private operations than simply issuing route permits. It should extensively collect and analyze data on private bus operations to formulate transport policy pertinent to the province.

Telecommunications

SECTOR REPORT 4 TRANSPORT, TELECOMMUNICATIONS AND ENERGY

PART 2 TELECOMMUNICATIONS

CHAPTER 1 EXISTING CONDITIONS

1.1 Telecommunications Services in Sri Lanka

1.1.1 Telecommunications administration

In accordance with the Telecommunications Act No. 25 of 1991, Sri Lanka Telecom Corporation (SLT) was licensed on 1st September 1991 for operations of both domestic and international telecommunications services from the Sri Lanka Telecommunications Department (SLTD). At present, SLT is a fully government-owned but otherwise autonomous enterprise headed by a chairman and a board of directors appointed by the Government and is licensed for operations of not only basic services consisting of plain ordinary telephone service (POTS), telex and telegram services but also other non-basic services including public pay phone service.

The 1991 Act has also provided the Sri Lanka Telecommunications Authority (SLTA) the regulatory authority under the Director General of Telecommunications (DGT) within the Ministry of Posts and Telecommunications. SLTA controls the tariff system and interconnection charge, licensing of operators, radio frequency allocation, national numbering, consumer protection, enforcement of relevant laws and licensing conditions, in accordance with the Act.

A number of private companies are also licensed for providing various telecommunications services. These services include what are defined as value added services such as mobile telephone, paging, data communication and public pay phones.

The present organization of Sri Lanka's telecommunications sector with governmental organizations and private companies is shown in Figure 1.1.

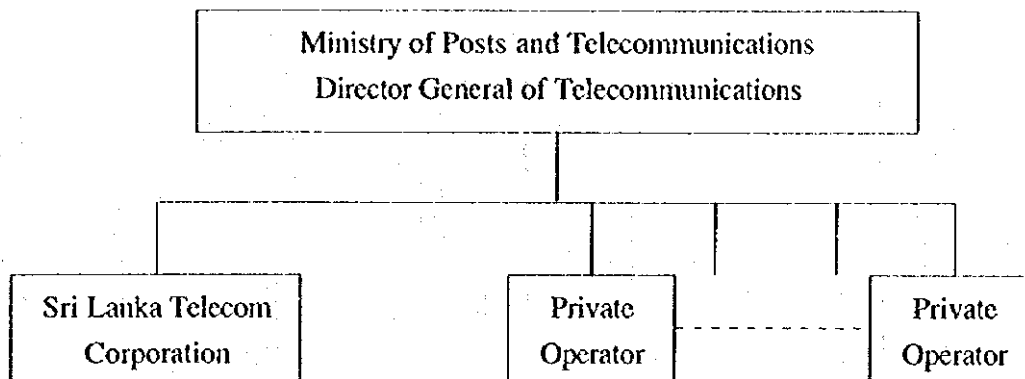


Figure 1.1 Organization of Telecommunications Sector

1.1.2 Telecommunications services

By the enactment of the Telecommunications Act No. 25 of 1991, operations of telecommunications services were opened to the private sector excluding basic services consisting of local, long distance and international POTS, and telex and telegram services. The Act has given SLT a monopoly of nation-wide basic telecommunications services and also provided the other services including value added services. Its services now include:

- plain ordinary telephone service (POTS),
- telex service,
- telegram service,
- leased circuits,
- public pay phone service,
- cellular mobile service (on a BOT basis),
- packet switching service (as a joint venture between SLT and Indian Saga),
- and
- radio maritime services including INMARSAT services.

All the eight services above are available in Southern Area.

The plain ordinary telephone service is the core of telecommunications services. At present telephone distribution in Sri Lanka is very skewed; about 70 % of the total telephones are concentrated in Western province (including Colombo), a highly disproportionate figure to its population share (Table 1.1).

Table 1.1 Telephone Distribution in Sri Lanka

Province	Telephones		Population		Number of telephones per 1,000 population
	Number	Share (%)	Number	Share (%)	
Western Province	134,169	72.4	4,640,700	26.1	28.9
Central Province	13,517	7.3	2,310,600	13.0	5.8
Southern Province	8,016	4.3	2,226,200	12.5	3.6
Northern and Eastern Provinces	4,535	2.5	2,297,800	16.8	2.0
North Central and North Western Provinces	9,062	4.9	3,314,200	17.7	2.7
Others	15,943	8.6	2,247,800	13.9	7.1
Sri Lanka	185,242	100.0	17,037,300	100.0	10.9

Source: Sri Lanka Telecom

In Sri Lanka as a whole, there exist 10.9 telephones per 1,000 population, but Western province dominates with 28.9 telephones per 1,000 population. Telephone availability is much lower in Southern Area with 3.6 telephones per 1,000 population.

Moreover, Southern Area has comparatively more waiting applicants for the telephone lines. The number of waiting applicants in Galle, Matara and Hambantota districts exceed the number of direct exchange lines as shown in Table 1.2.

Table 1.2 Number of Waiting Applicants and DELs

District	Waiting Applicants	Direct Exchange Lines
Galle	5,462	4,193
Matara	7,277	5,907
Hambantota	3,222	2,960

Note: The figures are as of January 1996.

Source: The Institution of Engineers, Sri Lanka. *Seminar on "essential technical inputs in the development of Southern Area,"* July 1996.

Under the 1991 Act, participation of private companies in non-basic services, especially in mobile telephone service, has been promoted to meet the rapidly increasing demand. In consequence, the number of private companies licensed has grown dramatically and reached

18 by May 1995. The number of private companies by service category is shown in Table 1.3.

Table 1.3 Number of Private Companies by Service Category
(as of June 1995)

Service Category	No. of Private Companies
Cellular mobile telephone	4
Paging service	5
Stored and forward fax service	2
Data transmission	3
Mobile radio trunking	1
Pay phone	3

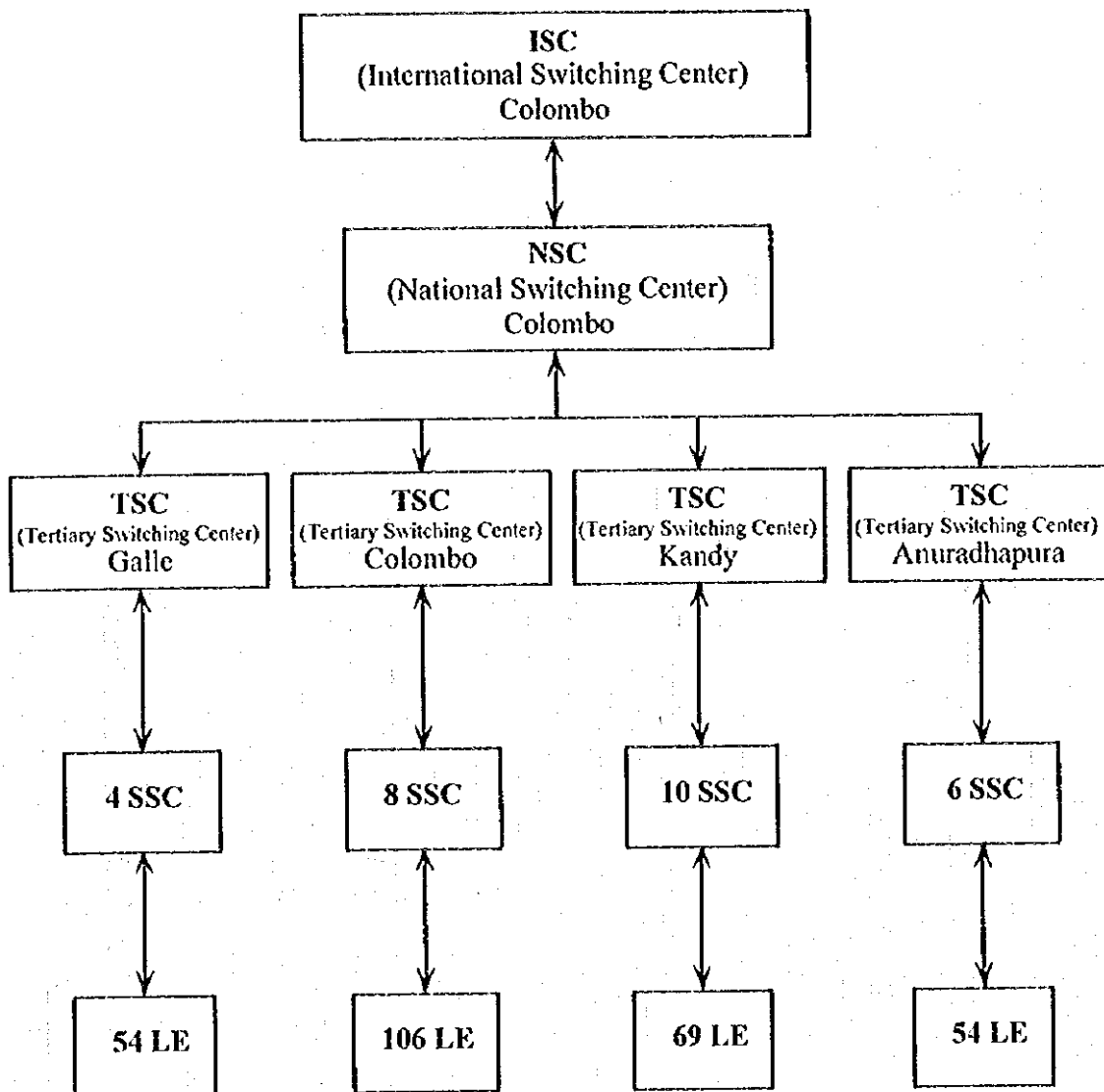
Source: Sri Lanka Telecommunications Authority

In Southern Area, two mobile telephone operators (Celltel and Mobitel) are in business as of June 1995. Service areas are Galle district by Celltel and Galle, Matara, Hambantota and Ratnapura districts by Mobitel.

1.1.3 National telecommunications networks

To meet the long-standing demand for the basic telecommunications services throughout the Country, SLT has been in process of digitalizing the whole system. It achieved to connect 87% of 180,724 total direct exchange lines to digital switching systems and to digitize 87% of the total transmission channels by October 1994. Both switching and transmission systems will be fully digitized by the year 2000, and improvement on and expansion of subscriber networks will also be accelerated by a series of projects.

The switching network of Sri Lanka consists mainly of national telephone switching network, international switching network and telex switching network. As shown in Figure 1.2, the national telephone switching network is structured by one national switching center (NSC) in Colombo as the gateway to/from an international switching center (ISC) also in Colombo, four tertiary switching centers (TSCs) in Colombo, Kandy and Anuradhapura, twenty eight secondary switching centers (SSCs) and 283 local exchanges (LEs). After the completion of several projects financed by SLT, the World Bank, OECF, Finland, France and suppliers, total switch capacity will reach approximately 620,000 in the year 1997.



Note: Prefix of SSC and LE show the numbers of SSCs and LEs.

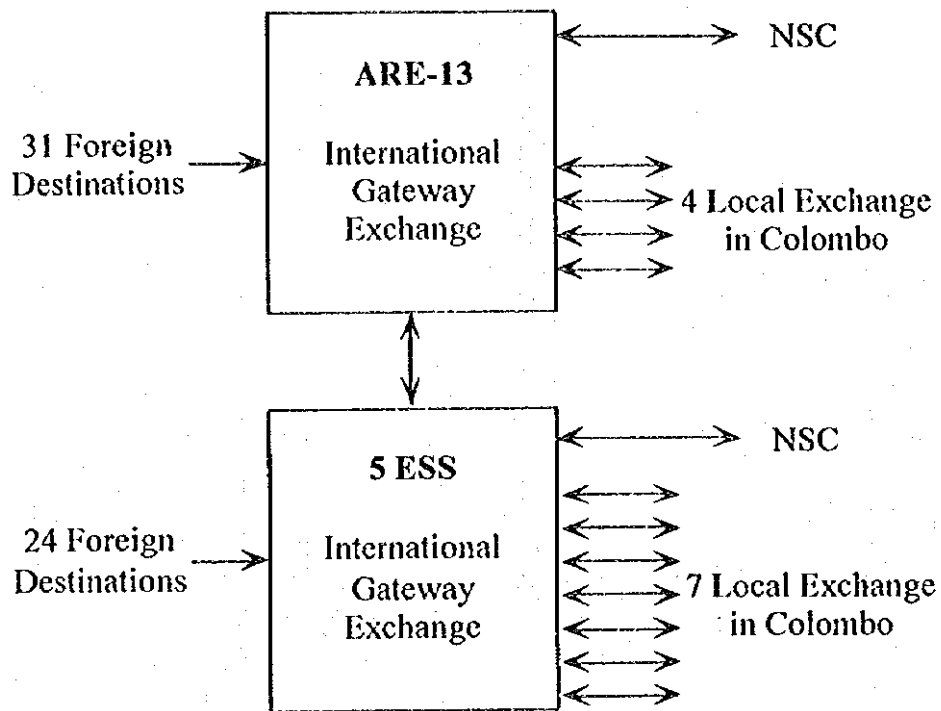
Figure 1.2 Hierarchical Structure of National Telephone Network

For the international switching center (ISC), two international switches, i.e., ARE-13 and 5ESS, operate in Colombo. In addition to the existing switches, NFAX-61 is under installation. International connections to/from foreign destinations are made through INTELSAT and/or submarine cables. Figure 1.3 shows the international telephone network configuration as of May 1995.

As shown in Figure 1.4, one telex exchange is operated in Colombo both for domestic and international telex services. As of May 1995, the total number of telex subscribers is 1,560. The telex network is used also for gentex service covering 44 post offices with 88 telex terminals on a nation-wide basis. International service is also provided with 213 international circuits.

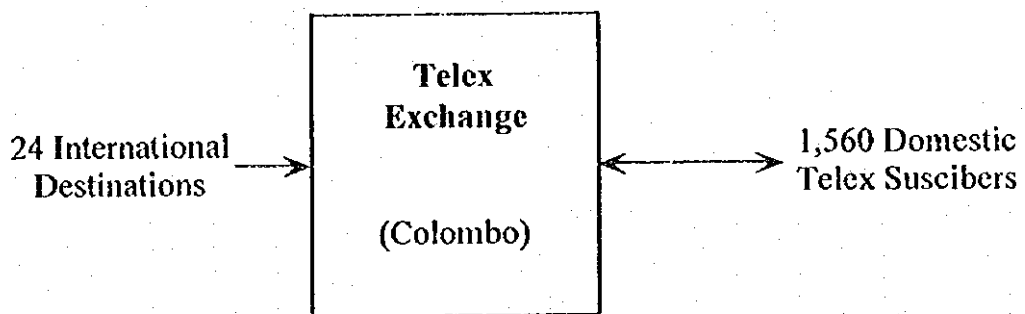
The national transmission network consists mainly of digital microwave transmission systems except for several spur links which were still of analog system as of May 1995. In some short sections the traditional cable PCM system is still in use. The fiber optic transmission system has so far been introduced for only one section between Kandy and Primrose. The national transmission network in the year 1997, when the on-going projects will have been completed, is depicted in Figure 1.5.

The international transmission network of Sri Lanka consists mainly of satellite transmission and submarine cable transmission networks for connections with 37 international destinations. Within the satellite transmission network, there are three kinds of earth stations installed: PDA-1A (INTELSAT-A type) with FDM/FM, SCPC and IDR transmission which was commissioned in 1975; COL-1B (INTELSAT-B type) commissioned in 1990; and PDK-2A, established recently. As for the submarine cable transmission network, two submarine cables are in use: SEA-ME-WE No.1 by a coaxial submarine cable system and SEA-ME-WE No.2 by a fiber optic cable system, which were commissioned in 1985 and 1994, respectively.



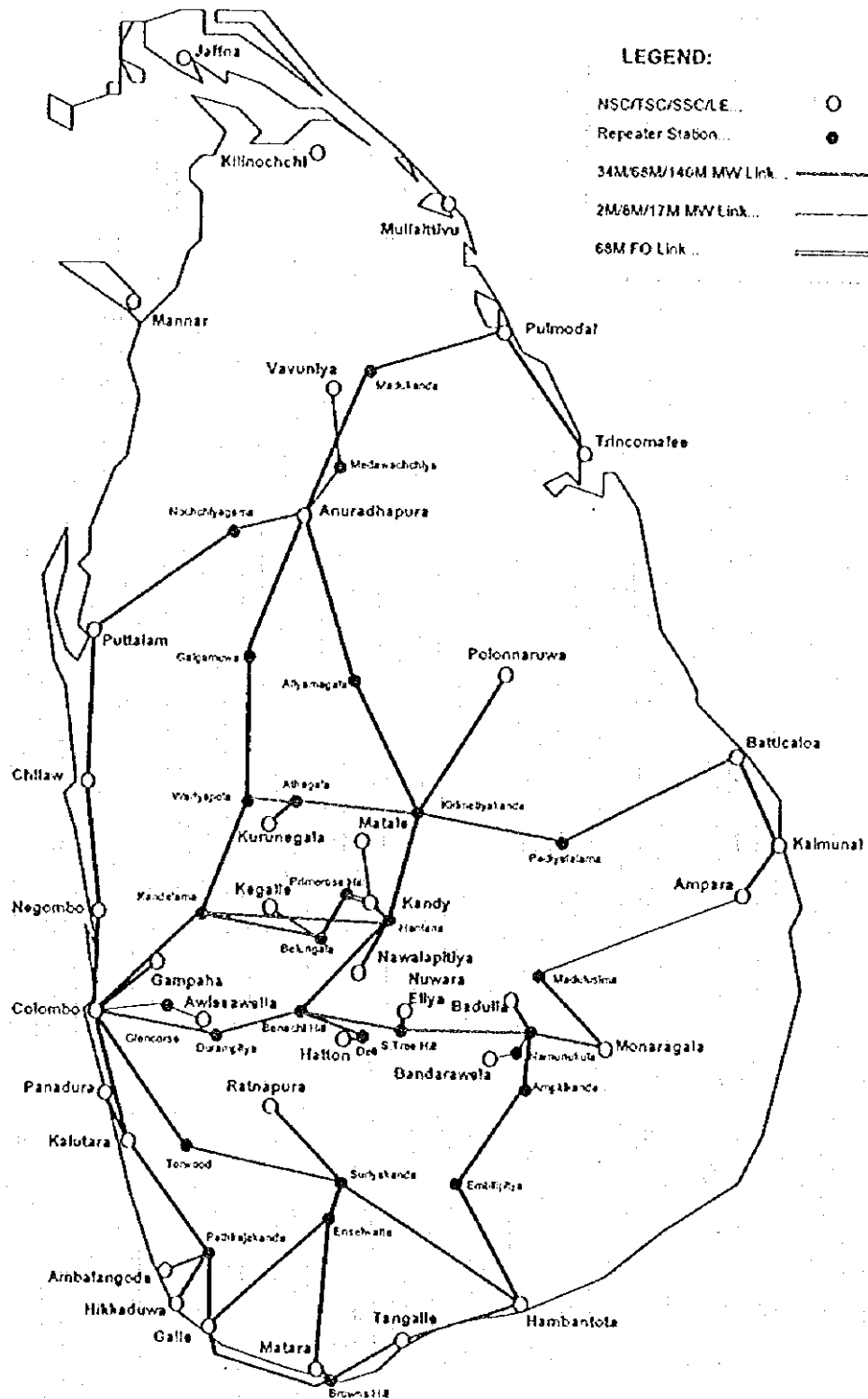
Source: Telecommunications Master plan

Figure 1.3 International Telephone Network Configuration



Source: Telecommunications Master plan

Figure 1.4 Telex Network Configuration



Source : TMP

Figure 1.5 National Transmission Network in 1997

The subscriber access network in Sri Lanka mostly consists of metallic cables. For some remote and isolated areas the multiple access subscriber system with digital radio is applied. The subscriber cable network has been rapidly improved by replacing deteriorated lead-sheathed cables with polyethylene-sheathed cables. The replacement will be completed by the year 1997. Table 1.4 compares subscriber cable facilities in 1994 with those in 1997.

Table 1.4 Subscriber Cable Facilities as of 1994 and 1997

Category	Condition as of the end of 1994	Condition in 1997
Switch capacity	237,466	619,987
Primary cable pairs	295,715	738,962
Cable pairs / Switch capacity	1.25	1.19

Source: Sri Lanka Telecom

Private operators other than SLT provide telecommunications services which are basically classified into two categories: data communication and mobile telephone. Two private operators, Lanka Communication Services and Electrotek, provide data communication service. Lanka Communication Services operates the DataNET whose service is available in the Colombo area. The network which was commissioned in 1993 is connected to TelePACK in Singapore. The number of subscribers as of June 1995 was 700. Electrotek also provides a data communication service in the Colombo area, and its subscribers totaled 800 in June 1995. In addition, Lanka Internet as an Internet provider in Sri Lanka is providing the Internet connection service. The number of subscribers was 200 as of June 1995.

Four mobile telephones operators are running separate networks: Celltel, Call Link, Mobitel and MTN Networks. The Celltel network is operated by Celltel Lanka Limited, a subsidiary of Milian International Cellular Company of the U.S. The service is currently limited to Colombo, Kandy, Galle and several other cities but its expansion is under way. Colombo, Kandy and other areas respectively account for 80%, 15% and 5% of the network's subscribers.

Mobitel is another major mobile telephone network operated by OTC Australia Ltd. The service started in 1993 as a BOT scheme under SLT. Its main coverage includes Colombo, Kandy, Anuradhapura and Galle. The network consists of one digital switch and 20 base stations which are connected with circuits leased from SLT except for Mobitel's own link between Galle and Matara. The network is connected to SLT's telephone network in

Colombo. Mobitel also provides international roaming to other AMPS networks. At present international roaming is available only in six Asian and Pacific countries, i.e., Australia, New Zealand, Hong Kong, Singapore, Thailand and Malaysia.

1.2 Telecommunications Development Plan and On-Going Projects

Over the past several years, under a new industrialization policy established in 1989, the Government of Sri Lanka has focused its economic activities on the development of export-oriented industries capable of obtaining foreign currencies. The policy has the following three pillars:

- To cultivate the private sector into the driving force of economic growth;
- To reduce the role of the public sector while making it work more effectively; and
- To distribute wealth fairly among the people.

Aiming at nation-wide telecommunications services, improvement of service quality, demand fulfillment and improvement of operational efficiency, the Telecommunications Department launched a five year development program which was first included in the Public Investment Programme 1990-1994. Due to some disturbances, however, implementation of the program was somewhat delayed and its completion is now scheduled in the year 1997. Tables 1.5 and 1.6 summarize the projects under the program. It is expected that by the end of the program the number of direct exchange lines (DEL) will reach 500,000 approximately.

Table 1.5 On-Going Projects with Foreign and Private Funds

No.	Project Title	Finance
1	International Telecommunications Network Facilities Project	ADB
2	Second Telecommunications Project (Trunk Transmission Network)	ADB
3	Technical Assistance for Trunk Transmission	ADB
4	Technical Assistance for International Network Facilities	ADB
5	Revenue & Operation Support System (ROSS)	ADB
6	Matara Telecommunication Development Project	Finland
7	Consultancy for Matara Project	Finland
8	Second Telecommunications Project (Exchanges)	IDA/WB
9	Exchange Rehabilitation	IDA/WB
10	Technical Assistance for Second Telecommunication Project (Exchanges)	IDA/WB
11	Greater Colombo Telecommunication Network Improvement Project II Package I (Greater Colombo Area)	OECF
12	Greater Colombo Telecommunication Network Improvement Project II Package II (Gampaha and Katunayake Area)	OECF
13	OECF III Regional Telecommunication Development Project	OECF
14	150 K Suppliers Credit Project	Private
15	Improvement of Telecommunication Facilities in Ingiriya Area	EDCF
16	Improvement of Telecommunication Facilities in Horana Area	EDCF

Source: Sri Lanka Telecom

Notes: ADB: Asian Development Bank

IDA: International Development Association

WB: World Bank

OECF: Overseas Economic Cooperation Fund, Japan

EDCF: Economic Development Cooperation Fund, South Korea

Table 1.6 On-Going Project with SLT's Own Funds

No.	Project Title
1	Local Transmission Links (spur link) for WB Exchange Project
2	Outside Plant Development in 9 Regional Stations
3	Subscriber Line Connections in Regions
4	Multi-Access Radio System
5	Single Channel Radio System
6	Crash Program for Cable Augmentation and Subscriber Line Connection
7	Colombo - Katunayake Radio Transmission Line Expansion
8	Investment in TAT (Transatlantic No. 12/13 Cable)
9	Investment in Columbus II Cables
10	Investment in MT (Malaysia - Thailand) Cable
11	Intelsat Satellite Capacity Expansion
12	Colombo PCM Expansion 2
13	Colombo PCM Expansion 3
14	SESS Gateway Expansion No.2

Source: Sri Lanka Telecom

Along with these projects, a JICA-funded master planning study for the national telecommunications sector was recently concluded. The study covered a 20-year period up to 2015. The Final Report was published in May 1996 and will be referred to as the Telecommunications Master Plan in this report.

Of those projects listed above, four projects have particular relevance to Southern Area. They are (1) Matara telecommunication development project, (2) 150 k suppliers credit project, (3) Multi-access radio system, and (4) Second telecommunications project (trunk transmission network). Brief descriptions of these projects follow.

1.2.1 Matara telecommunication development project

This project will provide around 15,500 new telephone lines in the following areas in Matara district.

Matara	Weligama	Deniyaya
Dickwella	Kottegoda	Tellijawila
Hakmana	Kamburupitiya	Kotapola
Mawarala	Urubokka	Pitabaddara
Akuressa	Morawaka	Yatiyana
Mulatiyana	Kekanadura	

To interconnect remote places to the city of Matara and to connect Matara to other cities, radio and optical fiber transmission links have been provided. This project is scheduled to complete before the end of 1996.

1.2.2 150 k suppliers credit project in Galle and Hambantota

Under this 150 k suppliers credit project, Southern Area will be given 12,000 land lines and around 1,600 radio lines. The installation work is expected to finish around mid-1997. The project covers the following areas in Galle and Hambantota districts.

<u>Galle district</u>		
Galle	Elpitiya	Habaraduwa
Baddegama	Kesgoda	Udugama
Imaduwa	Nagoda	Dodanduwa

Hambantota district

Hambantota
Embilipitiya
Beliatta

Ambalantota
Kataragama
Sooriyawewa

Tissamaharama
Tangalla

1.2.3 Multi-access radio system

A total of 19 remote areas in Southern Area have been selected by SLT for provision of wireless service. These areas have significant commercial activity taking place but no communications facilities in service. This project is expected to complete in early 1997. The remote villages covered by the project are as follows.

Galle district

Pokuluwakanda
Navadagala
Hiniduma

Kahaduwa
Neluwa
Wakwila

Madakumbura
Tawalana
Katudampe

Hambantota district

Ridiyagama
Barawakumbuka
Pallemalala
Sooriyawewa

Beragama
Mamadala
Mirijawila

Kirinda
Baudagiriya
Padalangala

1.2.4 Second telecommunications project

Under this project, supported by ADB, trunks connecting Southern province to Colombo will be increased to meet the traffic requirement up to the year 1998.

CHAPTER 2 CONSTRAINTS AND POTENTIALS

2.1 Constraints

2.1.1 Constraints in the national context

Major constraints of telecommunications in Sri Lanka are line shortage, low transmission capacity, underutilization of exchange capacity, low service quality, and SLT's difficulty to finance projects timely and adequately. These apply also to Southern Area as described below.

(1) Line shortage

As far as line shortage is concerned, the overall situation is improving rather fast. SLT will have expanded its national network by 1998 adding some 385,600 new lines to the existing 180,000. This is a significant increase to resolve immediate problems represented by almost 180,000 subscribers on the waiting list at the end of 1994.

The expected Southern Area development, however, would call for continuous and even more rapid expansion of telephone coverage. High costs associated with the installation of subscriber telephone lines would become a serious constraint. Especially, high costs of wire-line transmission have kept a good part of rural areas without telecommunications services. Southern Area has about 2.6 million population but only about 8,000 telephones and some 13,000 direct exchange lines in Galle, Matara and Hambantota districts. Low-cost methods should be explored to provide the rural population even with the basic telephone service.

(2) Low transmission capacity

Where the basic telephone service is available, the low capacity of existing lines becomes another problem. The installed networks consist of analog copper wires that for the most part of Southern Area will never be upgraded to a digital broadband system required for advanced network connections that have come to be known as the information highway. As the rapid movement of information becomes increasingly more essential to all those things associated with a high standard of living -- from education and health care to economic development and public services -- there is a real danger that the quality of life will not improve, and may even decline, in areas that lack the digital broadband infrastructure.

(3) Underutilization of exchange capacity

While a large number of applicants wait for a line connection, exchange capacity is not fully utilized to its maximum. For instance, SLT had 237,464 lines of exchange capacity and 180,724 connected lines at the end of 1994. This means only 76% of the installed exchange capacity was used nationally. The utilization rate was even lower in Southern Area despite the huge backlog. Installed exchange capacity and connected lines as of December 1994 were 5,095 and 3,393 in Galle district, 2,115 and 1,830 in Matara district, 4,326 and 2,793 in Hambantota district, respectively. The utilization rate of these three districts combined was 69.5%. This low utilization is caused by the fact that installation of peripheral facilities could not catch up with the rapid increase of exchange capacity. It is necessary to better manage the construction schedule of peripheral facilities so that the exchange resources can be used as efficiently as possible.

(4) Low service quality

Quality of available services, particularly of telephone service, is low. Service quality is evaluated generally with three indices: call completion rate, fault occurrence rate and fault clearance rate. The call completion rate is a percentage of call attempts that receive an answer. Statistical data from year 1990 to 1994 show that the call completion rate in Sri Lanka was 28%, a relatively low figure compared with that of the Philippines (30%), Indonesia (39.4%), Malaysia (50%), Thailand (54.5%), Singapore (70%) and Japan (83.5%). Both the fault occurrence rate and the fault clearance rate are also poor compared with those of other developed countries. This causes low customer satisfaction and a decrease in revenue.

(5) SLT's financial inability

As has been demonstrated in the preceding sections, telecommunications services, particularly telephone service, are unable to meet the existing demand in Sri Lanka and in Southern Area as well. The main reason for this failure is SLT's financial inability. The current system is such that SLT cannot raise adequate funds in a timely manner as stipulated or as necessary. To put it differently, funding requirements for telecommunications development can no longer be met with public sources. Delay in upgrading the telecommunications infrastructure has become more evident in comparison with economic growth. In order to fill the gap between supply and demand for telecommunications

services, infrastructure development with private participation should be given more serious consideration.

It therefore seems inevitable that basic telecommunications services will eventually be provided by private operators if further nationwide development of the telecommunications sector is to materialize. One concern is that private operations may lead to unbalanced development of telecommunications networks because profitability should become their primary consideration. It is especially feared that rural telecommunications may be left out.

For Southern Area, line shortage is the most critical of the five constraints described above. Its first and foremost priority should be to have sufficient telephone lines installed. This is clearly the first step for the telecommunications development in Southern Area to take.

2.1.2 Adverse effects of line shortage on Southern Area development

(1) Line shortage

The seriousness of line shortage in Southern Area may be seen as follows. Table 2.1 shows the number of direct exchange lines (DELs) and the number of industrial establishments of various kinds in three districts of Galle, Matara and Hambantota in 1995.

Table 2.1 Number of DELs and Industrial Establishments in Southern Area (1995)

	Galle District	Matara District	Hambantota District
DELs	3,750	2,979	2,912
Industrial establishments	12,064	9,829	4,190

Source: JICA Study Team

Since the direct exchange lines available are allocated among all kinds of subscribers, industrial establishments can only take up a portion of them. Comparable data elsewhere suggest that roughly 20% of total DELs will be made available to the industrial sector, that is 600 to 700 in each of the three districts. These numbers are too small even compared with the numbers of industrial establishments which already exist. No serious development can be expected for industry given this severe shortage in telephone lines.

(2) Effects by sector

Health care

The same constraint is being felt by various other sectors in Southern Area. Hospitals, schools and governmental organizations are also faced with insufficient telephone lines. In health care, for instance, a health referral system presupposes smooth communication between hospitals with telephones. The hierarchical system of primary, secondary and tertiary health institutions is not functioning as it is supposed to. In rural villages with no telephone line, the situation can be more serious when a medical emergency occurs.

Education

Schools also have very limited telephone access to and from outside. The shortage of telecommunications access in schools is partly accountable for high drop-out rate and inadequate quality of teachers. Lack of proper communications between schools and students' homes may prevent teachers' prompt actions when it is necessary to give guidance to students. Dropping out is one of the worst choices for students without such a guidance. Telecommunications inaccessibility sometimes causes more serious problems than poor transport access between a school and houses. Teaching in a rural area without telecommunications access may be equivalent to teaching in isolation from a modern society. Opportunities for improving his or her teaching level will be limited without telecommunications.

Agriculture

Poor telecommunications access affects agriculture as well. It hinders farmers from obtaining in real time wholesale and retail prices in the market. The same applies to fishery, too. Poor telecommunications access prevents fishermen from sharing the information such as present market prices, landed and marketing quantity, types of fish, and fishing conditions.

Tourism

Tourists also suffer from poor telecommunications access at the gateway and during itineraries. Most guest houses in Southern Area have no basic telephone facilities for reservation.

Development management

Area-wide water management and broad based environmental monitoring would call for participation of local people and communities as well as various agencies and institutes. A prerequisite would be public switched telephone networks covering extensive areas.

Some duplication of activities by governmental organizations may be attributable to a lack of communications. More effective communications and information sharing among governmental organizations would improve the overall development administration and management, leading even to changes in the present socio-political structure in Southern Area and elsewhere.

2.2 Benefits of Telecommunications Development

Advanced technologies have revolutionized the ways people exchange and process information in urban areas of developed nations. In the rest of the world, however, even more basic needs are left unmet. Today the cost of bringing modern communications technology to remote areas is so high that many of the people in Southern Area cannot participate in the global community. Yet the benefits of the information revolution should be extended to all, including those who do not live near centers of commerce or industry, who do not have ready access to doctors, hospitals, schools or libraries and who are at risk of being left out.

A digital wireless communications system can provide a way to extend the principle of universal service to unserved areas in Southern Area at low cost. If complemented with a technology that can inexpensively support broadband data and multi-media applications, digital wireless systems can induce fundamental social and economic changes in Southern Area.

Most importantly perhaps, digital wireless networks may help to reduce migration from less developed parts of Southern Area to the city of Colombo or even from the Country to some developed nations. Wire-line technologies represent the industrial-age paradigm in which the economics of infrastructure drives people into overcrowded, overburdened urban congregations. Digital wireless networks, in contrast, can help people choose where they live and work based on such considerations as family, community and quality of life rather than access to better infrastructure.

In this context, Southern Area's underdeveloped telephone networks at present may be a blessing in disguise. New networks using the latest technology of digital wireless communication can be introduced in Southern Area rather than laying any copper wires. It may change the distribution of people, economic activities and wealth in urban and rural areas through fast and easy communications between these areas.

2.3 National Demand Forecast

The Telecommunications Master Plan estimates national demand using a standard regression model developed by the International Telecommunication Union (ITU). The model analyzes correlation between the expressed demand density and the gross domestic product (GDP) per capita using 1992 data from 50 countries. Table 2.2 summarizes the results.

Table 2.2 Telephone Demand Forecast for Sri Lanka

Item	1995	2000	2005	2015
Population (x 1,000)	17,937.3	18,830.9	19,780.6	21,524.0
Suppressed: 0%	480,679	678,127	978,536	1,663,173
Demand density	2.68	3.60	4.95	7.73
Suppressed: 20%	576,815	813,753	1,174,244	1,995,808
Demand density	3.22	4.32	5.94	9.27

Source: Telecommunications Master Plan

National population estimates shown in the table above are slightly smaller than projected for the Southern Area Master Plan. Also, in view of the wide introduction of digital wireless networks and computer-based communications as envisaged earlier, the above forecasts appear on the conservative side. It is very likely that telephone demand nationwide will be more than 2 million in 2015.

CHAPTER 3 OBJECTIVES AND STRATEGY

3.1 National Objectives and Strategy

3.1.1 National objectives

The Economic Policy Statement of the Government of Sri Lanka announced in September 1994 states that public investment would be needed to build the infrastructure as a necessary complement to rapid private sector growth and socio-economic activities. In line with this policy, the Telecommunications Master Plan has set out the objectives of telecommunications development in Sri Lanka as follows.

- To provide telecommunications to all, at cost-based tariffs;
- To achieve universal service covering the whole Country including all villages, implying easy access to basic telecommunications services such as telephone, telegraph and facsimile to all at affordable and reasonable prices;
- To provide an acceptable quality of service for voice and data communications, both national and international;
- To eliminate the waiting lists for telecommunications facilities;
- To provide prompt and effective attention to customer complaints and improve public relations; and
- To progressively increase local value-added components of telecommunications projects by purchasing local manufactures and hiring domestic contractors at competitive price levels.

These objectives would be pursued with due consideration given to security and environmental concerns.

3.1.2 National strategy

To achieve the objectives presented above, the Telecommunications Master Plan further clarifies a long-term strategy to develop the national telecommunications networks by the year 2015. According to the Plan, the planning period up to 2015 is divided into three stages with a specific set of targets assigned for each. The short-term plan targeting 2000 focuses on improvements on a local exchange basis; the medium-term plan aiming at 2005 continues on an exchange basis; and the long-term plan up to 2015 steps up improvement on

a secondary switch center (SSC) area basis. Selected key indices of the Master Plan are summarized in Table 3.1.

3.2 Objectives of Telecommunications Development in Southern Area

Southern Area seen in the context of national socio-economic and spatial development can be characterized as follows. It is comparatively less developed and predominantly agricultural and rural; in agriculture some plantation crops and other traditional crops dominate; unemployment rates are high; it has a lower urbanization rate than the national average, without well developed urban centers; strong connection exists with the Colombo metropolitan area; out-migration is prevalent; compared with other regions, its physical environment, fauna and flora are diverse; and socio-cultural and historical inheritances are rich.

The objectives of the Southern Area development are defined to address the most critical economic, social and environmental problems facing the Area. They are:

- to create a sufficient number of high earning employment opportunities for growing and increasingly more educated labor force;
- to preserve/enhance the unique natural and social-cultural resources of sufficient diversity as a sustainable basis for various socio-economic activities; and
- to contribute to realizing open and competitive economies of Sri Lanka within the increasingly borderless world.

Telecommunications development in Southern Area should support the realization of these objectives by providing a firm ground on which the whole efforts and activities will take place. The development should be planned, therefore, by taking the regional characteristics and conditions into full account. Viewed from the telecommunications' perspective, Southern Area's development may be particularly facilitated when three distinctive directions are pursued.

Table 3.1 Key Indexes Planned by TMP (1/2)

Indexes	Sub-Indexes	Present Status as of 1994	Development Targets		
			Short-Term Targets By FY 2000	Medium-Term Targets by FY 2005	Long-Term Targets by FY 2015
Socio-Economy	Population	17,765,000	18,831,000	19,781,000	21,524,000
	GDP/Capita (US\$ Price in 1992)	534	761	1,056	1,673
Plain Ordinary Telephone Service (POTS)	Expressed Demand		820,000	1,180,000	2,000,000
	+20% Hidden Demand (DEls)				
	Expressed Demand (DEls)	367,000	680,000	980,000	1,670,000
	Supply Volume (DEls)	181,000	667,000	980,000	1,670,000
	Switching Capacity (Line Units)	237,000	800,000	1,200,000	2,000,000
Telex Service	DEls / 100 inhabitants	1.0	3.5	5.0	7.8
	Network Coverage	to Major Villages	to All Villages by 1998		
	Telex Subscriber Demand	Decreasing	Decreasing	Decreasing	
	Supply Volume (DEls)	1,560	No Expansion	No Expansion	to Other Services
Telegram Service	Genlex Service	88 Terminals for 44 Post Office	Same as the present	Same as the present	to Other Services
	Voice Circuits, Data Circuits	Between Major Cities	Between Major Cities	Between All Districts	Nation-wide Service
Leased Circuit / Matrimine Communication Services	Ordinary Services by MF, HF, VHF / INMARSAT services	Ordinary Services / INMARSAT services	Ordinary Services / Enhancing INMARSAT services	Ordinary Services / Enhancing INMARSAT services	Ordinary Services / Enhancing INMARSAT services
	Cellular Mobile Telephone	Operated (32,500DEL)	Major Cities	All District Capitals	All Districts
Value Added Services	Public Payphones	Operated	All Villages	Increase the Number	Increase the Number
	Electronic Mail	Operate in 1995	Major Cities	Major Districts	All District Capitals
	Data Communications	Operated	Major Cities	Major Districts	All District Capitals
	Voice Mail	Not Operated	Colombo	Major Cities	Major Districts
	Video Text	Not Operated	Colombo	Major Cities	Major Districts
	Audio Conference	Not Operated	Colombo	Major Cities	Major Districts
	Video Conference	Not Operated	Colombo	Major Cities	Major Districts
	Radio Paging	Operated	Major Cities	Major Cities	Major Districts
	Trunked Mobile Radio Services	Operated	Major Cities	All District Capitals	Nation-wide Service
	Narrowband ISDN Services	Not Operated	Colombo	Major Districts	All Districts
	Broadband ISDN Services	Not Operated		Major Cities	All District Capitals
IN Services	Not Operated	Colombo	Major Cities	Major Cities	

Table 3.1 Key Indexes Planned by TMP (2/2)

Indexes	Sub-Indexes	Present Status as of 1994	Development Targets		
			Short-Term Targets By FY 2000	Medium-Term Targets by FY 2005	Long-Term Targets by FY 2015
Service Quality (for basic services)	Call Completion Rate	28%	45%	55%	70%
	No. of Faults (/ month / 100 DEL)	26	15	10	5
	Fault Clear Rate within 24hours	55%	85%	90%	95%
Operational Efficiency (for basic services)	Number of Staff	7,500	9,200	10,000	10,900
	Staff / 1,000 DEL	42	14	10	7
Network Facilities	Switching System	Manual / Analog / Digital	100% Digital	100% Digital	100% Digital / Introduction of ATM
	Transmission System	Microwave & FOTS / Analogue & PDH	FOTS & Microwave / 100% Digital / Backbone by FOTS/ Introduction of SDH	FOTS & Microwave / 100% Digital / Expansion of Backbone by FOTS / Expansion of SDH	FOTS & Microwave / 100% Digital / Expansion of Backbone by FOTS / Expansion of SDH
Subscriber Network		Metallic Cable & Radio	Metallic Cable & Radio / Introduction of Optical Fibre Cable	Metallic, Optical Fibre and Radio system / Expansion of Optical Fibre	Metallic, Optical Fibre and Radio system / Expansion of Optical Fibre
	Maritime Communication	Conventional System	Introduction of GMDSS		
Revenue	Revenue / DEL (US\$)	838	620	551	505
	Total Revenue (US\$1,000)	142,765	365,915	484,939	792,750
Expenditure	O&M Cost (US\$1,000)	55,402	101,117	131,547	196,298
	Other Cost (US\$1,000)	25,548	238,333	224,191	214,636
Profit	Profit before tax (US\$1,000)	61,814	26,465	129,201	381,856

Abbreviations:

DEL: Direct Exchange Line

PDH: Plesiochronous Digital Hierarchy

SDH: Synchronous Digital Hierarchy

ATM: Asynchronous Transfer Mode

FOTS: Fibre Optic Transmission System

GMDSS: Global Maritime Distress and Safety System

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- If there is an information nucleus in Southern Area, the region may be far more tightly connected to the outside world;
- If every rural service center (kadamandiya) has access to telephone, the service will provide rural population with a modern means of communication with advanced parts of the region and the Country; and
- If sophisticated telecommunications access to the outside world is available in a large scale, it can change Southern Area dramatically.

With better telecommunication networks and services, economic activities in such sectors as agriculture, fisheries, industry, tourism, trade and other services can no doubt benefit and their development expedited. The networks and services will also facilitate environmental development and the protection and management of natural resources. Their benefits are particularly immediate in social development, in the education and health care systems.

3.3 Telecommunications Strategy for Southern Area Development

In line with the overall strategy adopted in the Telecommunications Master Plan, telecommunications development in Southern Area should also be phased in three stages. Since nationwide basic systems will be provided according to the Master Plan, only a few projects need to be formulated exclusively for Southern Area. Nonetheless, the region's development scenario as well as characteristic problems calls for some development strategy specific to Southern Area. The three-phase strategy is summarized in Table 3.2.

Table 3.2 Strategy for Telecommunications Development in Southern Area

Period	Characteristics
Phase I (1997--2000)	Rural telecommunications development Establishment of the information community in Galle
Phase II (2001--2005)	Extension of digital wireless networks to all rural service centers (kadamandiya)
Phase III (2006--2015)	Gradual introduction of Internet or integrated services social network (ISSN)

The strategy and targets are described below by phase.

3.3.1 Phase I: 1997--2000

In the immediate future, rural post offices should be strengthened with telephone/telex facilities for broad-based rural telecommunications development. It is recommended also to install payphone booths in every small town. These measures can be taken prior to commencing major telecommunication improvement projects.

South 2001 prepared by the Presidential Task Force for Southern Area Development envisages the new international city of Galle as a high priority to be realized. To support this vision, an international information base should be established in Galle. Strengthening of backbone networks in major cities of Galle, Matara and Hambantota will be finished by 2000 according to the Telecommunications Master Plan. The information community in Galle, therefore, can be established in 2000 based on the networks planned in the Master Plan.

During this phase, Galle will start a transformation into an information-oriented city. Some area in Galle shall be designated as the location of an information base or information community in which a telecommunication research center, private laboratories, and other associated facilities will be established.

3.3.2 Phase II: 2001--2005

A second step for the development of telecommunications in Southern Area is to extend digital wireless application from the trunk networks down to branch lines. The wireless branch networks should be expanded to all rural service centers (kadamandiya) where no telephone services have been available so far. Sri Lanka Telecom may carry out this development by 2005 in Phase II (2001--2005).

In selecting the most appropriate technology to install for telecommunications networks in Southern Area, following points should be considered.

- Construction period must be short;
- Construction cost must be low;
- Multimedia communications must be possible;
- Terminal mobility should be required;
- Complete two way communications must be available; and
- Interface with existing systems must be cleared.

Those requirements are satisfied by digital wireless networks. The so-called digital wireless local loop system (DWLLS) applied to the terminal equipment appears the right answer. This system is based on air interface and enables individual subscribers both in urban and rural areas to have direct, wire line quality connection from a public telephone exchange quickly and economically.

3.3.3 Phase III: 2006--2015

Phase III is the period when various application systems are introduced on the basis of the public telephone networks established and expanded by Phase II. The networks then combine computers and telecommunications extensively. Some aspects of development during this Phase are described below.

(1) Applications to agriculture and water management

Telecommunications networks can make possible highly efficient management of water resources. One system for this purpose consists mainly of rainfall and water level gauges, radio equipment for data transmission, and central equipment for monitoring/controlling and analyzing. This system's unique feature is that it relies on the public switched telephone network as its means of data transmission so that it can cover large areas with relatively low cost, and contribute to systematic and efficient water usage.

The Udawalawe reservoir and the Lunuganwehera reservoir, for instance, may have their own irrigation and drainage control systems separately. Once water diversion schemes are completed and the two reservoirs are connected, however, the two independent telemetering systems can be linked up via the public switched telephone network enabling the irrigation management of the extended areas. Similarly, individual river water monitoring systems for Kirindi Oya, Uma Oya and Menik Ganga can be technically integrated into one irrigation and drainage management system.

Another important application to agriculture is for marketing. Wholesale and retail prices of agricultural produce quoted at Colombo, Galle, Matara and even in overseas markets can be easily obtained in real time by farmers and traders in major production areas like Hambantota and Moneragala.

(2) Applications to fisheries

In order to achieve a modernized fish production and distribution system and to attain equal distribution of profits between fishermen, distributors, and consumers, a computer network system can be introduced. This system is composed of main frame computers which will be tied into personal computers through the public switched telephone network to obtain price information, landed and marketed quantity, types of fish, and fishing conditions. The Galle fishery harbor, Mirissa fishery harbor, Puranawella fishery harbor and Kirinda fishery harbor can be candidates for initial introduction.

(3) Applications to industry

For industrial activities, voice telephone, facsimile and computer data communications are essential means. Wireless personal phones can be introduced immediately for business purposes.

(4) Applications to tourism

A comprehensive tourist information system which provides tourists with necessary travel information in Southern Area is a possibility. The Ceylon Tourist Board may play the central role in collecting and providing the information through the public switched telephone network. The system connects the Board to various tourist locations like airports, hotels, tourist spots and so on. Typically, hotels in Colombo may install open terminal equipment connected to the public switched telephone network so as to provide guests with useful information on transportation, traffic conditions, events and accommodations in Southern Area.

(5) Applications to environmental management

An environmental monitoring system may be established first to monitor the natural environment. Sensors are installed in sensitive areas enabling prompt actions against damage or pollution to the natural environment. Such a system can be introduced in Yala National Park, Gal Oya National Park, Uda Walawe National Park and Sinharaja Forest Reserve.

(6) Applications to education

Incentive computer education (ICE) is a system which assists teachers to organize more advanced and attractive class lectures. ICE, for instance, enables students to communicate with other students outside the region--or even abroad. It can also help teachers share knowledge with fellow teachers working in various parts of the Country and with academics or experts on education. Internet is the medium for these purposes. The Southlands Girls School in Galle, Saint Thomas' Boys College in Matara, Saint Mary's National School in Hambantota, and Royal National School in Moneragala are some candidates for initial installation of such a system.

(7) Applications to health care

An integrated services medical network connecting health organizations can be a necessary step towards the advanced health care system. This system enables medical staff to communicate with each other mainly for consultation. Voice communication is standard for this purpose but for higher level health organizations Internet will also be needed for diagnostic as well as consultation purposes. The General Hospitals in Galle and Matara, and Base Hospitals in Hambantota and Moneragala can be linked up in this network.

(8) Applications to job placement

Job finding is the most crucial matter not only for newly graduates but also for the jobless. A computerized placement system can greatly facilitate those job-seekers' effort. The system consists of a data-based common computer and its peripherals connected via the public switched telephone network. IRDP offices in Galle, Matara, Hambantota and Moneragala may be the places expected to install this system.

(9) Applications to government offices

Internet can potentially improve the functioning of government offices through on-line services that are available on the World Wide Web (WWW). Those services can help manage important information, expedite decision making and improve efficiency.

CHAPTER 4 MEASURES

4.1 Basic Recommendation

One major objective of telecommunications development in Southern Area is to extend the services to all residents. However, the high cost associated with the conventional technologies has prevented remote areas from receiving the services. The Southern Area Master Plan recommends the application of a new technology: digital wireless networks with computers.

4.2 Projects

4.2.1 Establishment of Galle Information Community

Telecommunications development in Southern Area should start with establishing a backbone network in each of Galle, Matara, Hambantota, Moneragala, Ampara and Ratnapura cities. Those backbone networks are included in the Telecommunications Master Plan and their implementation is highly recommended. In addition to the backbone network, Galle should have a set of advanced facilities to function as an information city. This is in line with the concept of the new Galle city as described in *South 2001* prepared by the Presidential Task Force for Southern Area Development: "the City would need to strive to attract national and international business and investment including the location of corporate and other headquarters, operate as a transport hub for the South Asian region and become a popular destination for domestic and overseas visitors." To this end telecommunications should be given due emphasis in order to create an environment satisfactory to businesses and industries in Galle.

A telecommunications base named the Galle Information Community (GIC) shall be established which will function as a transmission and reception center for the information related to industry, culture and tourism. The GIC shall also provide educational and vocational training facilities focusing on computers and communications. Research and development constitute another important function there since computers and communications represent a field changing very rapidly and continuous study and research are necessary to catch up with the technological progress. Establishment of telecommunication-related industries is welcomed in Southern Area because of their generally smaller impact on the environment. Injection of international information to Galle and to Southern Area will surely accelerate the region's development.

Facilities to be located at the GIC include a research center, telecommunication-related factories, private laboratories and parabolic antenna for cable television (CATV).

4.2.2 Digital wireless networks to all rural service centers

The Telecommunications Master Plan expects that demand for telecommunications services will be met by the year 2001. In line with this, Southern Area's own telecommunications development plan should aim at strengthening the existing network by installing digital wireless networks in all rural service centers (kadamandiya) as well as in urban areas.

The digital wireless network operates by radio to connect the customer and the local exchange. Thus the subscriber connection is no longer restricted to copper wire or coaxial cable. For areas where the conventional local loop system is not feasible, this new technology offers a less expensive means of access to the public switched telephone network. Its introduction will expedite the telephone installation for waiting applicants and, at the same time, require the service provider less investment compared with the wire solution.

Major system parameters for the proposed digital wireless local loop system (DWLLS) may be as follows.

Interface on the access network side	2 x 2 Mbit/s (ITU-T Rec.G703)
Interface with PSTN	2 wire analog or V5.2
Voice coding	Max.64 kbit/s PCM ADPCM
No. of slots	60 (64 kbit/s coding)
Subscriber line capacity	Max. 1024 (64 kbit/sec coding)
Frequency band	1895 to 1918.1 MHz
Radio access	TDMA/FDMA
Carrier separation	300 kHz
Coverage	Max. 3 km

This system seems particularly appropriate for Unawatuna (Galle district), Pottuvil (Ampara district), Tissamaharama (Hambantota district), and Deniyaya (Matara district), where a large increase in demand is expected.

In relation to these locations, the following two projects proposed in the Telecommunications Master Plan should be concurrently implemented:

- SSC area network expansion project in Galle TSC area to fulfill the demand in Galle, Matara, Hambantota and Ratnapura districts and
- Rural telecommunication network project in southern part which aims at the improvement of rural telecommunications networks in 13 southern districts by digital radio multiple access subscriber system.

4.2.3 Integrated services social network

This project is to be implemented in two parts as follows.

(1) Part 1 (2006--2010)

This part shall provide a very high speed link to the Internet hub center in Colombo from Galle via high transmission lines. The 2 Mbps speed will be available for Southern Area to get connected to Colombo and the rest of Sri Lanka for access to information made available within Sri Lanka by various organizations such as universities, research institutions, financial institutions, commercial organizations and so on.

Also provided are Internet access at 256 cubs via fiber optic cable connections to the Internet backbone in the U.S. and a dial-in servers in Galle, Matara, Hambantota and Moneragala. The Galle node will be equipped to handle up to 16 simultaneous dial-in connections while the other three will be able to handle up to 8 simultaneous dial-in connections.

The following are also comprised:

- 64 cubs leased lines to connect Matara, Hambantota and Moneragala to Galle;
- fully configured Internet services in Galle, Matara, Hambantota and Moneragala with Internet servers acting as local mail hubs, WEB servers and so on;
- 64 kbs Internet access and 2 Mbps access to the Sri Lankan connect providers such as universities, research institutions, financial institutions, commercial organizations and so on for offices in Colombo via radio;
- a modem pool and associated equipment for Galle, Matara, Hambantota and Moneragala; and
- dial-up Internet connections to end users in Southern Area by dialing to the nearest modem pool.

Figure 4.1 schematically depicts this setup.

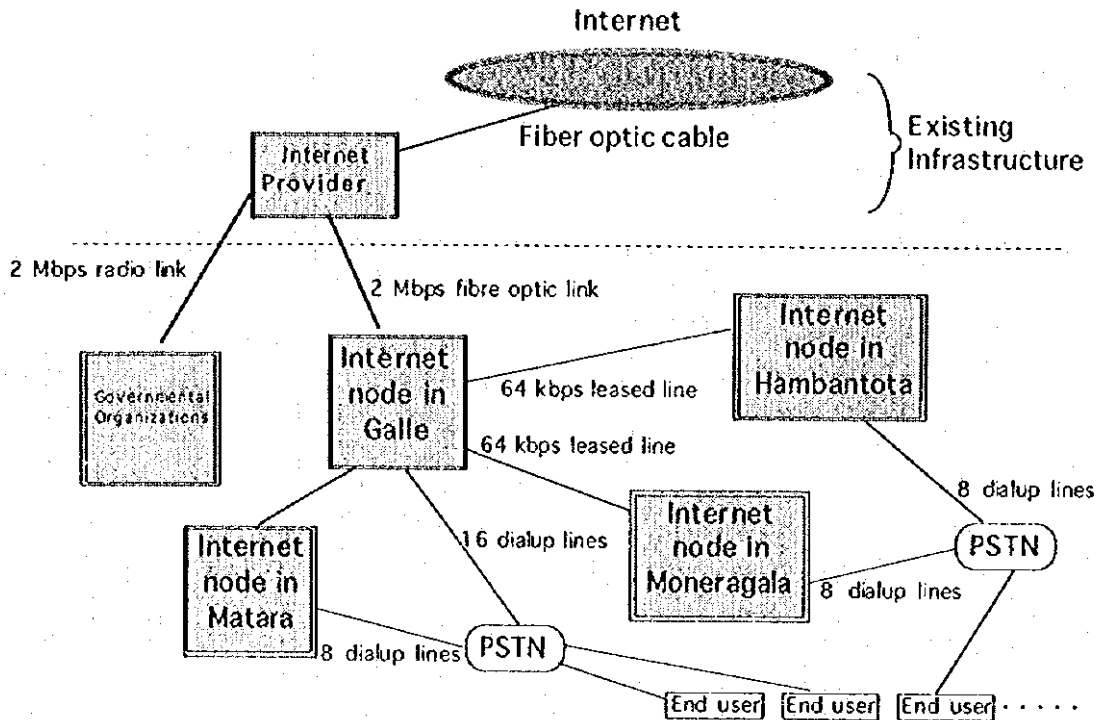


Figure 4.1 Network Architecture for Internet (Part 1)

(2) Part 2 (2011--2015)

The second part shall contain 64 kbps leased lines connecting Ratnapura and Ampara districts to Galle; dial-in servers in Ratnapura and Ampara capable of handling up to 8 simultaneous dial-in connections; and fully configured Internet servers in Ratnapura and Ampara acting as local mail hubs, WEB servers, etc.

The setup will be similar to that shown in Figure 4.1 except that Ampara and Ratnapura will also be connected to Galle as done with Matara, Hambantota and Moneragala in Part 1.

Power and Energy

SECTOR REPORT 4 TRANSPORT, TELECOMMUNICATIONS AND ENERGY

PART 3 POWER AND ENERGY

CHAPTER 1 EXISTING CONDITIONS

1.1 Present Conditions of Power and Energy in Sri Lanka

1.1.1 National energy policies and strategy

(1) National energy policies

Sri Lanka does not have a comprehensive and coherent energy policy except the nine-point energy policy guidelines adopted in 1985. Emphasis of the guidelines is on providing energy as part of basic human needs, while minimizing the cost to the national economy. Other concerns expressed include reducing dependence on foreign energy resources, ensuring energy supply reliability and price stability, and expanding capacity to develop and manage the energy sector.

A national committee to prepare a comprehensive energy policy was set up in September 1995 by the Ministry of Irrigation, Power and Energy (MIPE). The committee is expected to consider the following energy issues as well as the Government's socio-economic plans:

- 1) program to install plants of short delivery period such as diesel, gas turbines and combined cycles to meet coming power supply shortage in the last 20th century,
- 2) further use of bio-mass without degrading forest resources and a program for reforestation and utilization of fuel wood,
- 3) integrated approach to planning and development of energy supplies to meet various demands,
- 4) pricing of petroleum products,
- 5) electrification and associated improvement of railway system as a more energy efficient and environment-friendly mode of transportation,
- 6) tolerable level of dependence on imported energy, and
- 7) options for a reliable energy mix which will be economical and yet robust against external conditions.

(2) Strategy

Over the past few years, expansion, development and improvements in the power sector have received high priority as a part of infrastructure development. These developments have also been an important prerequisite for a higher and steady economic growth. The priorities of the sector are identified as follows:

- 1) Expanding the power supply by implementing the Least Cost Power Generation Plan,
- 2) Providing electricity to all villages by the end of decade, through a combination of the expansion of the power distribution network and the introduction of alternative sources of energy to very remote areas,
- 3) Rationalizing the power distribution system, improving reliability, minimizing power losses and reducing the cost to consumers, and
- 4) Implementing energy conservation by ensuring maximum utilization of available resources.

Energy conservation and demand side management are key issues overlooked due to lack of sufficient commitment at the national level and the absence of a clear policy direction. The issues include the following:

- i) Program related to efficient lighting,
- ii) Creation of awareness and promotion of the use of alternative sources of energy, and
- iii) Improvement of the efficiency of fuelwood stoves.

1.1.2 Energy administration

(1) Ministry of Irrigation, Power and Energy (MIPE)

MIPE was established in August 1994 with the reallocation of functions among the Ministries after the formation of the People's Alliance Government. It was formed by bringing certain agencies coming under the former Ministries of Mahaweli Development, Power and Energy, and Forestry and Irrigation, with the central focus on infrastructure development and management of the irrigation and the power and energy sectors, and having a special regard for the development of water resources. MIPE is entrusted with the responsibility of development and conservation of water resources of the Country and

the management and development of the power sector with a view to keeping pace with the increasing demand for power and energy.

The National Committee to prepare an energy policy chaired by MIPE has the authority to make all the energy policies and coordinate energy-related activities.

(2) Electric power sector

The electric power supply activities in Sri Lanka are under the control of MIPE. Based on the Electricity Act and the Ceylon Electricity Board Act, the Ceylon Electricity Board (CEB), Lanka Electricity Company (LECO) and local authorities (LAs) are executing the activities to supply electric power to all consumers in the Country. Under the laws, these enterprises must supply electric power to all consumers in the Country in impartial manners taking into account safety of the public.

Ceylon Electricity Board (CEB)

CEB is responsible for designing, constructing, operating and maintaining the generation, transmission and a substantial portion of distribution facilities in efficient, coordinated and economical manners covering the whole area of Sri Lanka. In addition to CEB's own direct power sales to consumers, CEB is also wholesaling a certain portion of power (17.1% of the whole in 1994) to power distribution utilities, LECO and LAs, for further retailing to consumers.

In executing development projects of power generation and transmission systems, CEB is required to obtain approval of MIPE. The finance for development is arranged from its own source or by borrowing from domestic and foreign sources.

Board members of CEB are composed of seven persons: four members from MIPE, each in charge of engineering, commerce, administration and accountancy respectively, one member representing local authorities, one member representing the field of industry and one member from the Ministry of Finance (MOF) in charge of the subject of finance. Board meetings are held with these seven members.

Seven deputy general managers in charge of divisions of Head Quarter, Generation, Distribution and Consumer Service, Transmission, Generation Projects, Planning, and Finance are managing the actual execution of the Board. The Planning division which is in charge of studies has six branches of Generation Planning, Transmission Planning,

Rural Development Planning, Demand Forecast and Tariffs, Electronic Data Processing, and Demand Side Management. The Generation Planning and Transmission Planning branches manage the long-term planning of the hydro and thermal power stations and the transmission system. Actual execution of construction of generation and transmission projects is undertaken by the Generation Projects division and Transmission division, respectively.

Central Engineering Consultancy Bureau (CECB)

CEB has engineering executive staff of only 508 (3.6% of the total CEB staff), not sufficient to carry out all technical activities of the Board. More than 90% of these staff are electrical engineers, and there are not sufficient staff for civil and mechanical engineering works related to hydro and thermal generation projects. Engineering works of these projects, therefore, are being performed by CECB.

Private power investors (PPI)

Several foreign private investors have submitted proposals for power development and are now carrying out investigation and studies for construction of several power generation projects in Sri Lanka under the BOO or BOT schemes. CEB has, within the Generation Projects division, established the Private Power Projects branch, and review of their proposals and negotiation are in progress.

Lanka Electricity Company (Private) Limited (LECO)

LECO was established in 1983 as a private power distribution company supported by the Government and CEB, both of them owning 50% each of LECO's share. Though LECO is at present operated as an independent organization, the company received financial assistance from CEB in the past and its repayment is a burden to LECO. Many directors of LECO are concurrent staff with positions in CEB and retired staff from CEB. The Government has a plan to privatize LECO's operation and negotiation is going on to sell its share.

LECO is now distributing electric power generated by CEB to the suburban areas around Colombo, not including its municipal areas, and to towns and villages along the coast line between Negombo and Galle. These areas constitute the most preferable regions for conducting a distribution business. LECO accounted for 15.0% of total energy sales and 14.6% of total consumers of Sri Lanka in 1994.

Local authorities (LAs)

Local government authorities have long time been operating power distribution activities by retailing electric power received from CEB on the wholesale basis. However, in accordance with a government policy, their operations have gradually been diminishing by handing over their facilities and concession areas to CEB and LECO. It is supposed that all facilities will be taken over by CEB and LECO in the near future. Currently, a limited number of local authorities are in operation in the Ratnapura area. Their energy sales was 2.1% of Sri Lanka's total in 1994.

(3) Other energy-related organizations

Ceylon Petroleum Corporation (CPC)

CPC is the sole supplier of petroleum products in Sri Lanka. At present, a refinery at Sapugaskanda meets more than 85% of the total demand in the Country. CPC functions as an importer, exporter, seller, supplier and distributor of petroleum, and carry out business of exploring for exploiting, producing and refining of petroleum products.

Its operation policy is to ensure smooth and uninterrupted supply of fuel to consumers within the Country at the lowest cost possible and to air and sea ports at competitive prices, and develop facilities with priorities for low environmental pollution, cleanliness and safety of consumers.

Colombo Gas Company Limited (CGCL)

With the conversion of the government-owned business undertaking of CGCL into a public company in 1992, the company has forged ahead experiencing growth and development. The company is to provide an uninterrupted supply of domestic gas at reasonable and economical prices, to encourage communities to utilize LPG optimally in an environmentally friendly atmosphere, to promote conservation of forest reserves by providing an alternative for fuel wood, and to encourage the use of gas in industries and in the rural sector. The company has been re-named Shell Gas Lanka after its privalization, and now is undertaking retail marketing of LPG.

Energy Conservation Fund (ECF)

ECF was set up in January 1985 through the Act of Parliament No.2 of 1985. This was followed by the establishment of the Ministry of Energy Conservation in April 1990. Their board objectives were to promote energy conservation and to develop renewable energy sources.