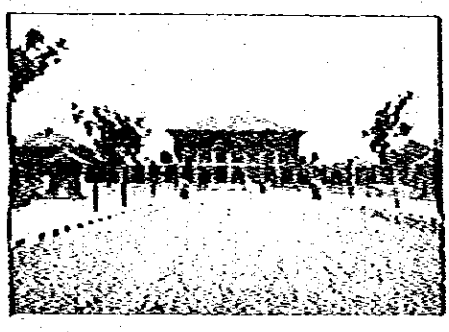
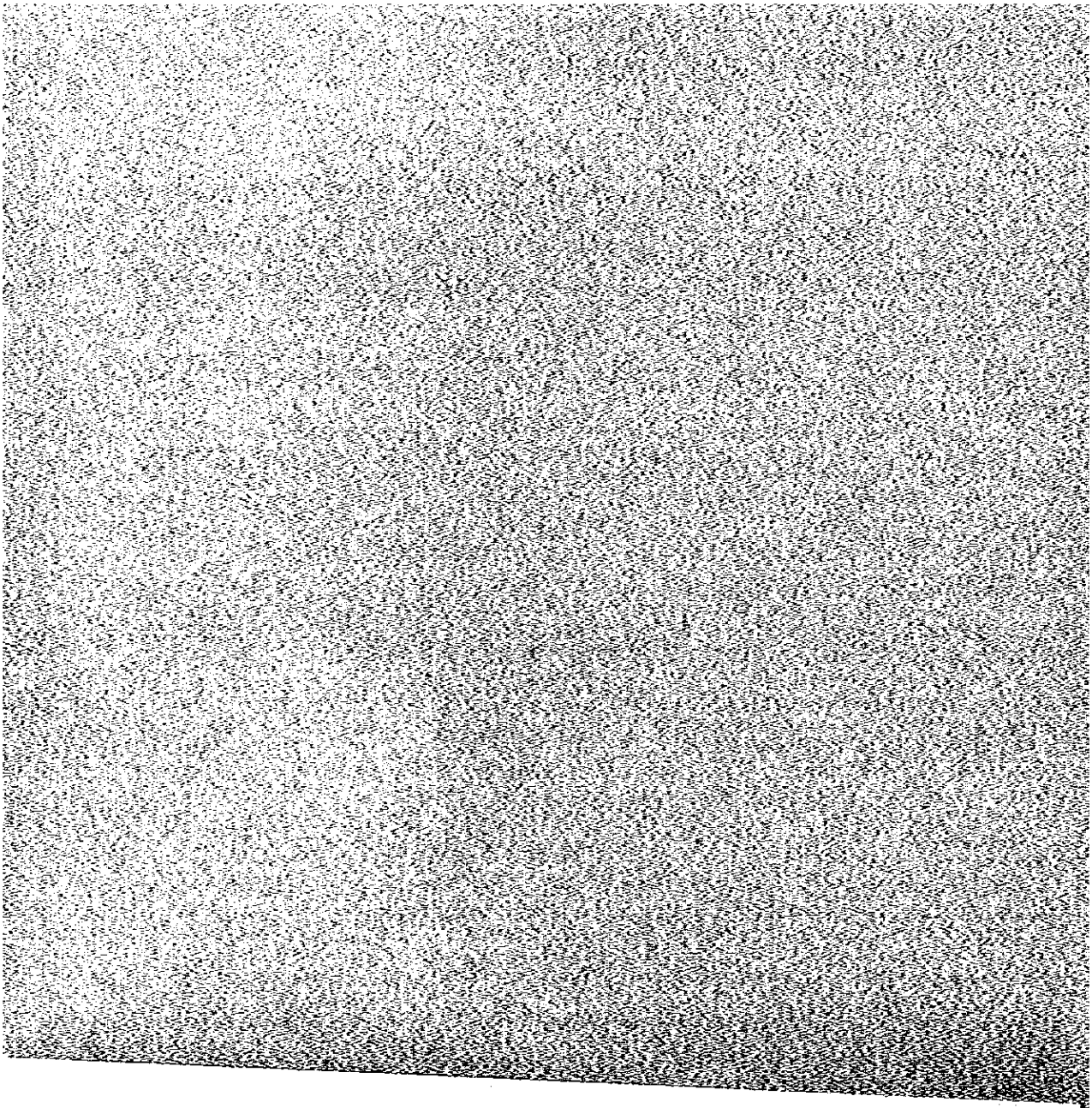
TEXT

# CHAPTER 1
# INTRODUCTION





# CHAPTER 1 INTRODUCTION

## 1.1 BACKGROUND

The Government of Japan, in compliance with a request of the Government of Sri Lanka, decided to undertake the feasibility study of the Colombo - Katunayake Expressway and the New Port Access Road Construction Projects within the Greater Colombo Metropolitan Region and assigned the Japan International Cooperation Agency (JICA) to carry out this study.

Accordingly, JICA dispatched a Preliminary study Team to Sri Lanka between 17th September to 1st October 1982 and this Team had discussions with the relevant government authorities in Sri Lanka and made preliminary survey.

The Government of Sri Lanka is presently concentrating on its development policy with measures such as, to increase the economic growth rate, to create employment opportunities, to increase national capital investment and to improve international balance of payment.

Investment Promotion Zones are already set up specially for this purpose at Katunayake and Biyagama close to the Capital City Colombo. Moreover, Colombo Airport Development Programme etc, were gradually launched with some satisfactory progress achieved already.

Nevertheless, traffic congestion due to increase of traffic and the delay in the preparation of infrastructures for transport in the Colombo Metropolitan Region is becoming grave day by day.

Therefore realizing the urgent need to construct a road connecting Katunayake with the Colombo Port and Colombo City in order to relieve congestion of traffic between the organic nodes of major transport facilities, such as the KIPZ, and Colombo City, the Government of Sri Lanka was compelled to make this request for the feasibility study.

The Terms of References of the Government of Sri Lanka for this project requests for the feasibility study on the construction of following two road projects.

(1) Project A

Colombo - Katunayake Expressway with length of approximately 25.4 km.

(2) Project B

New Port Access Road with length of approximately 5.7 km.

## 1.2 DESCRIPTION OF THE PROJECT

This project consists of Project A (Colombo - Katunayake Expressway -- approximately 25.4 km) and Project B (New Port Access Road – approximately 5.7 km) and as shown in Summary Fig. 2 is an approximately 31 km long road project with Colombo Port as the starting point and passing through the New Kelani Access Road, New Kelani Bridge, Peliyagoda, Ragama and Ekala, along the eastern parts of the GCEC 'Area of Authority' to connect with the ending point at the Colombo International Airport at Katunayake.

The division into Project A and Project B occurs near Dalugama along the Kandy Road. Out of this Project A is largely divided into three sections K-1, K-2 and K-3.

Sections K-4, K-5, K-6 and K-7 are access roads to Project A and the appropriateness of whether these roads need to be newly constructed or require improvements in the case of existing roads is to be judged only after a total evaluation based on judgements from the aspects of traffic engineering, economy etc.

On the other hand, Project B consists of three sections P-1, P-2 and P-3 and the section P-4 is a part of the existing Kandy Road.

Each section of roads in Project A and Project B are described below in detail.

(1) Project A

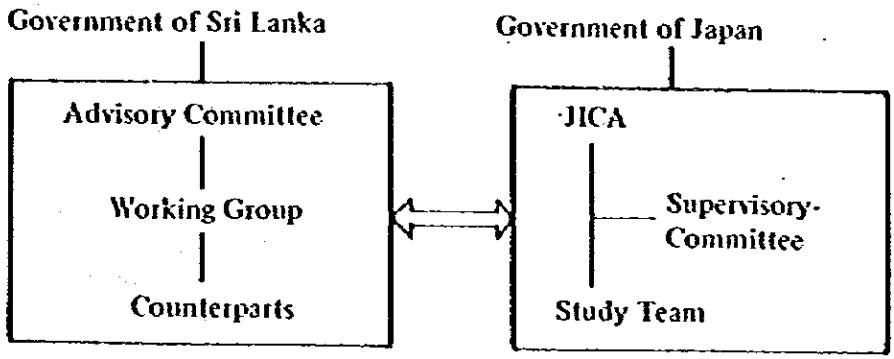
1) K-1: The road section between the intersection with Kandy Road (A-1 Road) at Dalugama and Ragama Interchange having a road length of approximately 7.1 km.
2) K-2: Approximately 8.4 km long road section between Ragama Interchange and Ekala Interchange.
3) K-3: Approximately 9.9 km road section between Ekala Interchange and the Expressway terminal at Colombo International Airport.
4) K-4: Access road towards Biyagama using the existing Dalugama - Hunupitiya Road and branching off the expressway near Wewelduwa. Approximately 1.7 km section up to Kandy Road.
5) K-5: Road connecting Negombo Road (A-3 Road) with the expressway at Ekala Interchange. It has a road length of approximately 3.1 km inclusive of 2.1 km length of existing road and approximately 1.0 km to be constructed.
6) K-6: Road section between the intersection of K-5 with A-3 Road and the expressway terminal at Colombo International Airport running approximately 9.5 km along A-3 Road and Canada Friendship Road.
7) K-7: Road section between the KIPZ access to the expressway and the intersection with Canada Friendship Road having a road length of approximately 1.6 km.

(2) Project B

1) P-1: Approximately 1.5 km long road section between Colombo Port and the intersection at Prince of Wales Avenue.
2) P-2: Existing road section between the intersection at Prince of Wales Avenue and Peliyagoda across New Kelani Bridge with approximate road length of
3) P-3: Approximately 2.9 km long road section between Peliyagoda and the starting point of Project A on Kandy Road near Dalugama.
4) P-4: Approximately 2.6 km road section of the existing A-1 road running parallel to P-3 between the same terminals as P-3.
5) P-5: Approximately 1.0 km long road section branching off P.3 road section towards Wattala on A-3 road. (This is part of the road of which construction was abandoned.)

## 1.3 ORGANIZATION OF THE STUDY

This study was conducted in close co-operation between JICA and the relevant government agencies in Sri Lanka and the organization of the study is shown below:




The Advisory Committee consists of members representing the following relevant organizations, and as a rule, met at least once every month to discuss the progress of work, to explain and discuss the results of studies made up to that meeting and to exchange views and opinions of the participant agencies.

(1) Regular Members

- Department of External Resources
- Greater Colombo Economic Commission
- Department of Highways
- Urban Development Authority
- Sri Lanka Ports Authority

(2) Relevant Government Agencies (invited when necessary)

- Ministry of Finance and Planning
- Airport and Aviation Services (Sri Lanka) Limited
- Sri Lanka Government Railway
- Police Department

## 1.4 APPROACH OF THE STUDY

### 1.4.1 Study Items

The general flow of works is as shown in Summary Fig. BI-1 and the major study items are given below.

- Selection of the Route
- Traffic Survey
- Traffic Projection
- Preliminary Engineering and Cost Estimates
- Economic Evaluation
- Financial Evaluation
- Implementation Programme

Outline of the above studies can be given as follows.

(1) Selection of the Route

In order to deduce the most feasible route, several alternative routes were selected for comparison after careful and comprehensive study of the factors such as the topography, geology, river flow conditions, flood levels during the wet season, land use, distribution of existing facilities, prospectives of regional development, present status and development plans for road and railway facilities etc. in the region surrounding the proposed route of the project road.

(2) Traffic Survey

In order to obtain the fundamental information required for estimating the future traffic demand,

1) Driver Interviewing,
2) Traffic Counting, and
3) Supplementary Traffic Counting were conducted in co-operation with DOH and Police.

Specially in the above Driver Interviewing Survey information with respect to origin, destination, trip purpose, number of passengers, and in the case of lorries the type of commodity loaded and the loading condition were grasped by questioning the driver. Driver Interviewing was conducted at Survey Stations set up at gates No. 1 to No. 7 of Colombo Port, Victoria Bridge, New Kelani Bridge and at Ja-Ela, where traffic counting also was done.

The purpose of supplementary traffic counting is to correct the skewness of data due to seasonal variations etc. with information collected through a second round of counting done on another day of the year several months after the first counting.

(3) Traffic Projection

In order to estimate the future volume of traffic that is expected to use the project road, factors such as population and employment by Zone, GDP, number of motor vehicles owned, traffic related to facilities such as KIPZ, BIPZ, Colombo International Airport, Colombo Port and the various plans and proposals of the GCEC regarding the allocation of private industries etc., were analyzed.

(4) Preliminary Engineering and Cost Estimates

After the determination of horizontal and longitudinal alignment using the contour photo maps to scale 1/10,000 and the resulting longitudinal survey, preliminary design of road profile and road structures were done. Then, using the results of this preliminary design, construction quantities such as the volume earth works, number of structures etc., were calculated and the construction cost was estimated, based on unit cost analysis. The construction costs thus estimated were used as the economic costs required in the economic evaluation.

(5) Economic Evaluation

In the economic evaluation, the benefit calculation based on the estimated future traffic volume for each alternative were evaluated comparing with the economic costs and the optimum time of investment was determined.

(6) Financial Evaluation

By setting a toll rate and estimation, the future traffic volume in the event of Project A (Expressway) functioning as a toll road, the Financial Internal Rate of Return was calculated and the optimum toll rate was decided, in evaluating the expressway from financial aspects.

(7) Implementation Programme

Based on the above analysis, an Implementation Program is proposed for this project considering various situations.

### 1.4.2 Alternatives

Taking into consideration the following basic elements, the alternatives in this project were selected from among the combination of these elements which were considered pertinent.

- Route
- Road cross section (2 lanes or 4 lanes)
- Road structure (High embankment type or low embankment type, comparison of feeder road connection type)
- Type of structures
- Improvement or reconstruction of feeder roads
- Stage construction according to road section

The main criteria of evaluation in the selection of alternatives is given below.

Table 1-1: The Main Criteria for the Selection and Evaluation of Alternatives

| Alternatives / Evaluation Criteria | Route | Cross Section | Road Structure | Type of Structure | Improvement or construction of Feeder Road | Stage Construction of Road Section |
|---|---|---|---|---|---|---|
| Social and natural conditions such as topography, geology, land use etc. | O | | O | | | |
| Potentiality of development | O | O | O | | O | O |
| Economic evaluation financial evaluation | O | O | O | O | O | O |
| Traffic study | O | O | O | | O | |
| Engineering (Cost, Design) | O | O | O | O | O | |

## 1.5 SCHEDULE OF THE STUDY

This feasibility study is largely divided into two phases, namely Phase I and Phase II.

Phase I of the study was commenced on the 17th of December, 1982 and was completed on 14th March, 1983. After the completion of work under Phase I, all the members of the study team returned to Japan temporarily. Study was resumed by commencing the Phase II study on 25th April 1983 and the work in Sri Lanka was completed on 17th of October, 1983.

The following reports were submitted during the above period.

(1) Submission of Reports

| Date | |
|---|---|
| 12th December, 1982 | – Submission of Inception Report |
| 11th March, 1983 | – Submission of Progress Report I |
| 28th June, 1983 | – Submission of Progress Report II |
| 5th October, 1983 | – Submission of Draft Summary Final Report |

Moreover, meetings of the Advisory Committee were held at the rate of once a month in principal and mainly the following matters were discussed.

(2) Advisory Committee Meetings

- The First Meeting – 20th January, 1983
  a. Discussion of the Inception Report.
  b. Explanation of the progress of work up to that date and work schedule thereafter.
  c. Explanation on the route selected for Project B.
  d. Explanation on traffic survey.
- The Second Meeting – 17th February, 1983
  a. Explanation on the routes selected for Project A and Project B.
  b. Explanation of basic thinking on proposed roads and structures.
  c. Confirmation of dates for the traffic survey.
- The Third Meeting – 9th March, 1983
  a. Confirmation of the route for Project A.
  b. Confirmation of the number of lanes for both Projects A and B as four.
  c. Consideration of 80 km/hr ~ 100 km/hr as a guide line for vehicle speed on expressway.
  d. Explanation of the results of the study on regional economy.

- The Fourth Meeting – 19th May, 1983
  a. Confirmation of arrangements for the supplementary traffic counting.
  b. Discussion of comments on Progress Report (I).
  c. Explanation of future work schedule.
  d. Explanation of the basic aspects of economic evaluation of the project.
- The Fifth Meeting – 28th June, 1983
  a. Explanation of Progress Report (II) in detail.
  b. Explanation of the progress made up to that date and the basic aspects for further study.
- The Sixth Meeting – 21th July, 1983
  a. Discussion of Progress Report (II).
- The Seventh Meeting – 5th October, 1983
  a. Explanation and discussion of Draft Summary Final Report.
  b. Explanation of the future work and schedule.

## CONCERNED PARTIES

1. Advisory Committee

Mr. Tilak Samarasekera ..... Chairman
(Director General, Greater Colombo Economic Commission)

Mr. Harold Mendis ..... Member
(Director, Dept. of Highways)

Dr. Tudor Gunawardene ..... Member
(Former Director, Dept. of Highways)

Mr. G. S. Hattotuwegama ..... Representative
(Chief Engineer, Dept. of Highways)

Mr. Nagananda Jayawardene ..... Member
(UNDP Consaltant, Urban Development Authority)

Mr. D. R. L. Y. Paktsun ..... Member
(Chief Engineer, Ports Authority)

Mr. G. P. Weerasinghe ..... Representative
(Superintendent Engineer, Planning & Designs, Ports Authority)

Mr. S. Weerapane ..... Member
(Assistant Director, External Resources Dept.)

2. Special Invitees of the Advisory Committee Meeting

Mr. D. M. Jayasekera
(Deputy Director, National Planning, Ministry of Finance & Planning)

Mrs. C. Amerasekera
(Deputy Director, Dept. of External Resources)

Mr. N. D. Dixon
(Director Planning, Urban Development Authority)

Mr. R. Kadiravelupillai
(Chief Civil Engineer, Airports Authority)

Mr. Bertram Mohandiramge
(Manager Engineering, Airports Authority)

Mr. Anada Goonewardene
(Senior Civil Engineer, Airport & Aviation Services)

Mr. C. R. Vithanage
(Deputy Chief Engineer, Sri Lanka Government Railway)

Mr. Priyal de Silva
(District Engineer, Sri Lanka Government Railway)

Mr. D. A. Randeniya
(City Traffic Police)

Mr. D. E. L. Wijekoon
(A. S. P. Traffic)

3. GCEC Project Group

Mr. G. L. Perera
(Senior Manager, Engineering Services)

Mr. G. K. Amaratunge
(Senior Manager, Regional Planning)

Mr. R. S. Palihawadana
(Senior Manager, Investment Appraisal)

Mr. E. R. Siriwardene
(Manager, Infra-Structure)

Mr. M. P. T. Cooray
(Manager, Investment Appraisal)

Mr. W. A. N. K. Wijeratne
(Engineer (Civil))

Mr. D. G. Munasinghe
(Technical Officer)

1. JICA Supervisory Committee

| | | |
|---|---|---|
| Mr. M. Tokumaru | (Japan Ministry of Construction) | Chairman |
| Mr. A. Rokuhara | (Japan Ministry of Construction) | Member |
| Mr. T. Fujita | (Japan Ministry of Construction) | Member |
| Mr. S. Ochiai | (Japan Ministry of Construction) | Member |
| Mr. K. Kikuchi | (Japan Ministry of Construction) | Member |
| Mr. N. Iwasaki | (JICA) | Coordinator |

2. JICA Colombo Office

| | |
|---|---|
| Mr. Y. Ikeda | (Resident Representative) |

3. Embassy of Japan (Sri Lanka)

| | |
|---|---|
| Mr. M. Itami | (First Secretary) |

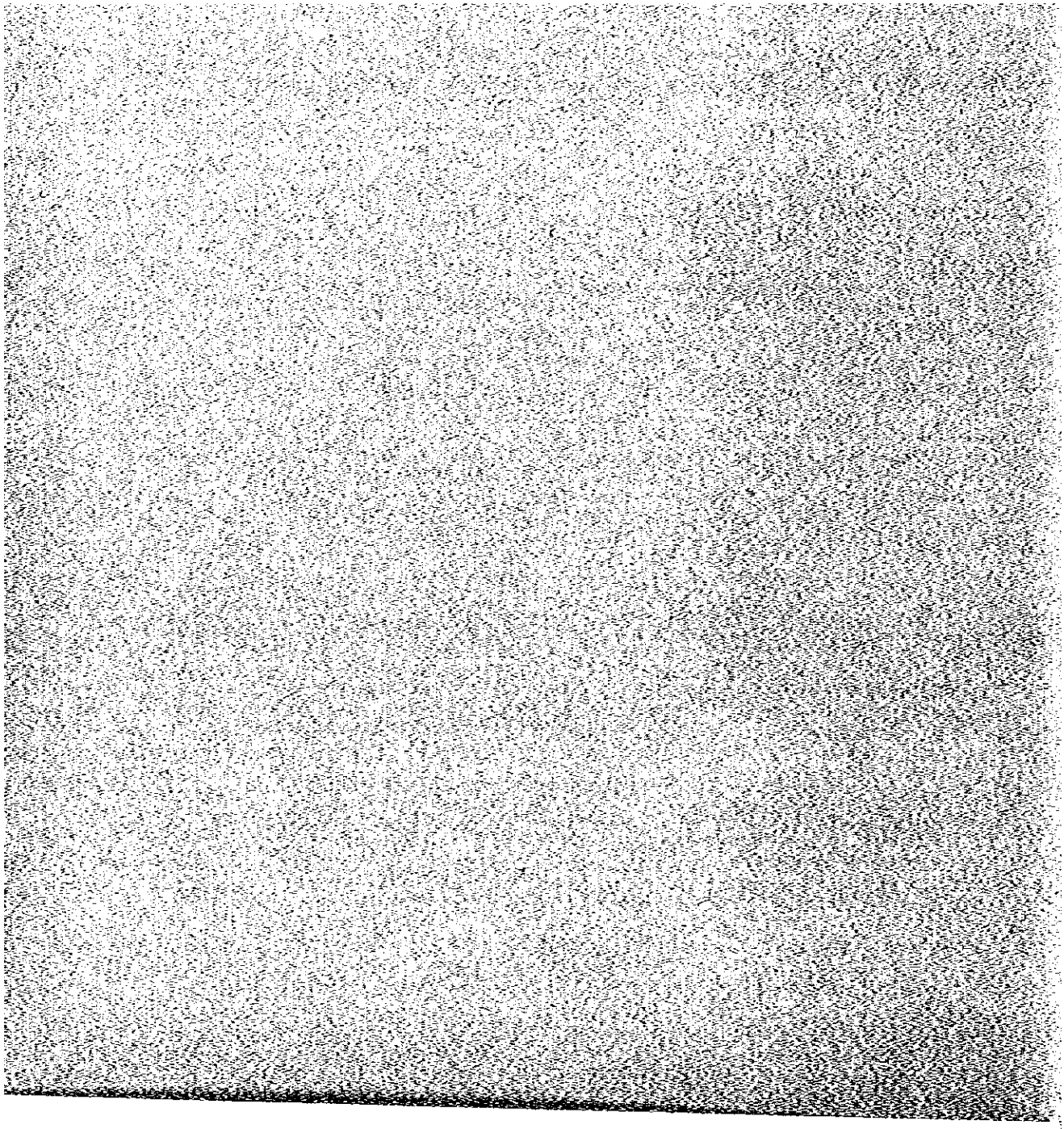
4. JICA Project Group

| | | |
|---|---|---|
| Mr. A. Asahi | | Team Leader |
| Mr. S. Okutsu | (Traffic Planner) | Member |
| Mr. T. Yamane | (Traffic Planner) | Member |
| Mr. M. Honma | (Economist) | Member |
| Mr. N. Tsuchihashi | (Regional Economist) | Member |
| Mr. K. Matsuda | (Traffic Engineer) | Member |
| Mr. T. Kawakami | (Road Planner) | Member |
| Mr. S. Adachi | (Road Designer) | Member |
| Mr. Y. Hayashi | (Surveyor) | Member |
| Mr. I. Karasawa | (Field Surveyor) | Member |
| Mr. K. Nomiyama | (Structural Planner) | Member |
| Mr. K. Matsumoto | (Structural Designer) | Member |
| Mr. T. Maruta | (System Engineer) | Member |

Consultant Joint Venture

- Japan Bridge & Structure Institute, Inc.
- Kokusai Kogyo Co., Ltd.

# CHAPTER 2
# PRESENT TRANSPORT CONDITIONS



# CHAPTER 2 PRESENT TRANSPORT CONDITIONS

## 2.1 ROAD CONDITIONS

### 2.1.1 Purpose of the Examination of Road Conditions

The main goal adopted in this traffic planning of this project is to forecast the traffic volume diverted from the existing roads into the project roads owing to the saving of travel time, the reduction of operating costs, and so on. The survey of the road conditions are among the basic work necessary for this purpose.

### 2.1.2 Study of Road Conditions in Sri Lanka

DOH classifies the roads from 'A' class to 'E' class according to their importance and it is also engaged in their maintenance work. 'A' class and 'B' class roads are the roads important in the traffic assignment. The definition of these roads are as follows:

'A' Class – All trunk roads within the road network of trunk roads connecting the National Capital with the District Capitals and also connecting these District Capitals with each other. Also included are other major roads. (All roads paved and bitumen surfaced with carriageway between 7.32 m to 10.98 m and roadway widths 10.98 m to 17.08 m.)

'B' Class – Main roads connecting other important towns and also providing important links within the trunk route system. (Bitumen surfaced roads with 3.66 m to 7.32 m.)

As for the roads within Colombo City, road classification is not performed by any authority.

Fig. 2-1 shows the main roads within Colombo City and Fig. 2-2 shows the main 'A' and 'B' class roads through the objective area. The average daily traffic volume on these roads is represented in Fig. 2-13 and Fig. 2-15. On the basis of information of the above-mentioned road classification, the average daily traffic surveyed by DOH and through field reconnaissance, the traffic zones for the traffic analysis were established as shown in Fig. 2-3.

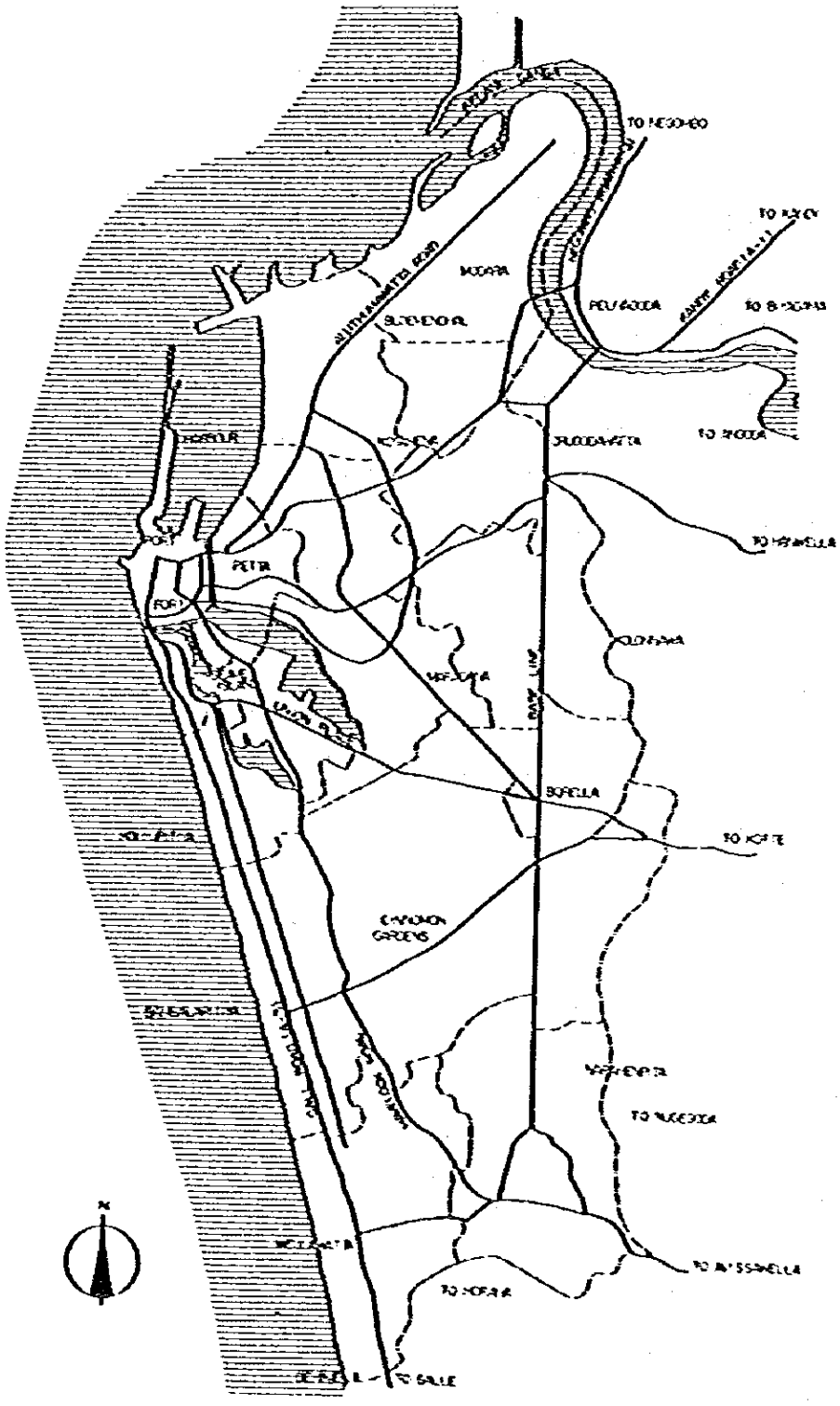


Fig. 2-1 Main Roads within Colombo City

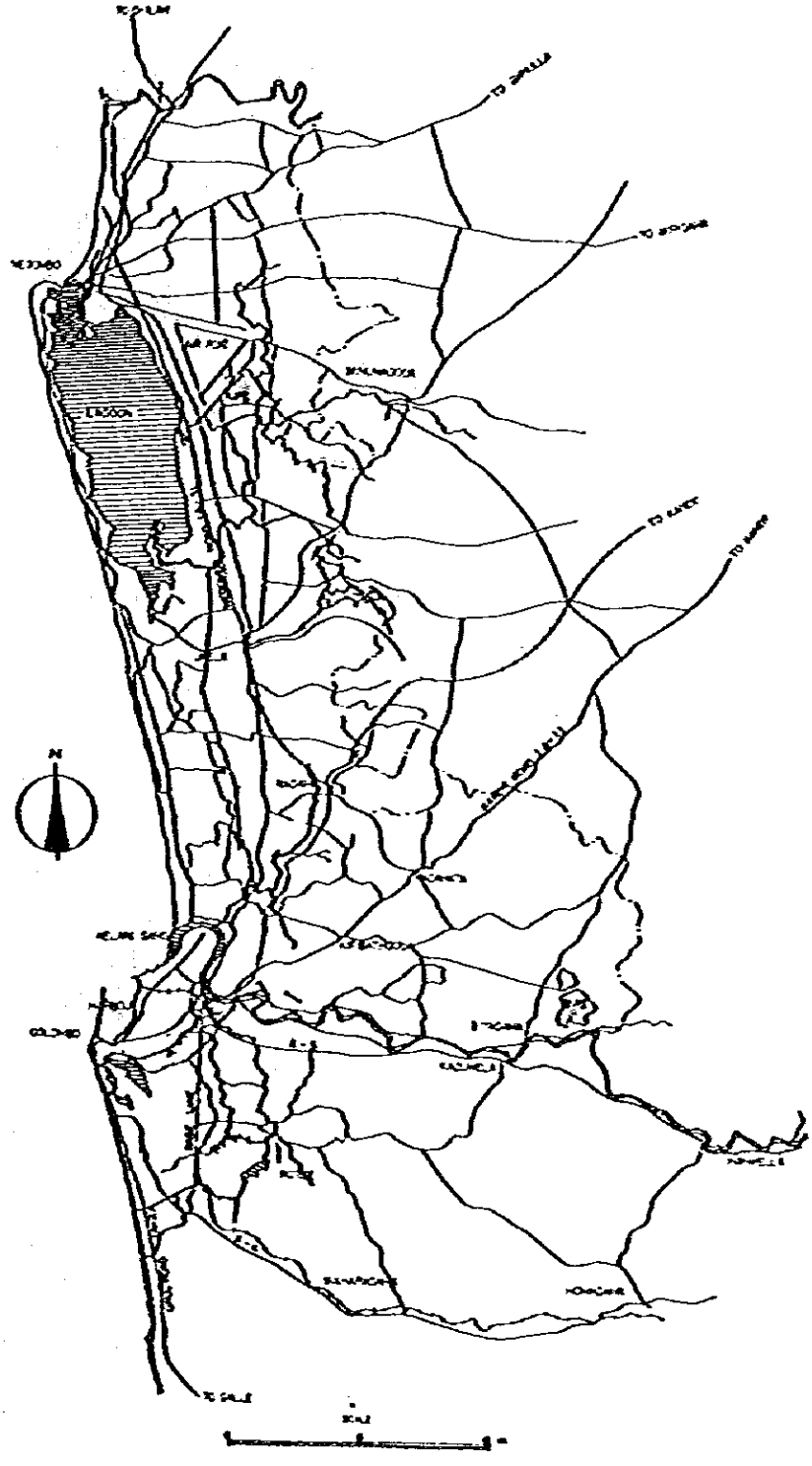


Fig. 2-2 Main Roads within Objective Area

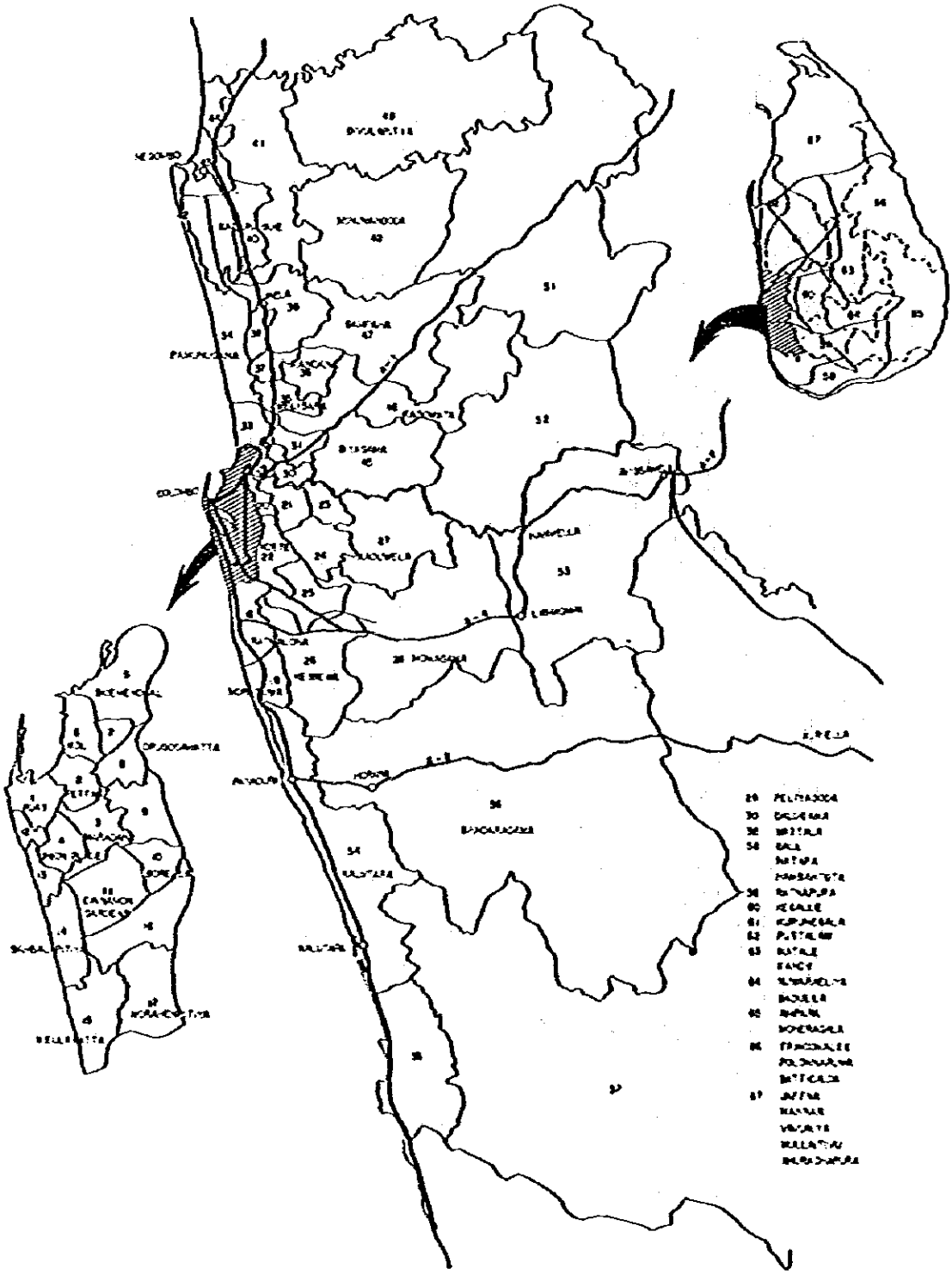


Fig. 2-3 Traffic Zone Map

### 2.1.3 Results of the Road Inventory Survey

The purpose of this survey is to investigate the physical characteristics of the road network. The designation of this primary network is based on the volume and nature of traffic carried, the existing road classification, and the requirements of the traffic assignment procedures to be adopted. Following the designation of a primary network, the basic characteristics such as road width, the number of lanes, availability of pedestrian platforms and so on were surveyed. Since the roads within Colombo City are not classified, a detail survey was conducted to ascertain their characteristics. The survey points are shown in Appx. Fig. 1 and the results of the main road inventory are summarized in Appx. Table 1. The inventory of cross roads along the expressway route is given in Appx. Table 19.

## 2.2 TRAFFIC SURVEY

### 2.2.1 Purpose of the Traffic Survey

In order to analyze the feasibility of Colombo-Katunayake Expressway and New Port Access Road Projects it is necessary to ascertain the actual situation of vehicle movements in and around the abovementioned project areas. Especially, the grasping of the origin and destination of vehicle movements in the relevant area is extremely important as a basic requirements of this study.

Therefore, it is necessary to conduct traffic surveys to obtain these valuable information about vehicle movements to analyze the existing road network and to make up plans for future road network to meet the traffic demand in future.

With the results of this survey, the traffic volume, nature and the characteristics of existing vehicle trips can be studied. Hence, results of the survey not only offer useful data for the urban traffic planning but also become affective as the basic data for the comprehensive future regional planning in this area.

### 2.2.2 Contents of the Survey

(1) Outline

This traffic survey consists of the following three parts:

1) Driver interviewing
2) Traffic counting
3) Supplementary Survey of traffic counting

Survey points are shown in Fig. 2-4 and Fig. 2-5.

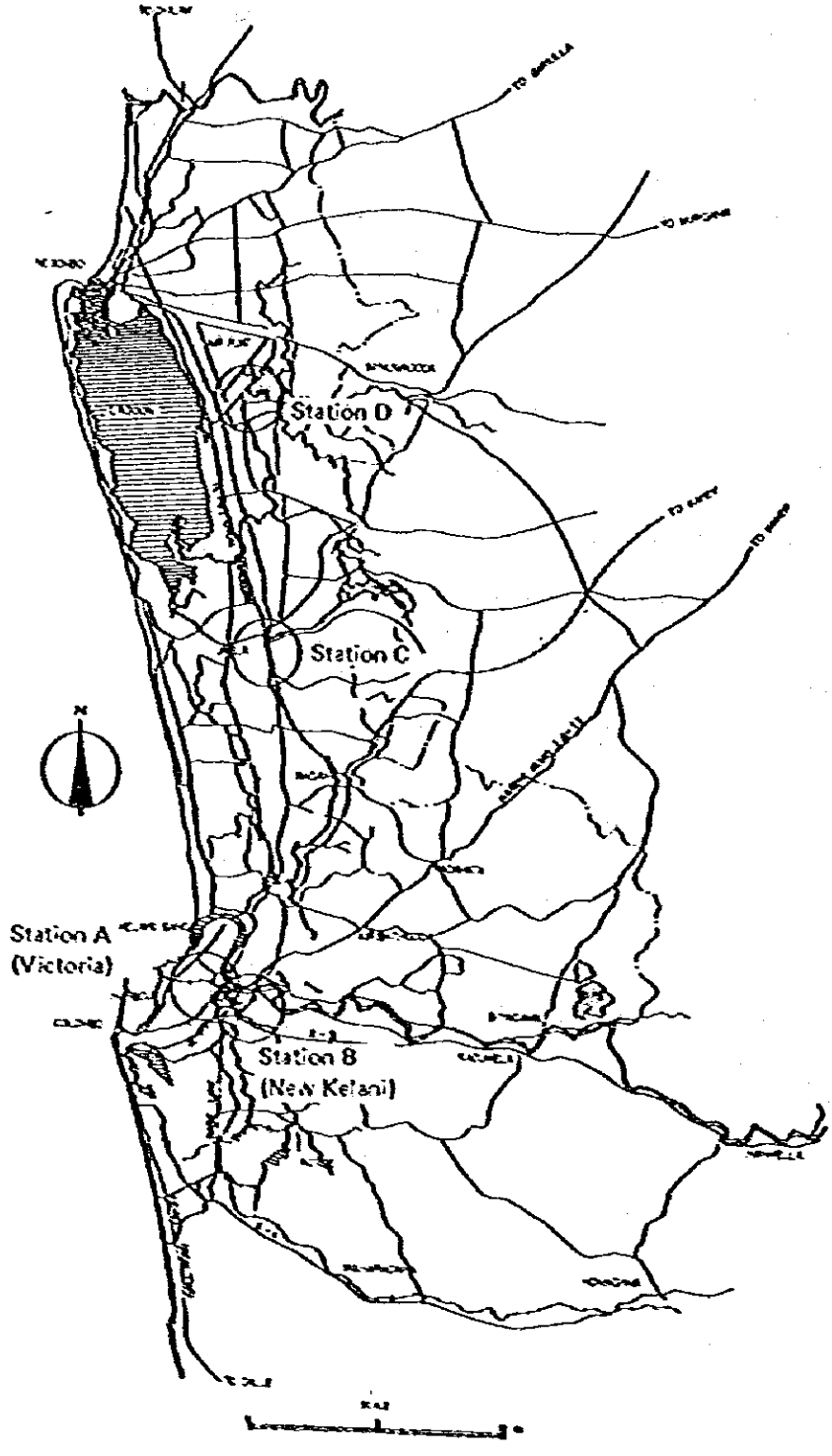



Fig. 2-4 Survey Stations for Driver Interviewing and Traffic Counting (Along the A-1 & A-3 Roads)

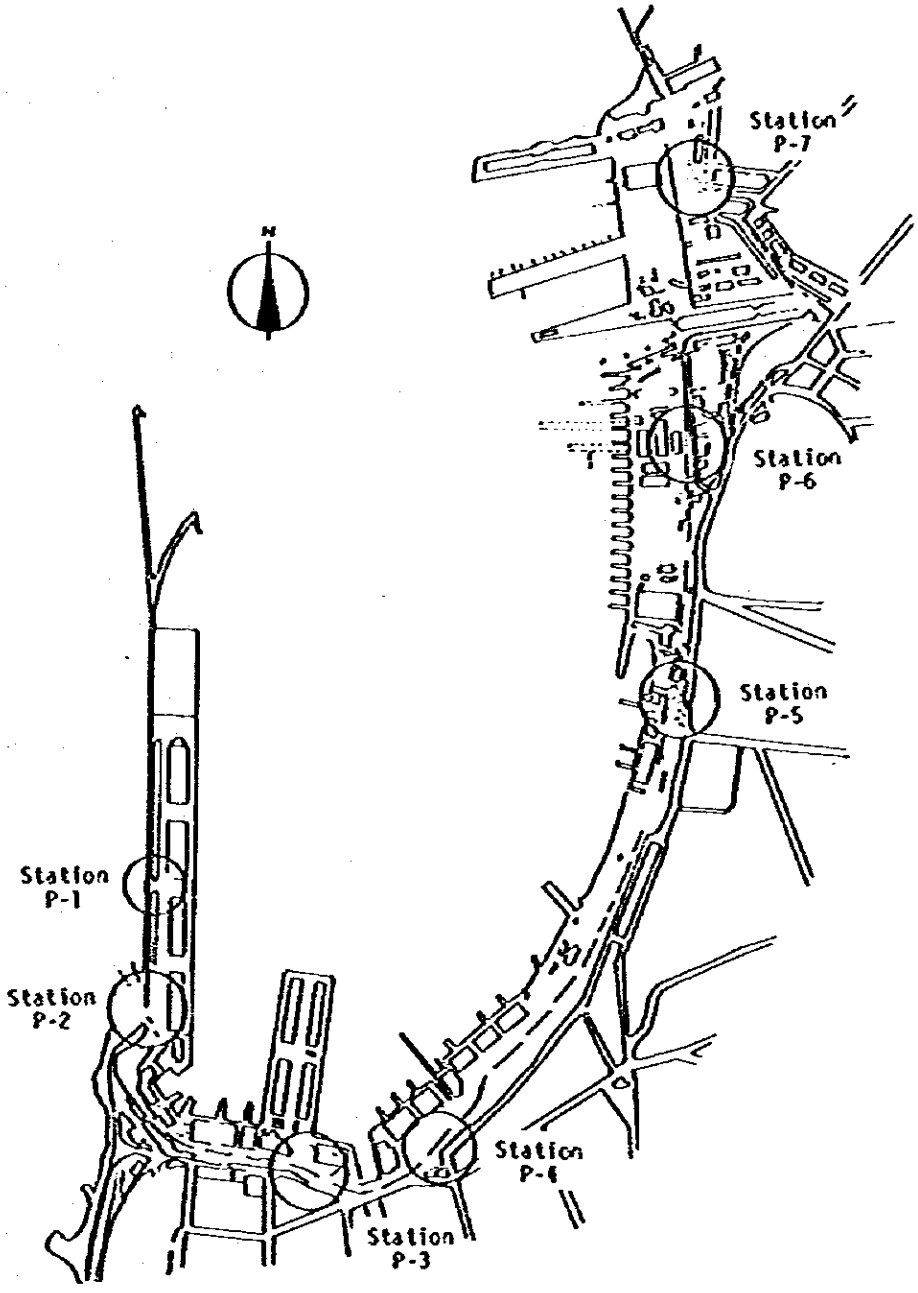



Fig. 2-5 Survey Stations for Driver Interviewing and Traffic Counting (Around the Colombo Port)

(2) Driver Interviewing

1) Purpose

The purpose of driver interviewing is to grasp the actual situation and characteristics of vehicle movements within the area of study by directly questioning the drivers.

2) Method of the survey

In the interviewing survey vehicles passing through each survey station were interviewed during the survey period based on a questionnaire.

The survey was conducted for 15 hours beginning at 6 a.m. and ending at 9 p.m.

(3) Traffic Counting

1) Purpose

In order to grasp the road-use pattern and deduce the characteristics of the road-use in the study area, traffic counting survey was done concurrently with the driver interviewing. This survey is also aimed at to render us the useful but fundamental information concerning the expansion factor, which is required in the interpretation of the results of driver interviewing to deduce present OD table for daily traffic.

2) Contents of traffic counting

In traffic counting, all the vehicles passing through each survey station during the survey period, were counted on an hourly basis according to the vehicle type.

3) Method of the survey

Every hour, the total number of vehicles was counted using a manual counting machine and the results were recorded on a traffic counting sheet according to the type of vehicle.

(4) Supplementary Survey of Traffic Counting

1) Purpose

The counting survey was conducted once again after a few months only in respect of traffic counting so that seasonal variations also could be taken into consideration.

2) Contents of traffic counting

Contents of counting in traffic counting (II) is as the same as in traffic counting (I).

3) Method of the survey

Traffic Counting was done for 12 hours from 6.00 a.m. to 6.00 p.m. The method of counting and arranging of results was as same as in traffic counting (I).

Items of survey and vehicle types surveyed are explained in TR (II): Technical Report on Traffic Survey.

## 2.3 CHARACTERISTICS OF EXISTING TRAFFIC

### 2.3.1 General

The Greater Colombo Economic Commission (G.C.E.C.) Area of Authority extends from the Kelani River in the south to Maha Oya in the North. It is primarily serviced by road transport. Two arterial roads radiating from Colombo – the Colombo - Kandy (A-1) and Colombo - Puttalam (A-3) – form the main spines of 55.42 km. Except for the Colombo - Kandy, Colombo - Puttalam and the Canada Friendship Road to the Airport at Katunayake all other roads in the project area are narrow and of low geometric standards.

The different categories of roads in the project area as per Department of Highways classification are as stated below:

| | |
|---|---|
| 'A' class | – 54.42 km |
| 'B' class | – 165.44 km |
| 'C' class | – 151.00 km |
| 'D' class | – 133.79 km |
| Total | – 504.65 km |

The total mileage in the area is 504.65 km.

In the project region there are four important areas whose traffic behaviour is significant not only to understand the prevailing transport conditions but also to appreciate the need for a new highway from Colombo to Katunayake.

These are:

1) The Port of Colombo
2) The City of Colombo
3) The Project area
4) The International Airport and the Free Trade Zone at Katunayake

### 2.3.2 The Port of Colombo

#### (1) Location and Present Conditions

The greater part of the trade of Sri Lanka is sea borne and is transacted by the Ports of Colombo, Trincomalee, Galle and Kankasanturai. Of these the Port of Colombo shares about 95% of the total shipping activity in the country.

The transport of goods to and from the Port is done both by rail and road. But the share of the railway over the years has not been more than 3 percent per annum.

The Port of Colombo is located at the north-eastern corner of the city surrounded by the central area – Fort and Pettah. The Port transacts its business through seven entrances/exits (P1 to P7). The Fig. 2-7 shows the Port of Colombo, the location of the entry points, the main network of roads in the city together with the 17 zones to which the city has been divided for planning purposes.

The Fig. 2-8 illustrates in detail the locations of the Queen Elizabeth Container Quay, the new container terminal and 90,000 D.W.T. Dry Dock under construction, the terminal point of the Port Access Road and the entry/exit points to the Port premises P1 to P7.

A survey of vehicles entering and leaving all gates of the Port was carried out on the 24/25th February, 1983.

#### (2) Traffic Volumes and Trends

1) Monthly trends

There are about 8,000 vehicles entering and leaving the Port on an average day. There are, however, daily, weekly and monthly variations. Analysis of the statistics for 1982 shows that average month may be considered as December which records a 103.7 percent of the monthly average traffic in the Port. From December to January there is a sharp drop in Port traffic from 103.7 to 36.8 percent. Thereafter traffic increases steadily till June which records 76.2 percent, and then rises rapidly to 166.9 percent in July. The month of July records the highest activity. Then on the transactions drop to 150.2 percent in August and remains fairly constant till October and falls off rapidly in November to December.

2) Weekly trends

The weekly statistics recorded by the Ports Authority in December, 1982 are shown in Fig. 2-9. The daily average of vehicles which enter/leave the Port premises is about 3,900. A average day for Port traffic operations may be considered as Thursday.

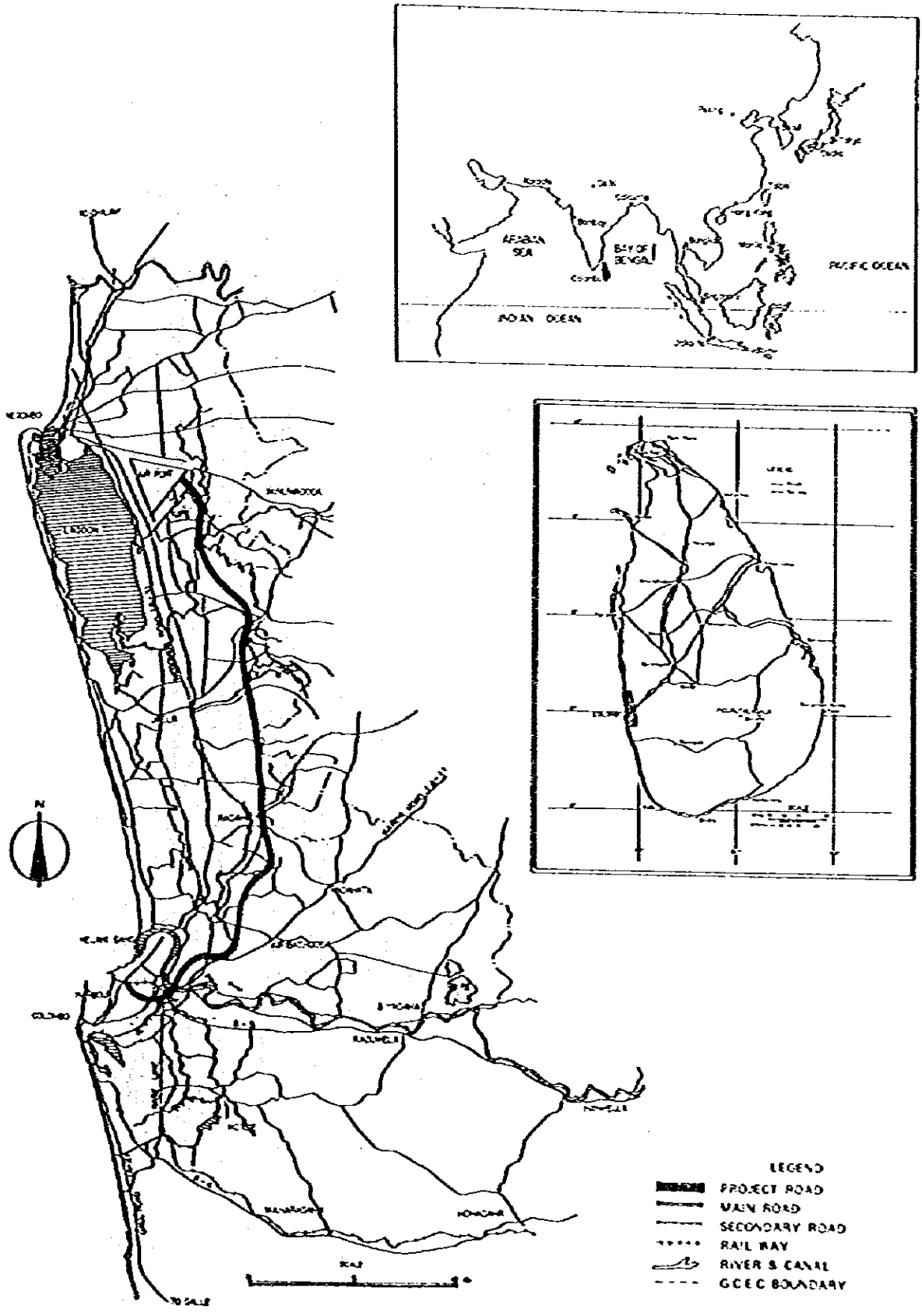



Fig. 2-6 Road Network – Project Area

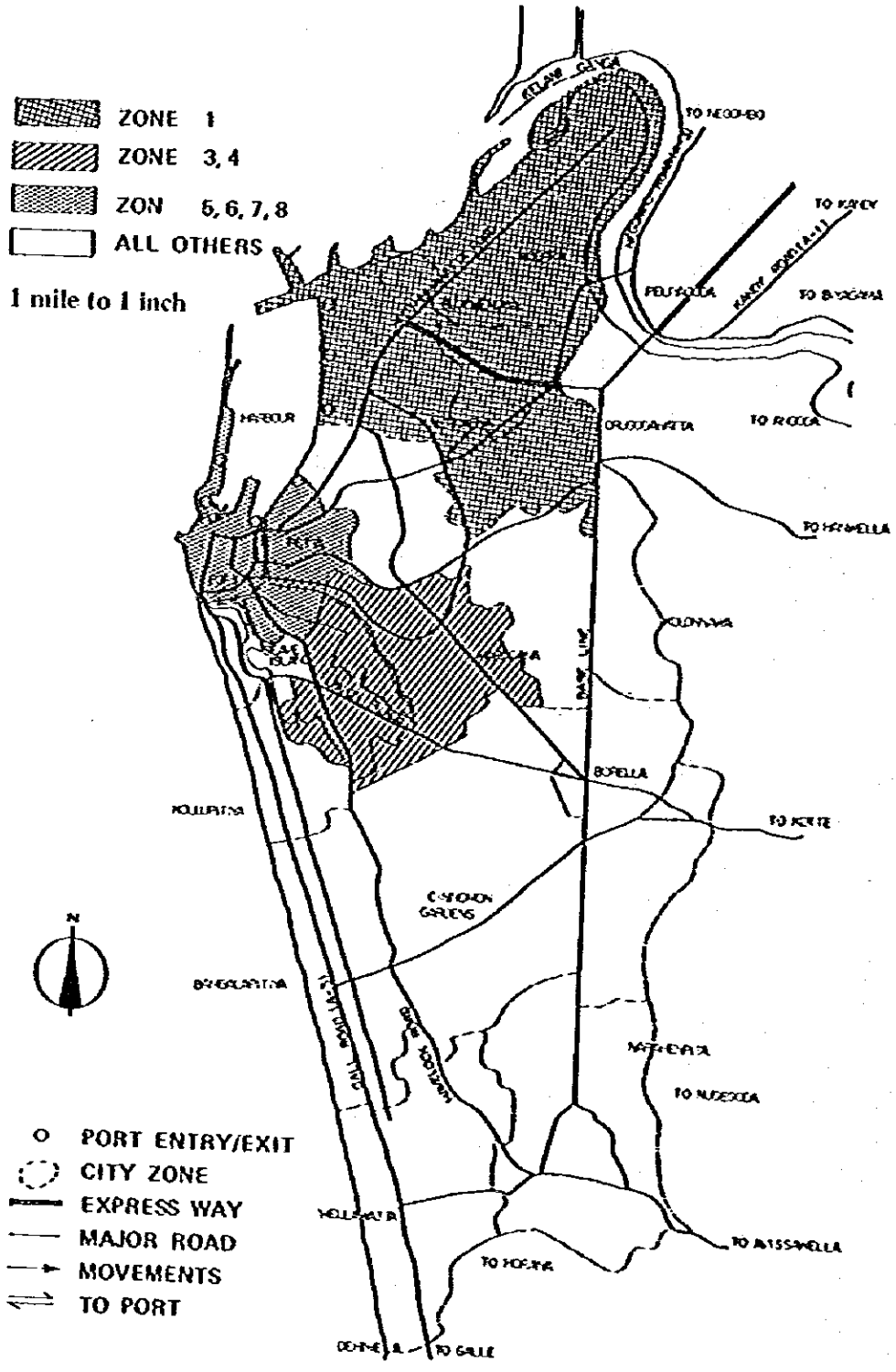



Fig. 2-7 Distribution of Trips Port and the City

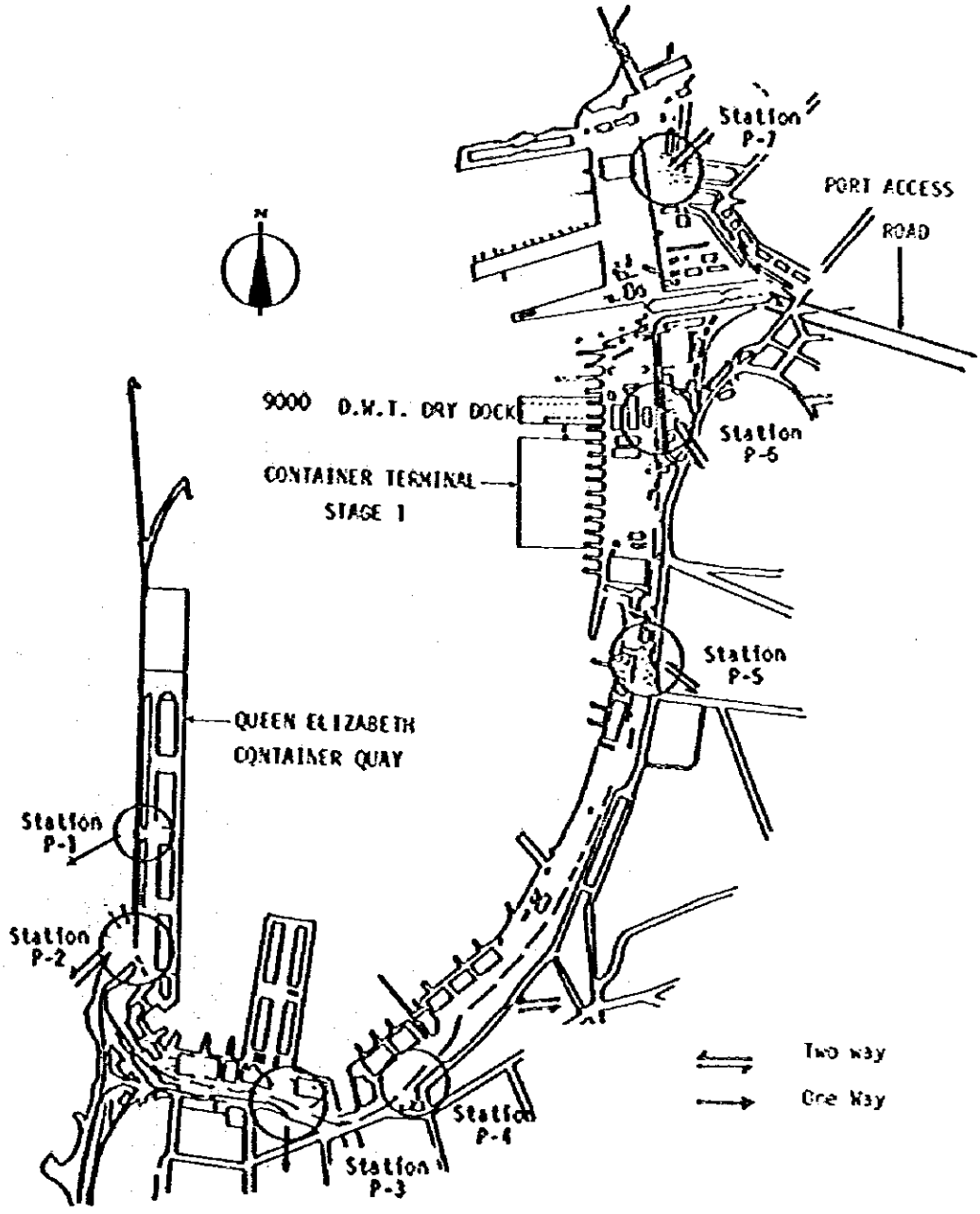



Fig. 2-8 Port of Colombo, Entry Points, Container Terminals and Port Access Road

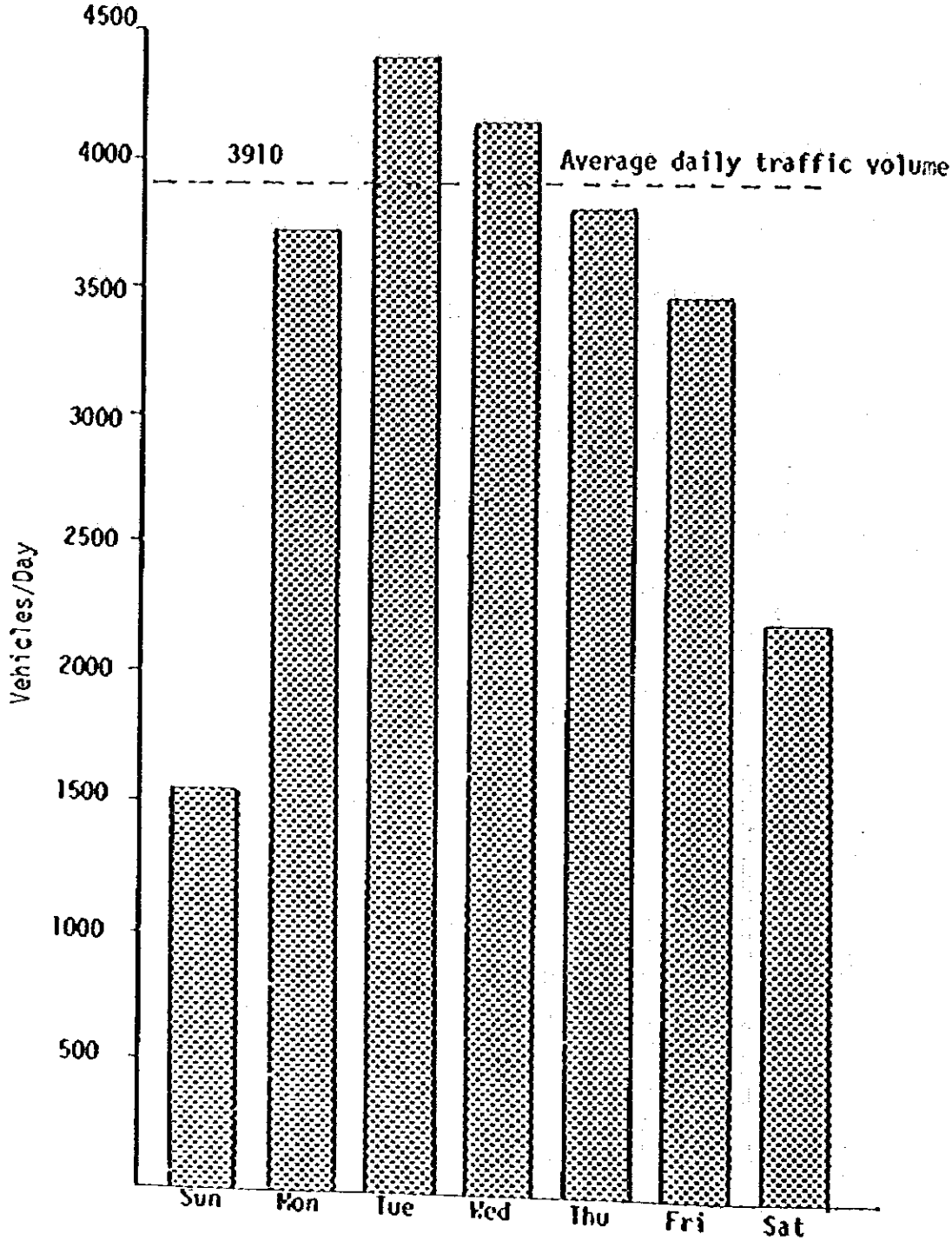



Fig. 2-9 Daily Variation of the Port Traffic Average from Monday to Friday

3) Daily variation

The 24 hour variation of Port traffic is shown in Fig. 2-10. There is a rapid rise of the number of vehicles which enters the Port premises from 7.00 a.m. till 10.00 a.m. and then the intensity falls off at about 2.00 p.m. During this period 56.7 percent of the total traffic has entered the Port. This inflow increases to 80.6 percent by 6.00 p.m. Of the traffic which leaves the Port 45.8 percent do so by 2.00 p.m. and 75.7 percent by 6.00 p.m.

As already mentioned all Port activity is put into operation through seven gates or stations. These operations both by day and night are shown in Fig. 2-10. The greatest activity centers around gate 4 (35.5%) which faces the Reclamation Road in Pettah, followed by gate 2 (32.3%) at the main entrance to the Port. Though activity at gate 1 (1.9%) appears very slight it is one of the main entry points almost entirely for container traffic. Gate 5 operates during daytime only.

(3) Vehicle Composition

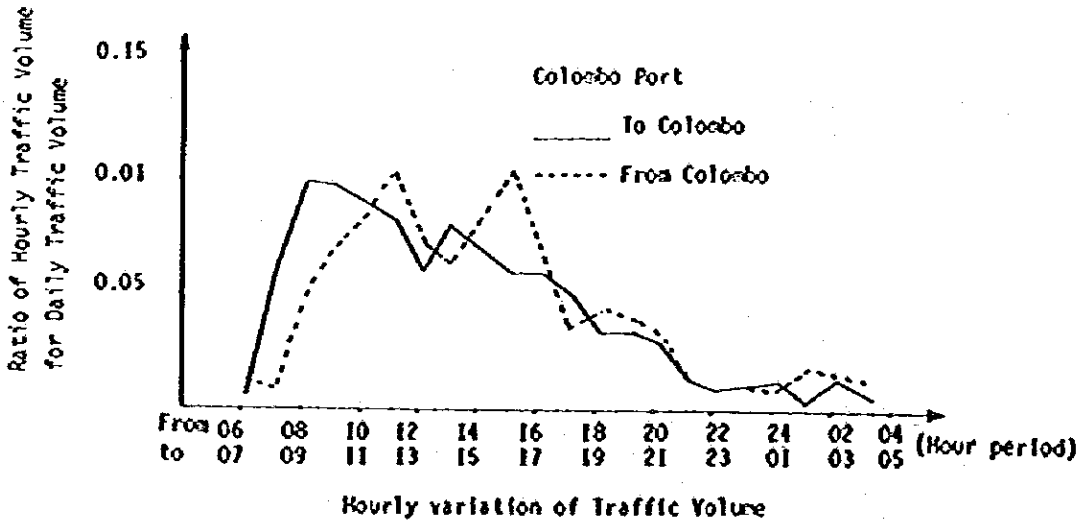
The manner in which the Port functions with respect to distribution of passenger and goods vehicles at the gates is illustrated in Fig. 2-11.

The largest amount of goods traffic is handled at gate 4 followed by gates 6 and 7. On the other hand the greatest passenger movement is through gate 2 followed by gates 4 and 6. Both gates 2 and 6 handle approximately equal amounts of goods and passenger traffic.

The distibution of traffic by vehicle type operating in and out of the Port is shown in Fig. 2-12. Of all vehicles which enter the Port premises 60.5 percent are goods vehicles and 39.5 percent are passenger vehicles. Of the variety of vehicle types using the Port, namely, passenger cars, goods vans, medium and heavy lorries, container trucks, motor cycles, taxis and tricycles, the largest single category is the heavy lorry (29.1%) followed by motor cycles (21.1%). Passenger cars (17.2%) and vans carrying goods (17.0%) are almost in equal proportions. Container truck traffic heads next with 9.6 percent followed by medium lorries 4.9%.

(4) Distribution of Port Traffic

The results of the origin-destination survey carried out show some interesting results. The traffic generated by the Port is roughly distributed in the ratio of 2/3 to the city and 1/3 outside Colombo (ref. trip distribution see appendix Table-3, -4).



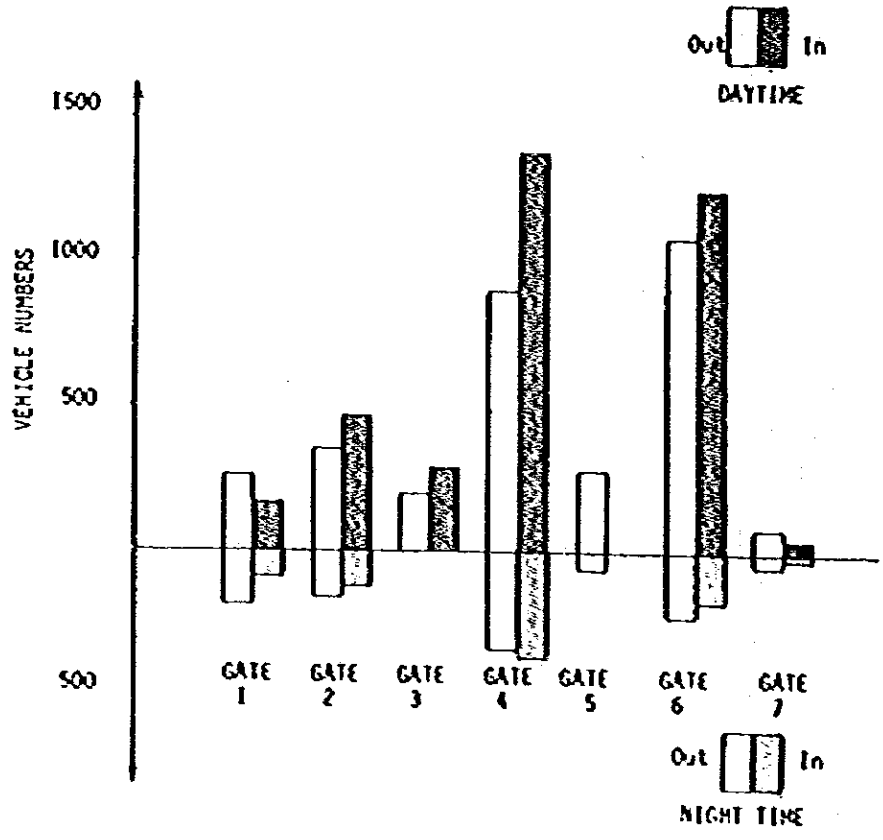




Fig. 2-10 Gate Utilization at the Port

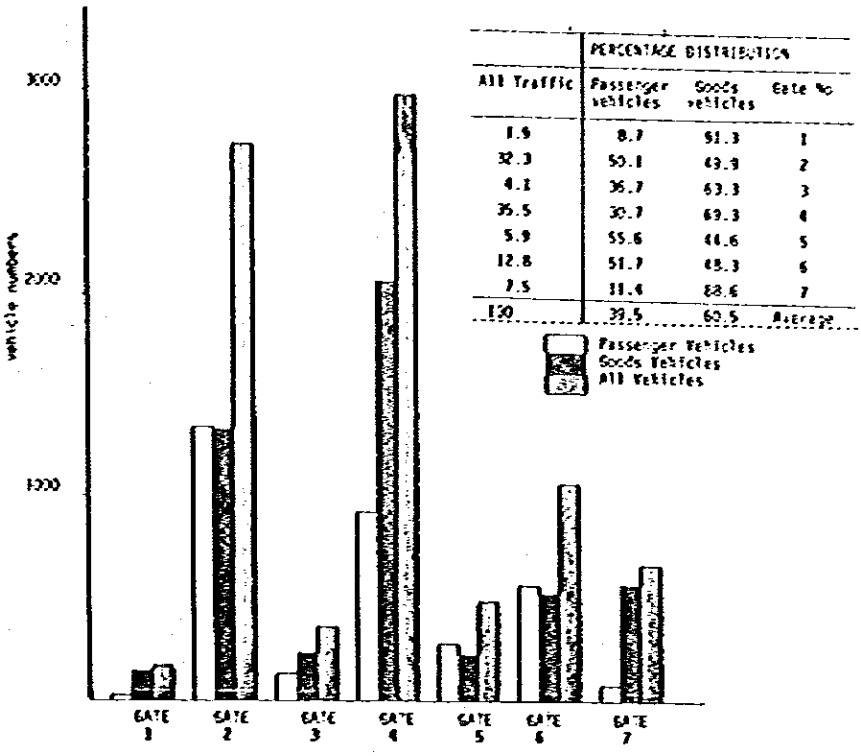



Fig. 2-11 Passenger and Goods Vehicle Usage at Gates

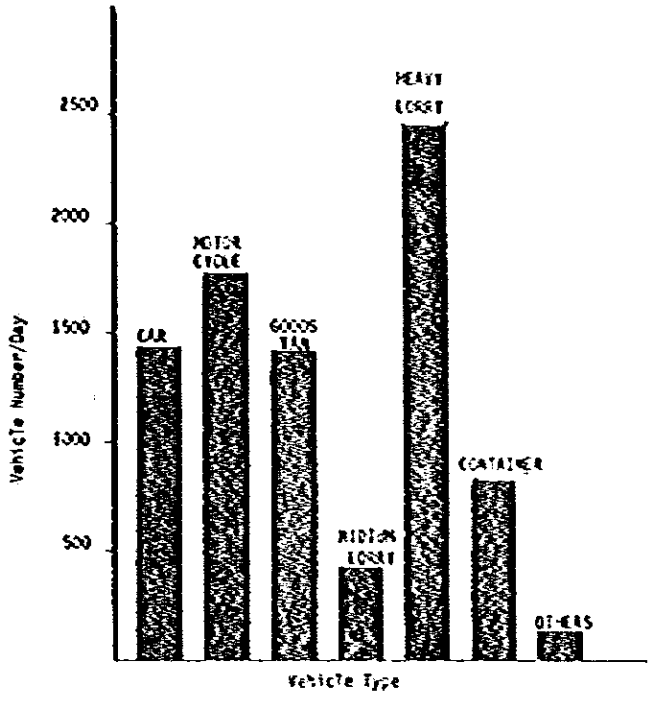



Fig. 2-12 Distribution of Vehicle Types Using the Port

Further analysis of these results are illustrated in Fig. 2-7. The greatest concentration of trips to the city is directed to zone 1 (26.2%) which constitutes the Central Area of Fort and Pettah. This is followed by zones 5, 6, 7, 8 (15.5%) which consists of Mattakkuliya, Bloemendhal and Grandpass where there is a high concentration of warehouses, industrial sites and container yards. The next in line are zones 3 and 4 (10.2%) which areas are around Beira Lake where there is a high intensity of warehouses and agency houses. These three areas attract 51.1 percent of the total Port traffic. The remaining 15.1 percent of the trips is distributed to all other areas of the city. The ratio of passenger traffic to goods traffic to and from the Port which has been seen to be in the proportion of 40:60 is maintained in the three groups of zones analyzed, except in the case of zones 3 and 4 where the goods percentage falls to 54.4. These results are summarised in Table 2-1 below:

Table 2-1: Passenger and Goods Trips Distribution of Port Traffic

| | % of Port Traffic | Pass. Trips | Goods Trips |
|---|---|---|---|
| Zone 1 (Pettah & Fort) | 26.2 | 39.5 | 60.5 |
| Zones 3 & 4 (around Beira Lake) | 10.2 | 45.6 | 54.4 |
| Zones 5, 6, 7, 8 (Mattakkuliya, Bloemendhal. Grandpass) | 15.5 | 39.4 | 60.6 |
| Rest of the city | 15.1 | 39.5 | 60.5 |
| Outside city | 33.0 | 38.4 | 63.6 |
| Total | 100.00 | | |

### 2.3.3 The City of Colombo

#### (1) General

The City of Colombo developed around the Port of Colombo which is strategically located on the East-West trade route. Surrounding the Port in the South-Eastern area is the most important sector of the City, Fort and Pettah – the Central Area. Fort contains about 50 hectares mainly devoted to institutional and commercial artivities. Pettah is the main wholesale trade centre and the retain centre for the City. About 750,000 sq. metres of floor space are concentrated in this area. A large amount of low utility land is under development by the government and private sector for offices, banking, hotels and shopping. About 21 sites have been earmarked for development of about 550,000 sq. metres. This would increase substantially the built area in the Central Area to about

1.8 million sq. metres by 2001 A.D. The other important areas for development are the nodal points, Kollupitiya, Bambalapitiya, Wellawatte, Borella, Maradana, and Slave Island. Their planning is being done by the Urban Development Authority. The satellite towns of Dehiwala, Mt. Lavinia, Nugegoda, Maharagama, Kotte, Peliyagoda and Wattala have important bearing on the traffic flows to the City.

(2) City Traffic

The transport in the City is mainly by road and rail. The main highways enter the City from the Colombo Metropolitan Area in a radial pattern and link up in the Central Area. The major rail routes enter the City in a similar manner.

As in most developing countries there is a mixture of fast and slow traffic on the City streets. Cars, buses, motor coaches, lorries, container trucks, motor cycles and the slow moving bicycles and carts use the same space.

Parking in the City is a major problem. There are no off street parking garages. All parking is by the kerbside. These contribute substantially to traffic congestion. A lack of correctly designed pedestrian crossings, suitably located bus stops, inadequate side walks, well designed road signs and markings contributed to poorly disciplined driver and pedestrian behaviour.

(3) Flow Patterns of Traffic

The traffic flow pattern in the City is shown in the flow map, Fig. 2-13. The highest traffic volumes in p.c.u. per day are recorded on Colombo - Galle Road (48,500), Havelock Road (27,000), Prince of Wales Avenue (48,200), Sri Sangaraja Mawatha (58,400), Olcott Mawatha (50,000) and Baseline Road (28,700). (Appendix for flow data)

Traffic enters the City through nine important points, namely, Victoria and New Kelani Bridges in the North; Kolonnawa, Cotta Road, Stace Road and Narahenpita in the east and Kirillapone, Pamankade and Dehiwala Bridges in the south. The daily variation at the four most important points are shown in Fig. 2-14. At Dehiwala and Victoria Bridges the flow rises to around 4% of the daily flow by 7.00 a.m. and maintains almost a steady value till 6.00 p.m. At Kirillapone and New Kelani Bridges, the high value runs about an hour later and continues till 7.00 p.m. The highest peak hour fast traffic flow (2,786 vehicles) and the largest traffic flow per day (58,422 p.c.u.) are recorded on Sri Sangaraja Mawatha. More significant is the high percentage of heavy

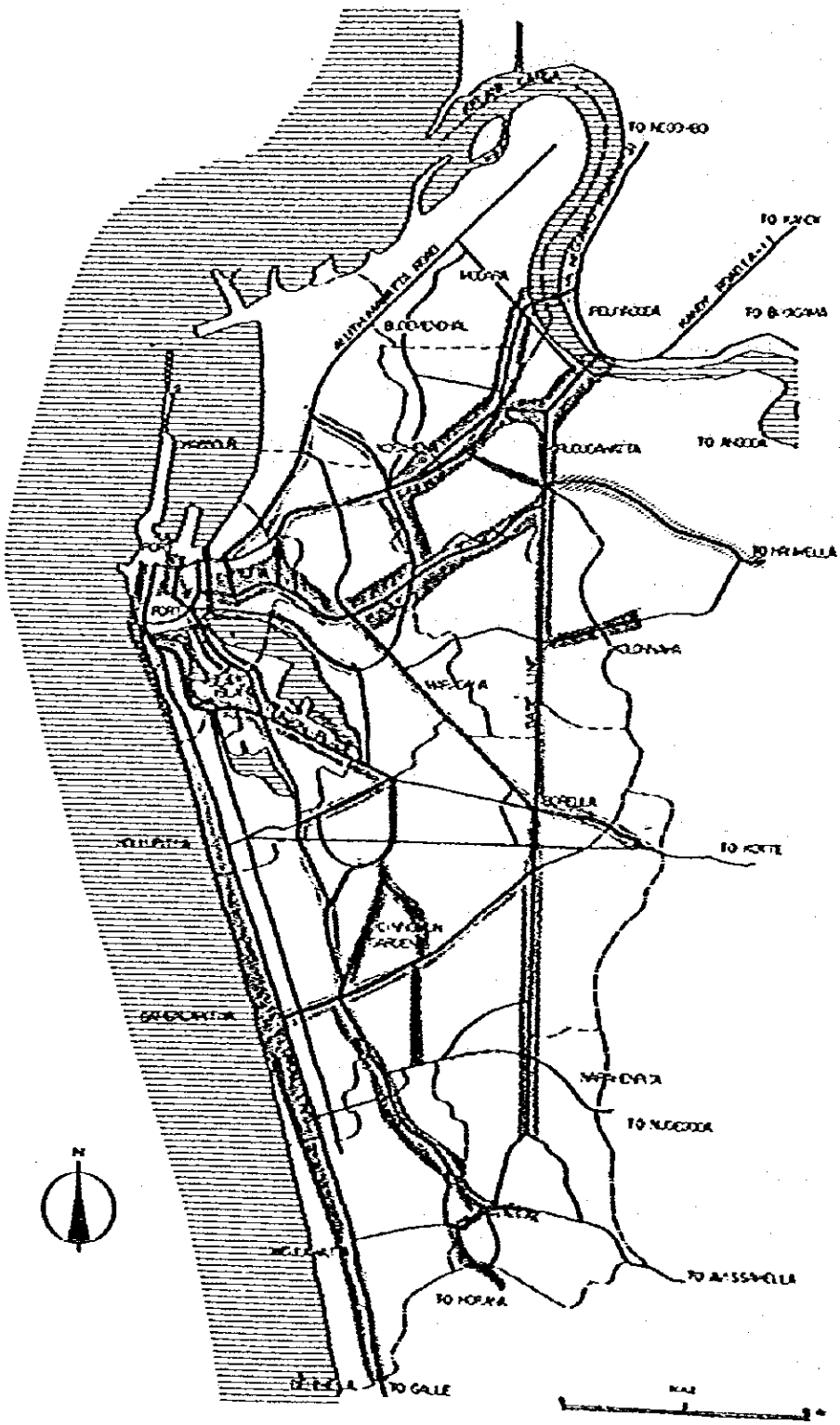


Fig. 2-13 Traffic Flow in Colombo City

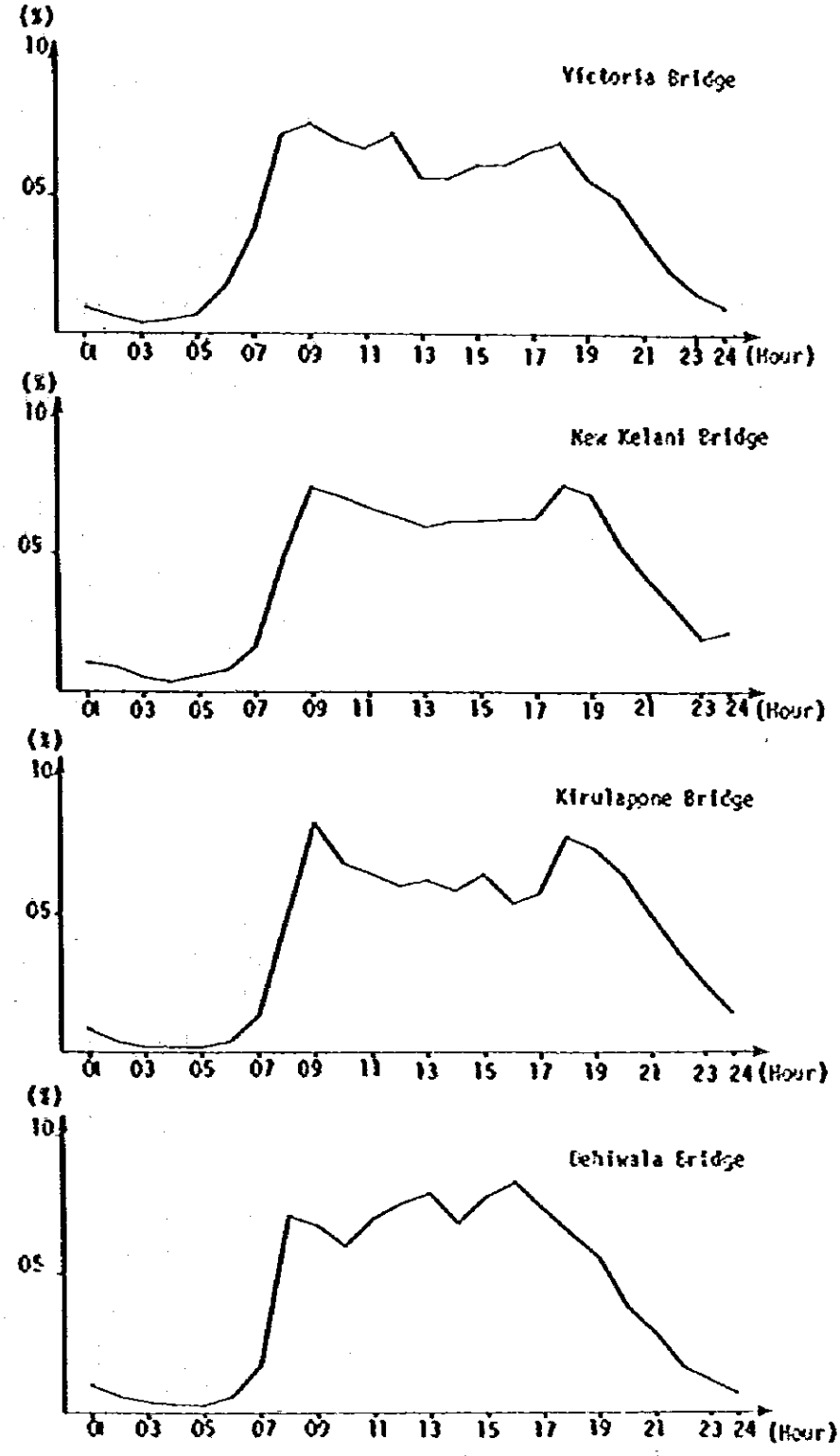



Fig. 2-14 Hourly Variation of Traffic Volume – 1983

vehicles in the traffic streams. The value varies from 22% on Colombo - Galle road to 36% on Colombo - Puttalam road. The streets on the North-Eastern sector of the City also record a very high percentage of slow traffic, ranging from 23% on Prince of Wales Avenue to 43% on Kolonnawa Road. These areas it may be noted are the low income residential areas.

Analysis of the Port traffic shows that, 34.2% of the traffic has to use the Fort area streets and 39.6% has to use the Pettah area streets. Hence, 73.8% of the Port traffic use the Central Area street system and 26.2% the rest of the City streets. Hence re-orientation of Port traffic can make a significant contribution to relieving Central Area traffic congestion and delays.

### 2.3.4 Secondary Road Network in Project Area

#### (1) General

Particularly north of the Kelani River within the project area the secondary road network is interspaced with important industrial sites. At Peliyagoda is a warehousing and industrial complex, at Hunupitiya a fertilizer stores, at Welisara a milk food factory and food stores, a tyre corporation at Kelaniya, oil refinery and urea complex at Sapugaskande, Investment Promotion Zones at Katunayake and Biyagama, a new town development at Seeduwa, an International Air Port at Katunayake and a tourist complex at Negombo.

#### (2) Secondary Road Network

The secondary road network links the two major arterials – Colombo Kandy and Colombo Puttalam forming a close matrix. Except for one or two roads all others are single carriage way roads of 3 to 4 metre width and 4 to 7 metre platform widths. These roads with their road widths and carriage widths are listed in Table 2-2.

#### (3) Secondary Road Traffic

The secondary road network carries low to medium level traffic. The more important traffic flows are shown in the traffic flow Fig. 2-15 and the flows are listed in Table 2-3 showing peak hour total flows both by vehicle type and P.C.U.

An important feature of this traffic is the very high ratio of slow to fast traffic. This ranges from 0.40 to 2.7 and reflects the local traffic of bicycle and carts. There is also a high percentage of heavy vehicular traffic varying from 9.8% to 32%. It is also significant that for the roads on which traffic flow is high both slow and heavy traffic are high and so is also the peak hour percentage of daily traffic.

Table 2-2: Secondary Road-Widths

| Name of Road | Carriageway Width (m) | Roadway Width (m) |
|---|---|---|
| Negombo - Mihirigama | 4.1 ~ 4.6 | 5.7 ~ 7.2 |
| Negombo - Aluttepola | 3.0 ~ 4.6 | 6.8 ~ 7.8 |
| Kadawata - Welisara | 5.0 | 4.5 |
| Negombo - Minuwangoda - Veyangoda | 4.8 ~ 5.1 | 6.9 ~ 7.2 |
| Ja-Ela - Minuwangoda | 5.0 ~ 5.7 | 7.0 ~ 7.8 |
| Ekala - Gampaha | 5.0 ~ 6.0 | 6.7 ~ 10.0 |
| Wattala - Mahara | 5.1 | 6.1 ~ 7.2 |
| Ja-Ela - Pamunugama | 5.1 ~ 6.1 | 6.8 ~ 7.2 |
| Wattala - Wanawasala | 3.2 | 5.1 |
| Wattala - Telagapatha | 4.0 ~ 4.2 | 5.3 ~ 6.8 |
| Dalugama - Wewelduwa | 3.4 | 5.5 |
| Seeduwa - Udugampola | 3.0 ~ 4.6 | 4.4 ~ 5.7 |
| Negombo - Giriulla | 3.0 ~ 4.8 | 4.2 ~ 7.2 |

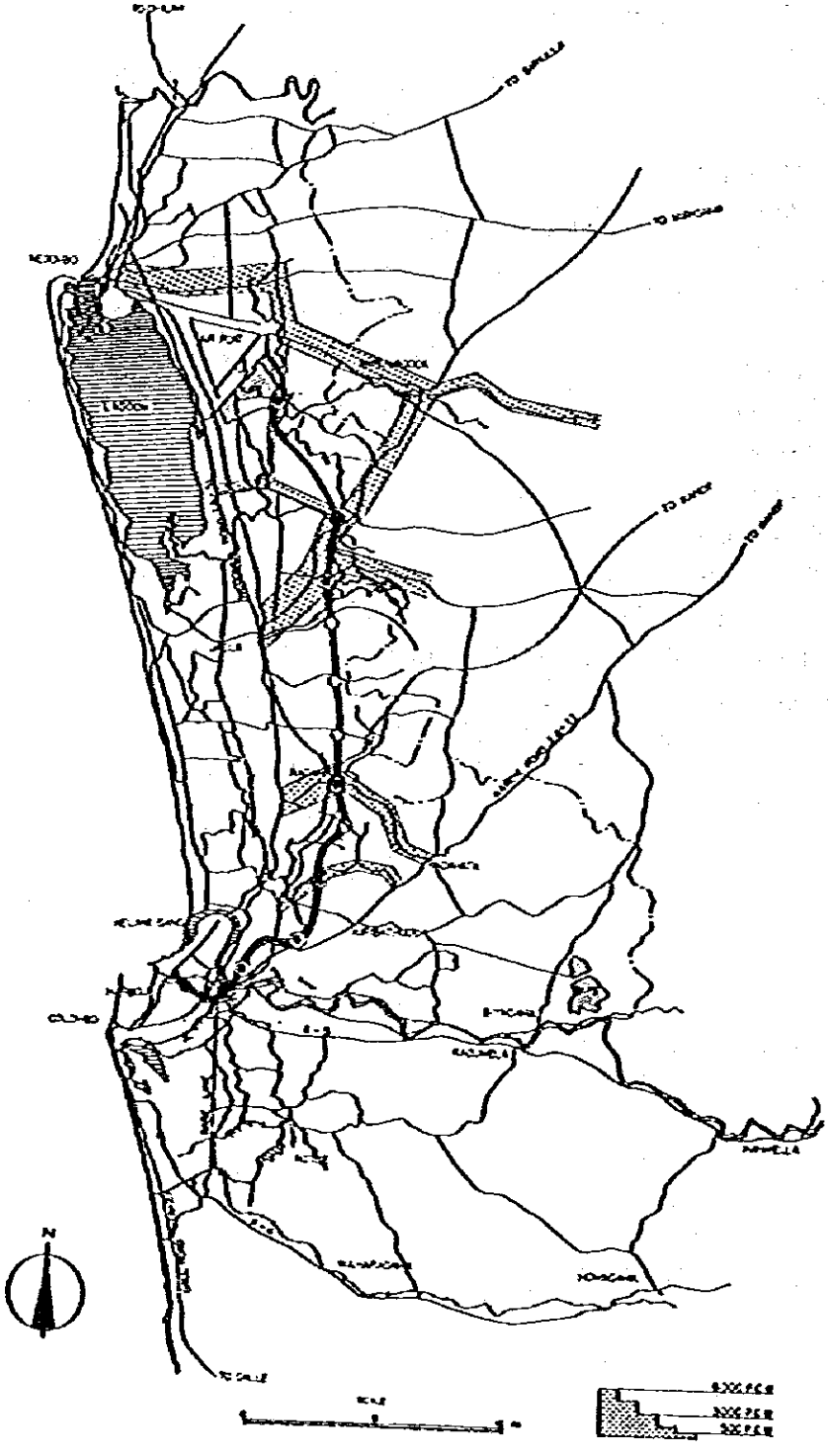


Fig. 2-15 Traffic Flow on Major Secondary Roads in Project Area

Table 2-3: Traffic Flow on Network of Secondary Roads in Project Area

| Year | Name of Road | Peak Hour Slow Total | Peak Hour Fast Total | A.D.T. Vehicle Type | A.D.T. P.C.U. | Ratio Slow/ Fast | % of Heavy Vehicle | % in Peak Hour |
|---|---|---|---|---|---|---|---|---|
| 1977 | Kadawatha-Ragama-Welisara<br>1st mile Kiribathgoda | 70 | 146 | 1,210 | 1,809 | 1.4 | 17.7 | 12.1 |
| 1977 | Wattala-Kadawatha<br>2nd mile Dalupitiya | 27 | 56 | 673 | 1,328 | 1.3 | 23.2 | 8.3 |
| 1978 | Seeduwa-Kadawatha<br>Amandoluwa Junction-Seeduwa | 29 | 63 | 718 | 1,401 | 1.2 | 0.17 | 8.7 |
| 1978 | Negombo-Nittambuwa<br>13/5 Bridge, Dewalapola | 51 | 64 | 760 | 1,437 | 0.53 | 26.0 | 8.4 |
| 1979 | Muthuwadiya Ferry<br>Raddoluwa Junction-Seeduwa | 11 | 13 | 271 | 500 | 1.1 | 32.0 | 4.8 |
| 1979 | Katunayake-Minuwangoda<br>1st mile Katunayake | 12 | 57 | 561 | 724 | 2.7 | 9.8 | 10.7 |
| 1979 | Katunayake-Awariwatta<br>1st mile Katunayake | 02 | 04 | 171 | 171 | 16.1 | - | 2.3 |
| 1979 | Mahabage-Kadawatha<br>Ragama | 104 | 192 | 2339 | 4458 | 0.78 | 30.0 | 8.8 |
| 1980 | Negombo-Veyangoda<br>11th mile Kalawana | 33 | 51 | 755 | 1,309 | 0.66 | 23.0 | 6.8 |
| 1980 | Ja-ela-Minuwangoda<br>15th mile Ekala | 294 | 403 | 4043 | 6248 | 0.4 | 25.0 | 10.0 |
| 1981 | Andiambalama-Negombo<br>Negombo | 171 | 242 | 2305 | 3358 | 0.57 | 24.0 | 10.5 |
| 1981 | Andiambalama-Katunayake<br>Air Port Katunayake | 120 | 206 | 1,928 | 2718 | 0.65 | 22.0 | 10.7 |
| 1981 | Canada Friendship Road<br>Katunayake Air Port | 455 | 781 | 7,471 | 10,334 | 0.37 | 14.0 | 10.0 |

Source : Department of Highways

Note: * A.D.T.: Average Daily Traffic
** P.C.U.: Passenger Car Unit

The more important routes are

Ja-ela - Minuwangoda
Ekala - Gampaha
Mahabage - Wattala
Wattala - Mahara
Wattala - Hunupitiya - Kiribathgoda
Seeduwa - Kotugoda
Seeduwa - Katunayake

As seen from the map all the major interchanges are located on these routes.

(4) Bus Operations

The main mode of transport for the low and middle income groups is by public transport, the state serviced S.L.C.T.B. and private coach services. The network of secondary roads is thus fairly well serviced by bus and coach. The main bus traffic is shown in the Fig. 2-16. This follows similar patterns of traffic flow discussed earlier.

(5) Accidents

On the A3 Road from Colombo to Negombo, there are accident black spots at the main junctions.
These are listed below: Table 2-4.

Table 2-4: Accidents in 1978 on A-3 Road

| | No. of Accidents |
|---|---|
| Peliyagoda | 190 |
| Wattala | 107 |
| Kandana | 107 |
| Ja-ela | 79 |
| Seeduwa | 86 |
| Total | 469 |

The accident trends are shown in Table 2-5.

Table 2-5: Accident Trends

| Year | 1973 | 1974 | 1975 | 1976 | 1977 | 1978 |
|---|---|---|---|---|---|---|
| Slight | 332 | 351 | 294 | 352 | 356 | 219 |
| Serious | 79 | 96 | 89 | 129 | 116 | 213 |
| Fatal | 17 | 24 | 16 | 21 | 34 | 37 |
| % Fatal | 4.0 | 8.1 | 4.0 | 4.1 | 6.7 | 7.9 |

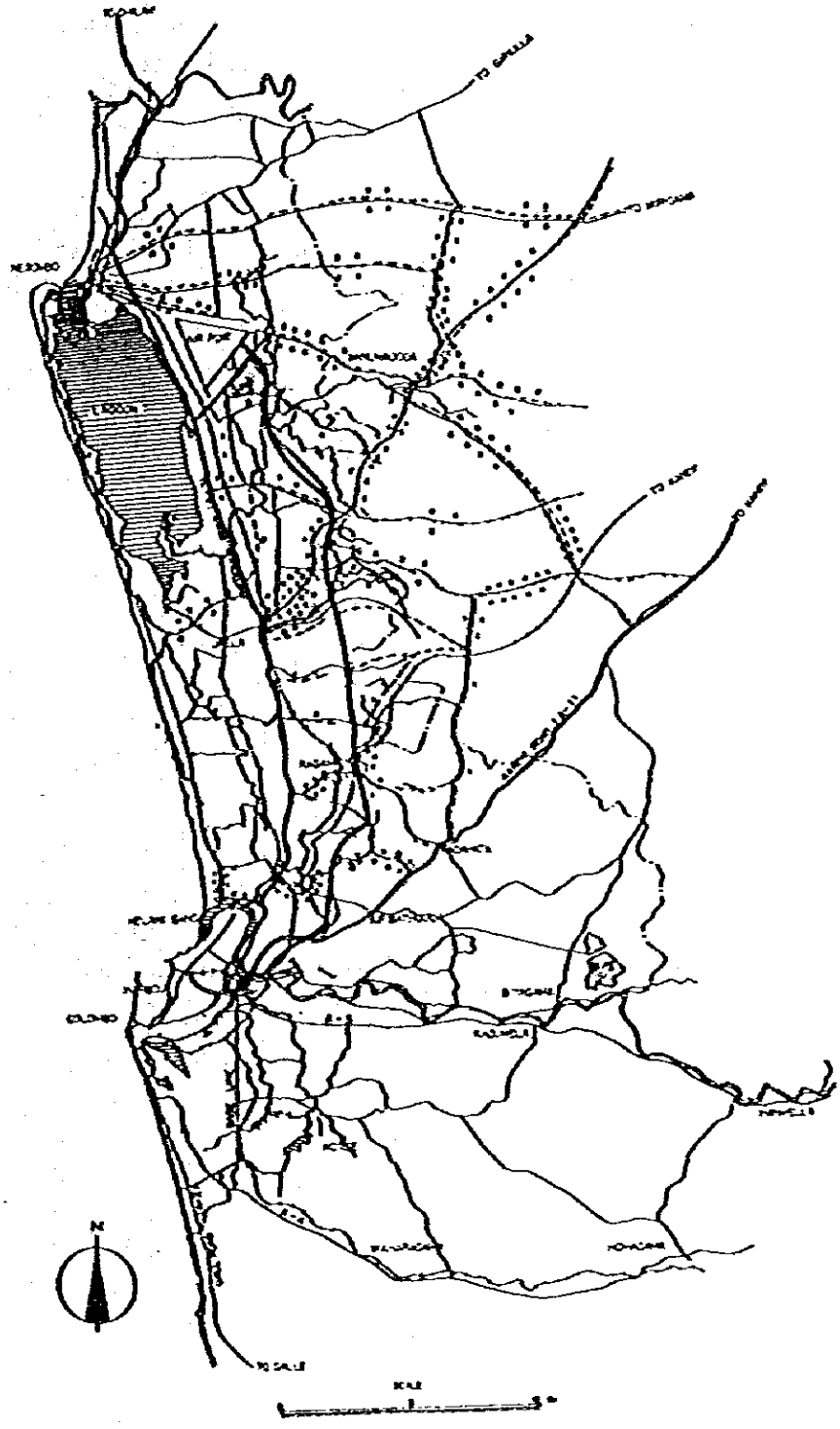


Fig. 2-16 Daily Bus Operations on Secondary Roads

Higher than 20% accidents occur between 7.00 a.m. ~ 9.00 p.m., serious accidents involve mostly pedestrians (31.8%); pedal cyclists (16.1%) – head on collisions at high speed and vehicles run off the road. Though the total number of accidents have not increased much there is a sharp rise in both serious and fatal accidents.

### 2.3.5 International Air Port and Katunayake IPZ

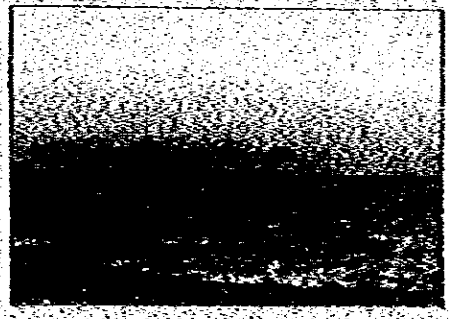
The development of the Katunayake Investment Promotion Zone anticipates an employment potential of 46,000 persons. At present there are 22 factories with 8,804 employees. Their main centres of residence are distributed as shown below with the main flow from the south followed by the north direction from IPZ.

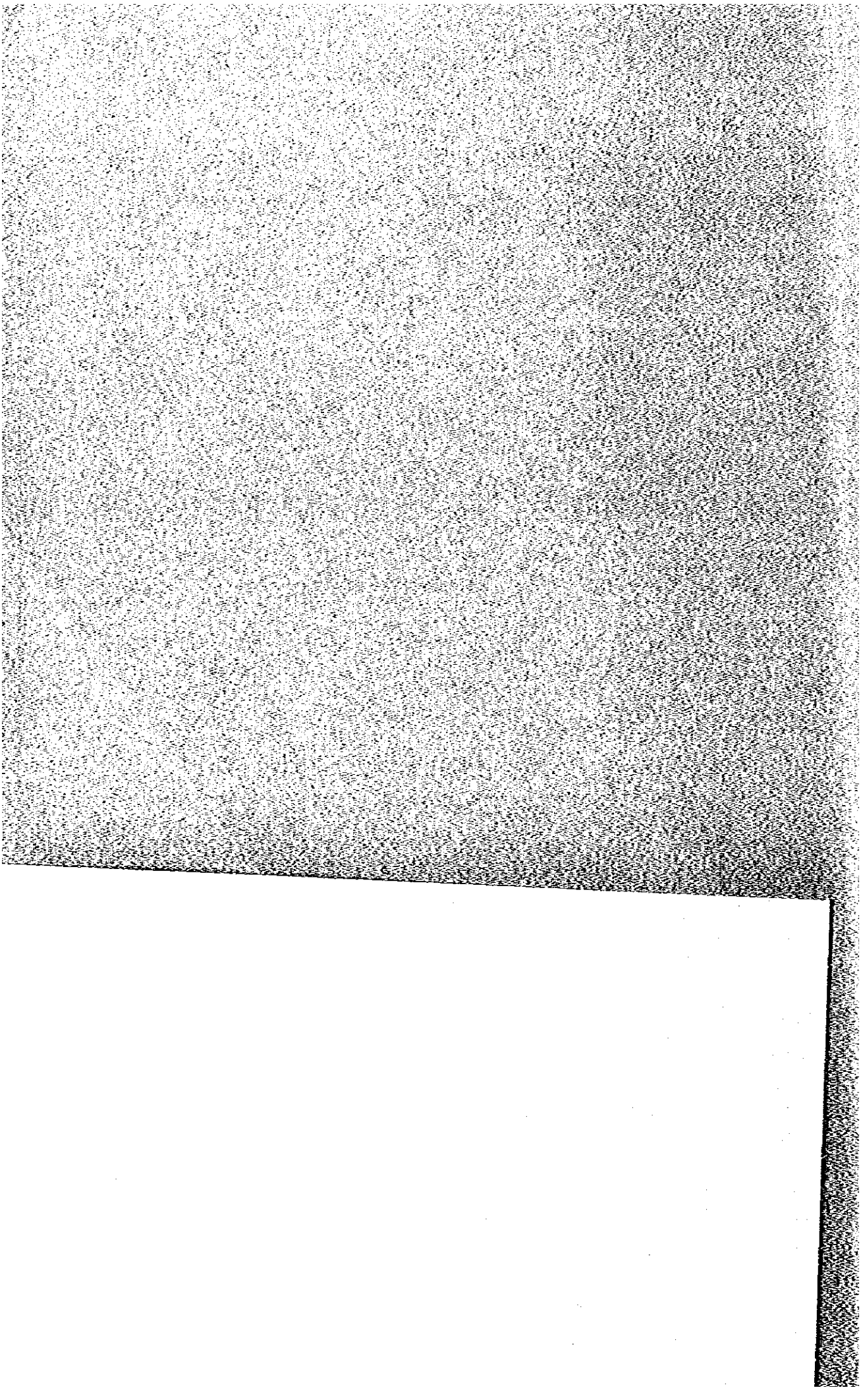
Percentage Distribution Of Employees

| | |
|---|---|
| South | 53.0 |
| North | 27.4 |
| East | 9.8 |
| Katunayake | 9.8 |
| Total | 100.0 |

The average daily traffic on the Canada Friendship Road to Colombo International Airport is 7,471 vehicles (1981), with the peak hour being 10 percent. There is a high ratio of slow to fast traffic (0.37%), the slow traffic being mostly bicycles (26.9%) which have destination as the I.P.Z. The passenger car traffic is 44.7% and mostly directed to the Airport.

# CHAPTER 3
# PROJECTION OF TRAFFIC DEMAND





# CHAPTER 3 PROJECTION OF TRAFFIC DEMAND

## 3.1 PROCEDURE

Since it is necessary to estimate benefits not only under the present existing conditions but also under the conditions that would prevail when this project is completed and in the subsequent years thereafter, it is essential that forecasts of traffic should be made to cover the full period of the financial and economic analysis. As it is very difficult to forecast the traffic flow for the far future, in this project traffic forecasting is made only for the years of 1990 and 2000.

The future traffic volume of the Project Road is mainly affected by the following two factors:

(1) Trend expansion based on the past socio-economic activities (natural growth of traffic).

(2) The new activities in the planned development area such as industrial, housing, and so on.

At first, the volume and the pattern of future traffic are forecasted on the basis of trend expansion and then, traffic from main developed areas is added to that volume. The above-mentioned traffic forecasting is done on the basis of the present origin-destination table. The outline of the traffic forecasting procedure is shown in Fig. 3-1, which is explained in more detail in the following sections.

## 3.2 SOCIO-ECONOMIC INDICATORS FOR TRAFFIC PROJECTION

### 3.2.1 Population

According to the 1971 and 1981 census data, the population of the whole country of Sri Lanka is 12.69 million and 14.85 million respectively. The actual annual growth rate from 1971 to 1981 was only 1.6 percent.

The population in 2000 has been estimated by the Ministry of Plan Implementation (High Case: 23 million, Low Case: 22 million). When considering the past trend of population increase, these projected values seem to be rather high. Therefore, toward the year 2000, this projection was modified after some consideration, (refer to Technical Report on Regional Economy). The projected values are shown in Table 3-1.

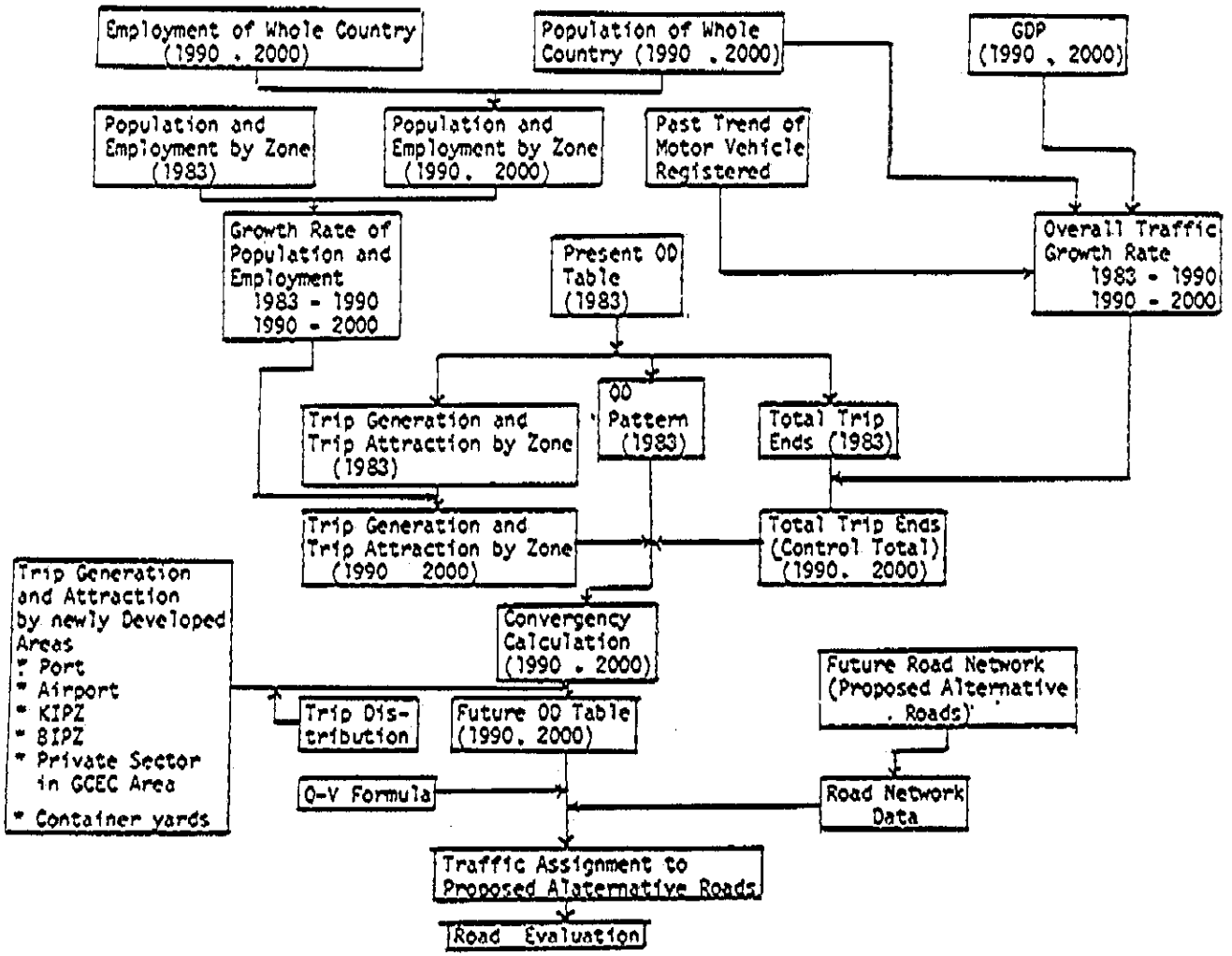



Fig. 3-1 Estimation of the Future Traffic Volume and Traffic Assignment to the Future Road

Table 3-1: Results of Population Projection of the Whole Country

Unit: $10^3$ persons

| Area | 1971* | 1981* | 1990 | 2000 |
|---|---|---|---|---|
| The whole country of Sri Lanka | 12,690 | 14,850 | 17,412 | 20,973 |

Remarks: (1)*: Actual figures
(2) Average annual growth rate
1981 ~ 1990 : 1.78%
1990 ~ 2000 : 1.88%

On the other hand, the objective region[1] will have a population of 4.452 million in 1990 and 5.134 million in 2000 as against the 3.402 million in 1971 and 3.914 million in 1981. As a result, average annual growth rate for the objective region is slightly more than 1.4 percent toward the year 2000. Table 3-2 shows the results of population projection by districts involved in the objective region.

Table 3-2: Results of Population Projection by Involved Districts[2]

Unit: $10^3$ persons

| District | 1971* | 1981* | 1990 | 2000 |
|---|---|---|---|---|
| Colombo | 1,498 | 1,698 | 1,902 | 2,157 |
| Gampaha | 1,174 | 1,389 | 1,624 | 1,928 |
| Kalutara | 730 | 827 | 926 | 1,049 |
| Total (Objective Region) | 3,402 | 3,914 | 4,452 | 5,134 |

Remarks: *: Actual figures

The present population by traffic zone is estimated, based mainly on the 1981 census data. These figures are extended to 1983 using the past trend from 1971 to 1981. The detailed flow chart of this procedures is represented in Appx. Fig. 2 and the projected values by traffic zone are also shown in Appx. Table 5 ~ 8.

Note 1) Objective region consists of Colombo, Gampaha and Kalutara districts.
2) Source – Study Team (refer to Technical Report on Regional Economy)

### 3.2.2 Employed Population

According to the results of the "Labour Force and Socio-economic Survey 1980/81", total employed population of the whole country of Sri Lanka was 4.851 million, of which

primary sector's proportion was 47.3 percent (2.293 million). This shows the economy of Sri Lanka is still basically agricultural. Table 3-3 represents the existing employed population of Sri Lanka by industrial divisions.

Table 3-3: Employed Population of Sri Lanka by Industrial Divisions – 1980/81

| Industrial Division | Employed Population (thousand) | Proportion to the Total Employment (%) |
|---|---|---|
| Primary | 2,293 | 47.3 |
| Secondary | 870 | 17.9 |
| Tertiary | 1,386 | 28.6 |
| Activities not adequately defined | 302 | 6.2 |
| Total | 4,851 | 100.0 |

Source: Dept. of Census & Statistics, "Labour Force and Socio-economic Survey, 1980/81".

Labour force and employment in the objective region were projected utilizing various ratios clarified from the past trend. Table 3-4 summarized the projected labour force and employment in the objective region. Judging from this Table, in the objective region, the share of the primary sector is only 15 percent in 1981 and is estimated to decrease to less than 10 percent by the year 2000. On the other hand, the share of Tertiary Sector has already exceeded more than 50 percent. However, as for the growth rate, Secondary Sector shows, the highest increase due to the industrial development plans such as the KIPZ and BIPZ in the objective region.

Table 3-4: Labour Force and Employment in the Objective Region

Unit: $10^3$ persons

| Item | 1981* | 1990 | 2000 |
|---|---|---|---|
| 1. Primary Sector | 181 (15.0) | 192 (12.1) | 201 (9.6) |
| 2. Secondary Sector | 244 (20.2) | 361 (22.7) | 528 (25.2) |
| 3. Tertiary Sector | 608 (50.3) | 809 (50.9) | 1,070 (51.1) |
| 4. Others** | 175 (14.5) | 227 (14.3) | 295 (14.1) |
| Sub-total (Employment) | 1,208 (100.0) | 1,589 (100.0) | 2,094 (100.0) |
| Unemployed | 298 | 315 | 371 |
| Total (Labour Force) | 1,506 | 1,904 | 2,465 |

Remarks: (1)* : Estimated figures, based on "Labour Force and Socio-economic Survey, 1980/81" and "Census of Population 1971".

(2)** : Activities not adequately defined.

(3) ( ) : Proportion to the total employment (Unit: %)

(4) Unemployment rate: 1981: 19.8%
1990: 16.5%
2000: 15.1%

The number of workers by sector by traffic zone, having the share obtained from 1981 census data, the total employment indicated in Table 3-4 is disaggregated into the number of employees by traffic zone. Next, these figures are extended to 1983 using the past trend from 1971 to 1981. Detailed flow chart of this procedure and the projections of employment by traffic zone in 1990 and 2000 is shown in Appx. Fig. 2 and Table 5 ~ 8 respectively.

### 3.2.3 Gross Domestic Product (GDP)

According to the analysis of GDP growth[5], the economy of Sri Lanka has changed from the year 1978. While an annual growth rate of GDP (in real terms) from 1971 to 1977 had been only 3.3 percent, that from 1978 to 1981 was higher at 6.0 percent per annum. From the analysis of the contribution by the industrial division/sector from 1971 to 1981, it can be said that the role of the agriculture/primary sector has stagnated in the whole country, however, the contribution rate of the Secondary Sector to GDP has gradually increased during the past ten years. Tertiary Sector has remained to be the main contributor to Sri Lanka's economy. In forecasting of GDP, the average annual increase rate was assumed towards the year 2000 by the industrial sector (3.5% in Primary; 7.2% (1981 to 1990) and 6.7% (1990 to 2000) in Secondary; 5.5% in Tertiary). Average growth rate of GDP will result in 5.5 percent during the projection period. The results of this projection is shown in Table 3-5.

Table 3-5: Gross Domestic Product (GDP) and Contribution by Industrial Sector[5)]

Unit Rs. $10^6$

| Industrial Sector | 1980* | 1990 | 2000 |
|---|---|---|---|
| 1. Primary | 18,221 (27.7) | 24,833 (23.3) | 35,030 (19.3) |
| 2. Secondary | 18,410 (28.0) | 34,420 (32.4) | 65,835 (36.3) |
| 3. Tertiary | 29,145 (44.3) | 47,189 (44.3) | 80,605 (44.4) |
| Total (GDP) | 65,776 (100.0) | 106,442 (100.0) | 181,470 (100.0) |

Remarks: (1) : At 1980 constant factor cost prices, discounted by the implicit GNP deflator.
(2) : * : Actual figures
(3) : ( ) Contribution rate (Unit: %)

Note 5): Refer to Technical Report on Regional Economy.

### 3.2.4 Number of Vehicles

As shown in Table 3-6 (refer to Table (1) of Appx. 1 for the number of motor vehicles registered by the type of vehicle and by year) and Fig. 3-2 before 1977 the increase in the number of motor vehicles registered is extremely small due to restrictions on the import of vehicles. However there was a sudden increase after this restriction was relaxed in 1977 (refer to Appendix 1 about this restriction), because just after 1977, business and social activities increased with unpredictable rapidity. However, recently its pace has gradually dropped down and a stable growth rate has now been established. But this drop does not mean that there is a stagnation in economic and social activities in Sri Lanka.

In this study, the growth rate of the number of motor vehicles registered gives the groundwork for the growth rate of overall traffic volume, which is explained in Section 3.3.

Table 3-6: Number of Motor Vehicles Registered by Year

| Year | Passenger Cars* | | Lorries** | | GDP | |
|---|---|---|---|---|---|---|
| | No. of Vehicles Registered | Growth Rate % | No. of Vehicles Registered | Growth Rate % | GDP*** | Growth Rate % |
| 1971 | 99,448 | 1.4 | 58,020 | 2.2 | 13,209 | 1.7 |
| 1972 | 100,860 | 1.4 | 59,890 | 3.3 | 13,631 | 3.2 |
| 1973 | 101,963 | 1.1 | 61,840 | 3.2 | 14,138 | 3.7 |
| 1974 | 103,351 | 1.4 | 64,362 | 4.1 | 14,585 | 3.2 |
| 1975 | 104,543 | 1.2 | 65,908 | 2.4 | 14,987 | 2.8 |
| 1976 | 106,911 | 2.3 | 67,607 | 2.6 | 15,431 | 3.0 |
| 1977 | 111,133 | 3.9 | 70,644 | 4.5 | 16,078 | 4.2 |
| 1978 | 118,891 | 7.0 | 79,356 | 12.3 | 17,401 | 8.2 |
| 1979 | 131,770 | 10.8 | 95,139 | 19.9 | 18,501 | 6.3 |
| 1980 | 141,625 | 7.5 | 113,722 | 19.5 | 19,575 | 5.8 |

Source: Economic & Social Statistics of Sri Lanka

* Cars; hiring cars & taxis, CTB buses and private coaches

**Lorries; Vans, Tractors and Trailers

***Unit: Rs. million (at constant factor cost price of 1970)

### 3.2.5 Future Plans

Inside the objective area, various plans and projects have been carried out, of these, those of the GCEC, UDA, NHDA and the Department of Town and Country Planning were fully looked into. Contents and physical progress of each project/plan have been understood, after the discussion with the suitable personnel of the related agencies. The results of these studies are summerized in in Appx. Table 9 ~ 11.

## 3.3 FORECASTING THE FUTURE TRAFFIC DEMAND

### 3.3.1 Procedure of Estimating the Future OD Table

The future volume of traffic (future OD table) is estimated through the following three stages:

- Forecasting the overall traffic growth rate
- Estimation of traffic growth rate by traffic zone
- Trip distribution based on present pattern

(1) Stage 1 -- Forecasting the overall traffic growth rate

It is necessary to project overall traffic demand prior to the projection of the future OD traffic volume. This projected volume is used as the *control total* in the future OD

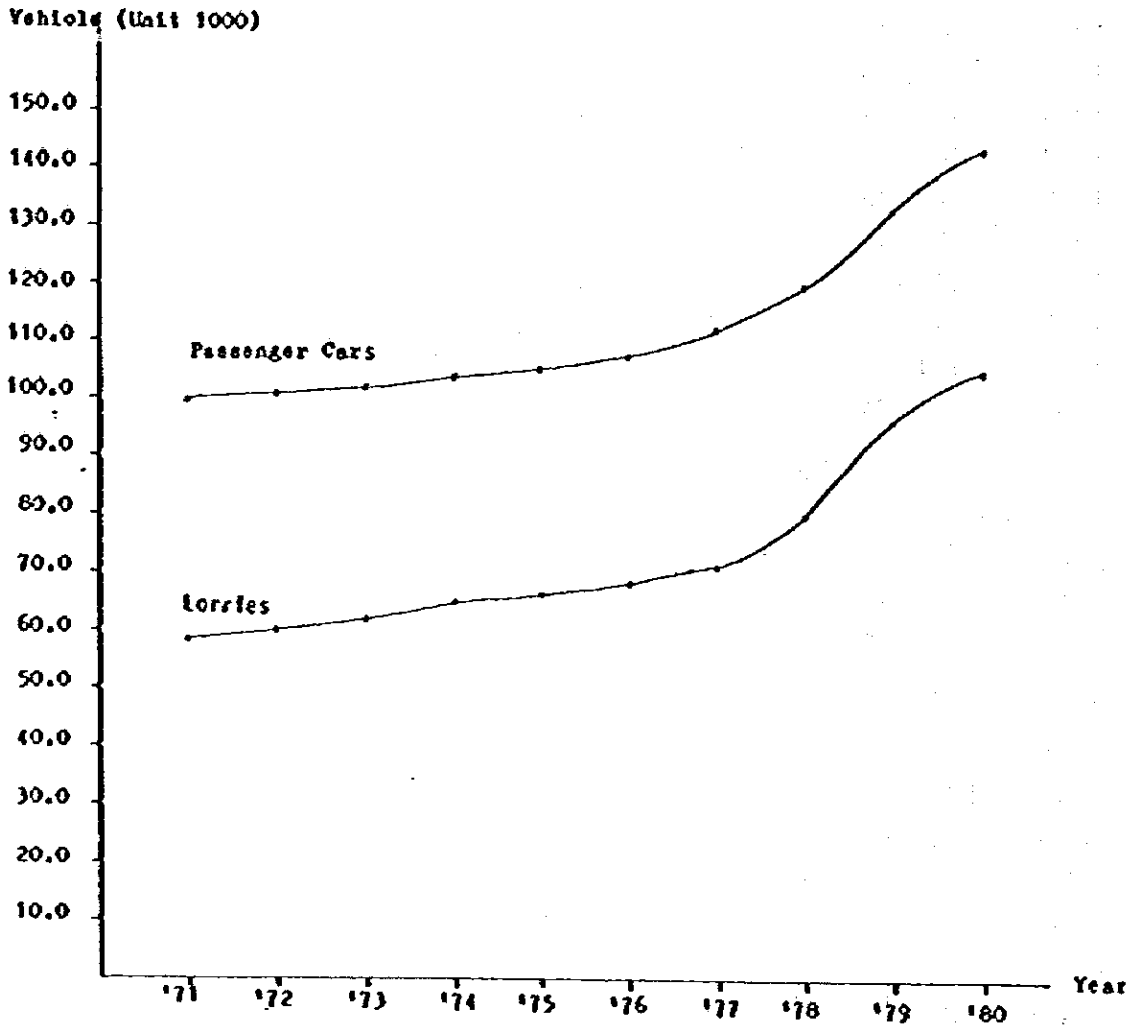



Fig. 3-2 Number of Motor Vehicles Registered by Year

table prepared based on the trend expansion.

The growth rate to be applied to the total trip ends in the OD table (that is, overall traffic volume) is estimated by the model explained in next clause 3.3.2. The future overall traffic is then projected by the present volume multiplied with this growth rate.

(2) Stage 2 – Traffic growth rates by traffic zone

Traffic growth rate by each zone is assumed to depend on the growth of the population and/or employment. In the first place, the zonal growth rates of these variables are calculated and then applied to estimate the future trip generation and trip attraction of each zone. In the second place, after these trip generation or trip attraction of each zone are summed up, the proportionate constant can be calculated by dividing this total value by the aforementioned projected overall traffic volume (control total). The estimated trip generation and trip attractions of each zone are proportionately expanded or reduced using this proportionate constant.

(3) Stage 3 – Trip distribution based on the present pattern

The future trip distribution (that is the traffic flow from one zone to another zone) is estimated using the present pattern method. Since the future trip generation and trip attraction of each zone are already estimated in the fonner stage, the future trip distribution is estimated with the Fratar Method on the basis of the present trip distribution pattern. It should be noted that up to this stage it takes in no account of traffic generated from the newly developed areas.

### 3.3.2 Estimation of Natural Growth Rate

As shown in Fig. 3-3, the growth rates of GDP and the number of motor vehicles registered have a similar trend of expansion. Judging from this fact, it may be concluded that irrespective of the existence of vehicle import restrictions, there seems to be a strong correlation between the growth of the number of vehicles registered and the GDP. Based on past trend, it may be, therefore, reasonable to adopt such a correlation as a basic assumption in the future traffic forecasting.

In the following analysis, the growth rate of the number of motor vehicles registered is used in order to forecast the future overall traffic volume.

Basic model is as follows:

$t = (\rho + 1)^{\beta} (\epsilon g + 1)^{\gamma} - 1$ (2)

$\rho$ : Annual growth rate of population in Sri Lanka

$g$ : Annual growth rate of per capita GDP

$\epsilon$ : Elasticity in terms of per capita vehicles/per capita GDP
$t$ : Average traffic growth rate for overall project area
$\beta, \gamma$ : Parameters

Parameters applied for this equation are shown in Table 3-7. The background of this model and the procedure of estimating these parameters are explained in Appendix 3.

Table 3-7: The Value of Parameters in Basic Model

| Type of Vehicle | Parameter | | | Multiple Correlation Coefficient |
|---|---|---|---|---|
| | $\alpha$* | $\beta$ | $\gamma$ | |
| Passenger Car | -18.985867 | 1.5167078 | 0.6643768 | 0.9817 |
| Lorry | -47.071592 | 0.462754 | 0.585765 | 0.9997 |

*See Appendix 3.

Using these parameters and substituting the projected growth rates of GDP and population in 1990 and 2000 in the above equation, the annual average growth rates are estimated, as shown in Table 3-8.

Table 3-8: Annual Average Growth Rate

| Type of Vehicle | 1980 ~ 1990 | 1990 ~ 2000 | 1983 ~ 2000 |
|---|---|---|---|
| Passenger Car | 8.0% | 7.8% | 3.63* |
| Lorry | 8.2% | 8.0% | 3.75* |

*Expansion factor

The total traffic volume of 1990 and 2000 based on the trend expansion reaches 1.7 times and 3.7 times respectively compared with the year 1983. The estimation of parameters is explained in Appendix 3, Table (1).

### 3.3.3 Evaluation of the Growth Rate

These estimates based on the theoretical model can be said to be reasonable considering the following facts: DOH conducted traffic counting on Victoria Bridge and New Kelani Bridge from 1978 to 1980 and also JICA Study Team conducted a similar survey in 1983. The results are shown in Table 3-9.

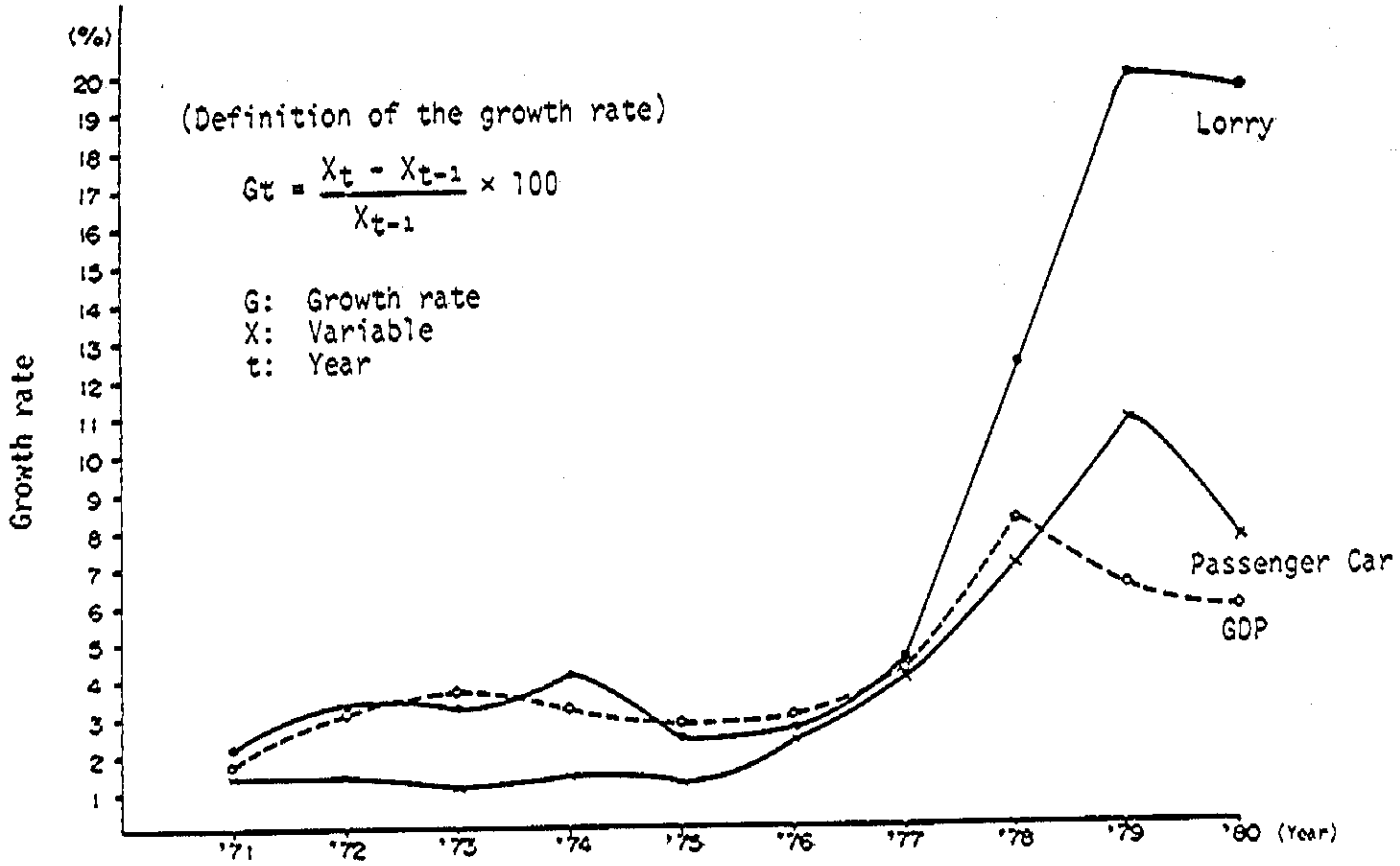



Fig. 3-3 Growth Rate of the Number of Motor Vehicles Registered and GDP

Table 3-9: Existing Traffic Volume

(Vehicles/12 hours)

| Year | Victoria Bridge | New Kelani Bridge | Total | Survey Conducted by |
|---|---|---|---|---|
| 1978 | 9,744 | 11,438 | 21,182 | DOH |
| 1979 | 10,337 | 12,003 | 22,430 | DOH |
| 1980 | 11,605 | 15,180 | 26,785 | DOH |
| 1983 | 13,460 | 19,950 | 33,410 | JICA |

*Considering that the annual growth rate of traffic on both bridges is 9.5 percent between the year 1978 and 1983, our estimates are a little conservative.* The reason is as follows:

As we have already shown in the growth pattern of GDP, lorries and passenger cars in Fig. 3-3, after 1976, the growth rate began to increase rapidly in spite of low growth rate before 1976. Judging from the future economic growth of Sri Lanka, such a high growth rate cannot be expected. *It is reasonable to assume that the growth rate converge to a stable rate.* The annual growth rate of GDP is forecastd to be 5.5 percent during the projection period in the 'Technical Report on Regional Economy'. This estimate would be a reasonable and stable growth rate from the view point of worldwide economy. Therefore, our estimates of future growth rate of traffic can be justified.

## 3.4 TRAFFIC FROM DEVELOPED AREA

Traffic often arises owing to the new activities of areas newly developed for industries, housing, and so on. This is sometimes identified separately from other generated traffic and called 'traffic from developed area'.

The following traffic would be considered to be added to the estimated trip generation and/or trip attraction of the related zones:

- Traffic from Colombo Port
- Traffic from Colombo International Airport
- Traffic from KIPZ
- Traffic from BIPZ
- Traffic related to private firms in the Project area
- Traffic related to container yards and warehouses

As for the trip distribution related to this traffic, the following models are applied in the projection of the future trip distribution.

Trip generation

$$Tkj = (\sum_{j} Tkj) \cdot \frac{Tj \cdot Lj}{\sum_{j} Tj \cdot Lj}$$

Trip attraction

$$Tik = (\sum_{i} Tik) \cdot \frac{Ti \cdot Li}{\sum_{i} Ti \cdot Li}$$

where,

Tkj : Traffic volume from developed zone k to zone j

Tik : Traffic volume from i zone to developed zone k

L : The number of workers

### 3.4.1 Traffic from Colombo Port

Future traffic from Colombo Port is based on the examination of forecast of freight (see Table 3-10) in 'Report on the Development Project of the Port of Colombo' March, 1980, JICA. The results are shown in Table 3-11.

The growth rate of traffic is as follows:

(1) Container Vehicles

Container vehicles are forecasted with the growth rate of the number of containers handled at the Port (excluding transhipment within the Port).

(2) Other Types of Vehicles

Vans, Medium Lorries, Heavy Lorries, Cars & Taxis are forecasted with the growth rate of the dry cargo (excluding containers and transhipments within the Port).

Table 3-10: Forecast of Dry Cargo at Colombo Port

(In thousand tons)

| | 1983 | 1990 | 2000 |
|---|---|---|---|
| Dry Cargo | 9,131 | 14,397<br>(1.6) | 27,809<br>(3.0) |
| Container | 127 | 337<br>(2.7) | 830<br>(6.5) |

Source : "Development Project of the Port of Colombo (JICA)"

( ) : Growth rate with year 1983 as unity

Table 3-11: Traffic Forecast for Colombo Port

(1) Traffic Generation

(Vehicles/Day)

| Type of Vehicle | 1983* | 1990 | 2000 |
|---|---|---|---|
| Van | 603 | 965 | 1,809 |
| Medium Lorry | 406 | 650 | 1,218 |
| Heavy Lorry | 1,334 | 2,134 | 4,002 |
| Container | 84 | 227 | 546 |
| Car & Taxi | 605 | 968 | 1,815 |

(2) Traffic Attraction

(Vehicles/Day)

| Type of Vehicle | 1983* | 1990 | 2000 |
|---|---|---|---|
| Van | 597 | 955 | 1,791 |
| Medium Lorry | 364 | 582 | 1,092 |
| Heavy Lorry | 1,608 | 2,573 | 4,824 |
| Container | 76 | 205 | 494 |
| Car & Taxi | 610 | 976 | 1,830 |

*Results of Survey by JICA Study Team

### 3.4.2 Traffic from Colombo International Airport

Future traffic from Colombo International Airport is based on the growth rate of the number of arriving and departing passengers per day and average daily cargo handling at Colombo International Airport according to 'Master Plan for Katunayake International Airport' conducted by Netherland Airport Consultants. These forecasts are adopted in the JICA Report of 1982 (Table 3-12).

The results are shown in Table 3-13.

Table 3-12: Forecasts of Passengers and Cargo at Colombo International Airport

| | 1983 | 1990 | 2000 |
|---|---|---|---|
| Number of arriving and departing passengers per day (persons/day) | 3,611 | 7,600 (2.1) | 14,271 (4.0) |
| Volume of Cargo handling (ton/year) | 22,763 | 42,000 (1.8) | 70,000 (3.1) |

Source: JICA Report

( ) : Growth rate with the year 1983 as unity

Table 3-13: Traffic Forecast for Colombo International Airport

(1) Traffic Generation

(Vehicle/day)

| Type of Vehicle | 1983* | 1990 | 2000 |
|---|---|---|---|
| Van | 366 | 676 | 1,127 |
| Medium Lorry | 29 | 54 | 89 |
| Heavy Lorry | 77 | 141 | 237 |
| Container | 5 | 10 | 15 |
| Car & Taxi | 698 | 867 | 1,537 |

*Results of Survey by JICA Study Team

(2) Traffic Attraction

(Vehicle/day)

| Type of Vehicle | 1983* | 1990 | 2000 |
|---|---|---|---|
| Van | 535 | 988 | 1,647 |
| Medium Lorry | 33 | 61 | 102 |
| Heavy Lorry | 123 | 227 | 378 |
| Container | 7 | 13 | 22 |
| Car & Taxi | 1,087 | 1,304 | 2,391 |

*Results of Survey by JICA Study Team

Note: The future modal split of air passengers using road transport is assumed based on 'Report on Transport Requirements of the GCEC Area of Authority' as follows:
Cars : 40% (including taxis)
Buses : 60%

### 3.4.3 Traffic from KIPZ

Future traffic from KIPZ is based on 'Report on Transport Requirements of the GCEC Area of Authority'.

The results are as shown in Table 3-14 & 3-15.

Table 3-14: Forecasts of the Number of Employees and Volume of Freight

| | 1983 | 1990*** | 2000**** |
|---|---|---|---|
| Average Daily Cargo (Tons) | 77* | 292 (3.8) | 600 (7.8) |
| Number of Employees (Persons) | 25,666** | 28,707 (1.1) | 46,000 (1.8) |

* Estimate by JICA Study Team based on the relationship between average daily cargo and number of employees

** Actual figure from GCEC

*** Linear interpolation from 1983 to 2000

**** Based on GCEC Report

Table 3-15: Traffic Forecast for KIPZ

(1) Traffic Generation

(Vehicle/day)

| Type of Vehicle | 1983 | 1990 | 2000 |
|---|---|---|---|
| Van | 155 | 589 | 1,209 |
| Medium Lorry | 26 | 99 | 203 |
| Heavy Lorry | 102 | 388 | 796 |
| Container | 3 | 11 | 23 |
| Car & Taxi | 207 | 227 | 373 |

(2) Traffic Attraction

(Vehicle/day)

| Type of Vehicle | 1983 | 1990 | 2000 |
|---|---|---|---|
| Van | 34 | 129 | 265 |
| Medium Lorry | 13 | 49 | 101 |
| Heavy Lorry | 34 | 129 | 265 |
| Container | 2 | 8 | 16 |
| Car & Taxi | 79 | 87 | 142 |

### 3.4.4 Traffic from BIPZ

There is no traffic data related to the Biyagama IPZ except 'Technical Memorandum 5' by Hurbert S. Levinson. However, this report does not give any useful information of the number of vehicles by each type. Therefore, we conducted a survey by interviewing the

heavy industries which are already located near BIPZ. The results are summerized in Table 3-16, 3-17.

Table 3-16: Outline of Corporations Visited

| Name of Corporation | Location | No. of Workers (Persons) | Area (Acres) | Main Products |
|---|---|---|---|---|
| Petroleum Corporation | Sapugaskanda | 650 | 160 | Fuel & Bitumen |
| Fertiliser Corporation | " | 1,000 | 136 | Urea |
| Tyre Corporation | Kelani | 2,000 | 36 | Tyre |

Table 3-17: Daily Incoming and Outgoing Traffic*

(Vehicles/day)

| Type of Vehicle | Petroleum | Fertilizer | Tyre |
|---|---|---|---|
| Van | – | 2 | – |
| Medium Lorry | – | – | 10 |
| Heavy Lorry | 21 | 100 | 15 |
| Container | – | – | – |
| Car & Taxi | 25 | 10 | – |
| Bus | 10 | 16 | 2 |

*Estimates by the Corporation.

Above data are inadequate to estimate the future traffic generated from and/or attracted to the Biyagama IPZ. Therefore, the future volume of traffic is simply estimated on the basis of the number of employment generated in BIPZ (estimated as 30,000 according to Some Basic Information about the Biyagama Investment Promotion Zone) as in Table 3-18. The results of traffic forecast are shown as in Table 3-19.

Table 3-18: The Estimated Number of Workers and Traffic Forecast for BIPZ

Estimated Workers (In Thousands)

| 1983 | 1990 | | 2000 | |
|---|---|---|---|---|
| | Natural Growth | Development of BIPZ | Natural Growth | Development of BIPZ |
| 17.1 | 19.6 | 4.3 | 24.6 | 30.0 |

Table 3-19: Traffic Forecast for BIPZ

(1) Traffic Generation

(Vehicles/day)

| Type of Vehicle | 1983 | 1990 | 2000 |
|---|---|---|---|
| Van | 48 | 68 | 158 |
| Medium Lorry | 8 | 11 | 26 |
| Heavy Lorry | 26 | 19* | 45* |
| Container | 1 | 19* | 45* |
| Car & Taxi | 81 | 114 | 267 |

(2) Traffic Attraction

(Vehicles/day)

| Type of Vehicle | 1983 | 1990 | 2000 |
|---|---|---|---|
| Van | 138 | 193 | 455 |
| Medium Lorry | 26 | 36 | 86 |
| Heavy Lorry | 86 | 61* | 144* |
| Container | 1 | 61* | 144* |
| Car & Taxi | 222 | 312 | 733 |

* According to 'Some Information about the Biyagama Investment Zone' (GCEC August, 1980), the heavy industrial firms are expected to be introduced within this area. Also considering the increment of containers, heavy lorries and containers are assumed to be in equal proportion in the future.

### 3.4.5 Traffic Related to Private Firms in the Project Area

After 1980 many private firms have newly located at Ja-Ela, Kelaniya, etc. within GCEC Area. Judging from the present economic policy, this trend would be expected to continue in the future.

GCEC already has data from such firms with regard to the location, the type of industry, the operation year, the present number of employees, and the future number of employees, and so on. These data are summarized in Table 20 and Appx. 3, Table (3). The estimate of the future traffic volume of each traffic zone is forecasted taking into account the future number of workers including the employees of abovementioned private firms.

Table 3-20: The Existing and Future Number of Employees of Private Companies in the GCEC Area

| Traffic Zone | 1980 | 1981 | 1982 | 1983 | Traffic Zone | 1980 | 1981 | 1982 | 1983 |
|---|---|---|---|---|---|---|---|---|---|
| 29 | A 0 | 0 | 6 | 6 | 39 | A 7 | 20 | 22 | 25 |
| | B 0 | 0 | 5 | 5 | | B 214 | 617 | 617 | 692 |
| | C 0 | 0 | 29 | 29 | | C 467 | 1210 | 1322 | 1353 |
| 31 | A 3 | 5 | 9 | 12 | 40 | A 5 | 9 | 15 | 18 |
| | B 53 | 273 | 275 | 310 | | B 40 | 100 | 123 | 126 |
| | C 156 | 656 | 685 | 700 | | C 47 | 202 | 243 | 243 |
| 32 | A 21 | 25 | 28 | 31 | 41 | A 18 | 32 | 41 | 41 |
| | B 481 | 609 | 651 | 703 | | B 237 | 465 | 606 | 606 |
| | C 661 | 796 | 821 | 876 | | C 471 | 719 | 862 | 362 |
| 33 | A 10 | 13 | 18 | 19 | 42 | A 1 | 3 | 4 | 4 |
| | B 744 | 750 | 786 | 786 | | B 7 | 96 | 96 | 96 |
| | C 674 | 674 | 699 | 699 | | C 3 | 171 | 171 | 171 |
| 34 | A 0 | 0 | 5 | 6 | 43 | A 5 | 12 | 21 | 23 |
| | B 0 | 0 | 14 | 15 | | B 35 | 63 | 160 | – |
| | C 0 | 0 | 193 | 195 | | C 2 | 84 | 204 | – |
| 35 | A 8 | 13 | 13 | 13 | 44 | A 3 | 3 | 5 | 8 |
| | B 532 | 637 | 637 | 637 | | B 10 | 10 | 10 | 17 |
| | C 1,107 | 1,320 | 1,320 | 1,320 | | C 22 | 22 | 22 | 182 |
| 36 | A 0 | 1 | 1 | 1 | 45 | A 7 | 16 | 29 | 34 |
| | B 0 | 8 | 8 | 8 | | B 91 | 489 | 649 | 670 |
| | C 0 | 16 | 16 | 16 | | C 101 | 531 | 803 | 833 |
| 37 | A 1 | 2 | 5 | 8 | 46 | A 1 | 3 | 7 | 107 |
| | B 21 | 21 | 122 | 139 | | B 140 | 158 | 293 | 293 |
| | C 42 | 162 | 194 | 224 | | C 0 | 75 | 403 | 403 |
| 38 | A 4 | 5 | 7 | – | | | | | |
| | B 315 | 375 | 375 | 375 | | | | | |
| | C 697 | 822 | 822 | 822 | | | | | |

A: Number of Industries

B: Present Number of Employees

C: Future number of Employees Estimated

Source: GCEC

### 3.4.6 Traffic Related to the New Container Yards and Warehouses

The commercial activities which include wholesale trade, retail trade, private business and banking are carried on mostly in Pettah and the adjoining area. These are housed in what were originally shop houses built during the early Dutch period. Only recently some of these have been rebuilt for use as commercial premises but many of them occupy the original small sites.

On the other hand, the industrial activities consist mostly of medium and small scale manufacturing and service establishments and warehousing. Most of these activities are concentrated in North of Colombo, around Union Place and close to Beira Lake.

According to the results of the traffic survey, about half the traffic from Colombo Port is connected with these areas., as shown in Table 3-21.

Table 3-21: Traffic Volume between Central Business District (CBD) of Colombo City and Colombo Port

(Unit: Vehicle/day)

| Traffic Volume | Total Trip | Freight Trip |
|---|---|---|
| Total traffic from and to Colombo Port (A) | 8,856 | 4,060 |
| Traffic connected between Port and CBD of Colombo City (B) | 4,940 (55.8) | 2,227 (54.9%) |

Note: ( ) means (B ÷ A) x 100

Judging from the future traffic growth of Colombo City and Colombo Port, problems in movement of traffic between these two places are considered to become worse, especially in the Fort and Pettah areas. In order to prevent the traffic congestion due to excess generation of traffic and mounting pressure on infrastructure, UDA is planning to develop warehouses and container yards at suitable site away from the CBD.

Through these development plans it is expected to reduce the movement of freight vehicles inside the CBD of Colombo City, and to have an efficient movement of goods since the freight vehicles become larger with the containerization.

In order to relocate the container yards and warehouses within the Colombo City to areas outside, UDA has proposed the future locations as follows:

- *Proposed future locations of container yards and warehousing area*
  1. Peliyagoda
  2. Urugodawatta
  3. Ratmalana
- *Average extent of a container yard*
  1. Medium scale = 4 to 8 Acres
  2. Large scale = 10 to 15 Acres
- *Dimentions of heavy vehicles with containers*
  1. Width = 9'.6"
  2. Length = 60'.0"
  3. Height = 16'.0" (Maximum)

In order to estimate the future traffic volume from these development areas the companies possessing container yards and warehouses were visited and investigated the existing traffic volume related to these activities. The results of investigation are summerized in Appx. Table 12.

Judging from the results of this investigation, the daily number of container traffic per acre coming in and going out the container yards and/or warehouses could be assumed to be 15 vehicles. Therefore, above-mentioned planned container yards would generate and/or attract the following number of container vehicles in the future, as shown in Table 3-22.

Table 3-22: Future Container Traffic Volume from the Proposed Container Yards

| Proposed Container Yards | Extent of Area (Acre) | Number of Containers (Vehicle/day) |
|---|---|---|
| Peliyagoda | 15 | 225 |
| Urugodawatta | 15 | 225 |
| Ratmalana | 8 | 120 |

## 3.5 TRIP GENERATION AND ATTRACTION

The projected number of trips of all vehicles generated from and attracted to the objective region reaches 189,000 (Expansion factor 3.6) in the year 2000, compared with the 53,000 trips in 1983. Among these, the trips by heavy lorries and containers are expected to increase by about four times the present number of trips, due to the increment of freight movement from Port and the newly developed area.

The projected number of trips by vehicle type is shown in Appx. Table 3-23.

Trip generation and attraction by traffic zone is projected under the procedure explained in Section 3.3.1.

Table 3-23: Projected Number of Trips by Vehicle Type

(Number of trips/day)

| Type of Vehicle | Number of Trips | | | Expansion Factor (Times) | |
|---|---|---|---|---|---|
| | 1983 | 1990 | 2000 | 1983 ~ 1990 | 1983 ~ 2000 |
| Car, Taxi & Tricycle | 15,499 | 26,968 | 57,394 | 1.74 | 3.70 |
| C.T.B* and Private Coaches | 7,543 | 10,742 | 19,207 | 1.42 | 2.55 |
| Van & Medium Lorries | 11,728 | 21,445 | 45,258 | 1.83 | 3.86 |
| Heavy Lorries & Containers | 8,451 | 15,998 | 33,937 | 1.89 | 4.02 |
| Motorcycle | 9,843 | 16,204 | 33,224 | 1.65 | 3.38 |
| All Vehicles | 53,064 | 91,357 | 189,020 | 1.72 | 3.56 |

*Note: Trips of CTB is assumed to increase only by 10% up to the year 2000, based on the discussions of Survey Team with CTB officials.

Fig. 3-4 illustrates the trip generation and attraction at each compressed traffic zone. Peliyagoda shows the highest growth rate of trip ends of all types of vehicles (more than 6 times in 2000 compared with 1983). Next to Peliyagoda, Wattala, Welisara, Ekala and Biyagama also show higher growth rates of trip ends. The back data of this figure is shown in Appx. Table 13.

## 3.6 OD TRAFFIC VOLUME

The projected OD matrix represents the future characteristics of the interzonal traffic volume. Appx. Table 3-22 shows the change of the distribution pattern of traffic related to Colombo City including Port crossing Kelani Ganga which can be summarized as follows:

a) The traffic volume with origin or destination in Colombo City crossing Kelani Ganga in the year 2000 reaches 3.6 times (about 100,000 vehicles) that of 1983 (28,000 vehicles).

b) In 1983, the composition of the passenger cars and freight cars was almost the same. Towards 2000, the number of freight cars exceeds that of the passenger cars.

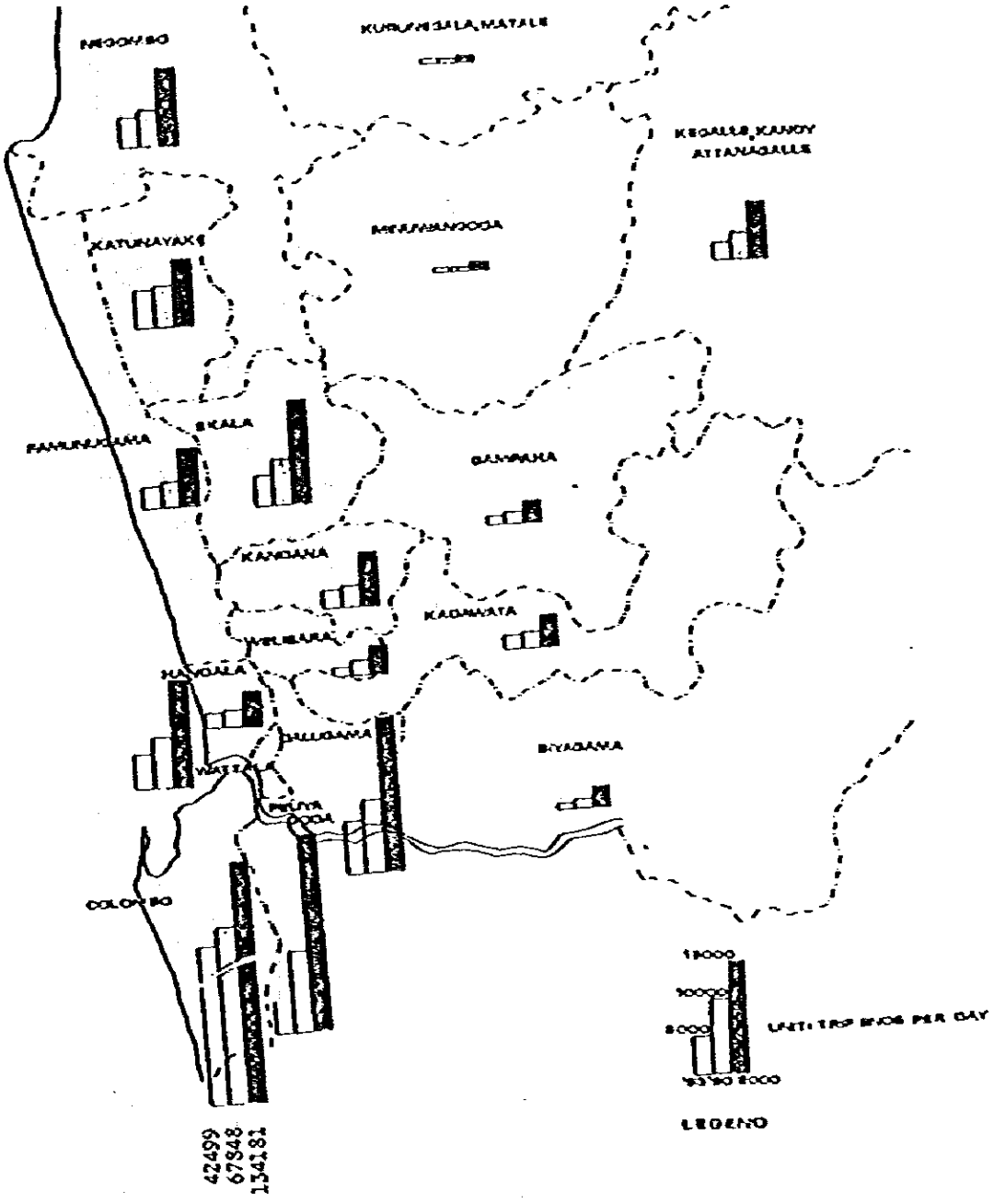



Fig. 3-4 Trip End by Year and Compressed Traffic Zone

## Table 3-24: OD Pattern between Colombo City and Port and Compressed Traffic Zone

(Unit : Vehicle/day)

| TYPE OF VEHICLE | | 2 Peliyagoda | 3 Dalugama | 4 Wattala | 5 Kendala | 6 Pamunugama | 7 Welisara | 8 Kandana | 9 Ekala | 10 Katunayake | 11 Negombo | 12 Kadewatte | 13 Gampaha | 14 Minuwangoda | 15 Kurunegala | 16 Kegalle Kandy | 17 Biyagama | 24 Attanagala | 25,26 North | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CAR & TAXI | 1983 | 1,218 | 2149 | 1,188 | 390 | 685 | 186 | 553 | 468 | 1,371 | 680 | 396 | 308 | 71 | 56 | 69 | 311 | 448 | 438 | 10985 |
| | 1990 | 3196 (2.6) | 3298 (1.5) | 2357 (2.0) | 618 (1.6) | 1,099 (1.6) | 332 (1.8) | 627 (1.5) | 559 (1.2) | 1,676 (1.2) | 963 (1.4) | 608 (1.5) | 427 (1.4) | 107 (1.5) | 78 (1.4) | 106 (1.5) | 417 (1.3) | 679 (1.5) | 685 (1.6) | 18432 (1.7) |
| | 2000 | 7226 (6.0) | 7077 (3.3) | 5002 (4.2) | 1,304 (3.3) | 2427 (3.5) | 696 (3.7) | 1,727 (3.1) | 1,121 (2.4) | 2924 (2.1) | 1,657 (2.4) | 1,255 (3.2) | 804 (2.6) | 205 (2.9) | 149 (2.7) | 211 (3.1) | 953 (3.1) | 1,390 (3.1) | 1,432 (3.3) | 37567 (3.4) |
| BUS | 1983 | 453 | 1,178 | 513 | 756 | 263 | 321 | 224 | 746 | 465 | 622 | 628 | 214 | 100 | 88 | 210 | 143 | 00 | 24 | 6948 |
| | 1990 | 1,337 (3.0) | 1,844 (1.6) | 709 (1.4) | 796 (1.1) | 439 (1.7) | 589 (1.8) | 296 (1.3) | 991 (1.3 | 147 (0.3) | 858 (1.4) | 875 (1.4) | 267 (1.2) | 147 (1.5) | 136 (1.5) | 270 (1.3) | 172 (1.2) | 354 ( _ ) | 207 (8.6) | 10264 (1.5) |
| | 2000 | 2939 (6.5) | 3613 (3.1) | 1,181 (2.3) | 1,460 (1.9) | 965 (3.7) | 1217 (3.8) | 497 (2.2) | 1,724 (2.3) | 154 (0.3) | 1,423 (2.3) | 1,550 (2.5) | 396 (1.9) | 276 (2.8) | 270 (3.1) | 426 (2.0) | 236 (1.7) | 162 ( - ) | 216 (9.0) | 18705 (2.7) |
| VAN, LORRY & CONTAINER | 1983 | 1,184 | 1701 | 1039 | 373 | 749 | 377 | 494 | 657 | 966 | 691 | 288 | 335 | 98 | 52 | 87 | 296 | 718 | 1259 | 11,364 |
| | 1990 | 4547 (3.8) | 2749 (1.6) | 2254 (2.2) | 605 (1.6) | 1,182 (1.6) | 620 (1.6) | 817 (1.7) | 802 (1.2) | 1695 (1.8) | 838 (1.2) | 438 (1.5) | 474 (1.4) | 150 (1.5) | 63 (1.2) | 134 (1.5) | 445 (1.5) | 1,050 (1.5) | 1934 (1.5) | 20,795 (1.8) |
| | 2000 | 7764 (6.6) | 8108 (4.8) | 4874 (4.7) | 1284 (3.4) | 2578 (3.4) | 1233 (3.3) | 1,764 (3.6) | 1,736 (2.6) | 2773 (2.9) | 1,406 (2.0) | 907 (3.1) | 933 (2.8) | 302 (3.1) | 120 (2.3) | 265 (3.0) | 1175 (2.6) | 2218 (3.1) | 4096 (3.3) | 43538 (3.3) |
| MOTOR CYCLE | 1983 | 599 | 1250 | 899 | 286 | 617 | 125 | 435 | 316 | 230 | 237 | 284 | 226 | 30 | 43 | 24 | 232 | 120 | 122 | 6035 |
| | 1990 | 1,751 (2.9) | 2022 (1.6) | 1,737 (2.0) | 454 (1.6) | 990 (1.6) | 206 (1.6) | 638 (1.5) | 376 (1.2) | 101 (0.4) | 285 (1.2) | 438 (1.5) | 320 (1.4) | 40 (1.3) | 58 (1.3) | 34 (1.4) | 249 (1.1) | 174 (1.5) | 179 (1.5) | 10052 (1.7) |
| | 2000 | 3961 (6.6) | 4191 (3.4) | 3624 (4.2) | 953 (3.3) | 2154 (3.5) | 396 (3.2) | 1,280 (2.9) | 591 (2.2) | 142 (0.6) | 409 (1.7) | 880 (3.1) | 597 (2.6) | 72 (2.4) | 98 (2.3) | 64 (2.7) | 545 (2.3) | 345 (2.9) | 354 (2.9) | 20756 (3.4) |
| TOTAL | 1983 | 3454 | 6278 | 3599 | 1,805 | 2314 | 1,009 | 1,706 | 2187 | 3032 | 2230 | 1,596 | 1083 | 299 | 239 | 390 | 982 | 1,286 | 1,843 | 35332 |
| | 1990 | 10831 (3.1) | 9913 (1.6) | 7087 (2.0) | 2473 (1.4) | 3710 (1.6) | 1,747 (1.7) | 2578 (1.5) | 2728 (1.2) | 3619 (1.2) | 2944 (1.3) | 2359 (1.5) | 1426 (1.4) | 444 (1.5) | 335 (1.4) | 544 (1.4) | 1,283 (1.3) | 2057 (1.6) | 3005 (1.6) | 59543 (1.7) |
| | 2000 | 21,890 (6.3) | 22989 (3.7) | 14688 (4.1) | 5001 (2.8) | 8124 (3.5) | 3542 (3.5) | 5268 (3.1) | 5272 (2.4) | 5993 (2.0) | 4895 (2.2) | 4592 (2.9) | 2730 (2.5) | 855 (2.6) | 637 (2.7) | 966 (2.5) | 2909 (3.0) | 4115 (3.4) | 6098 (3.3) | 120566 (3.4) |

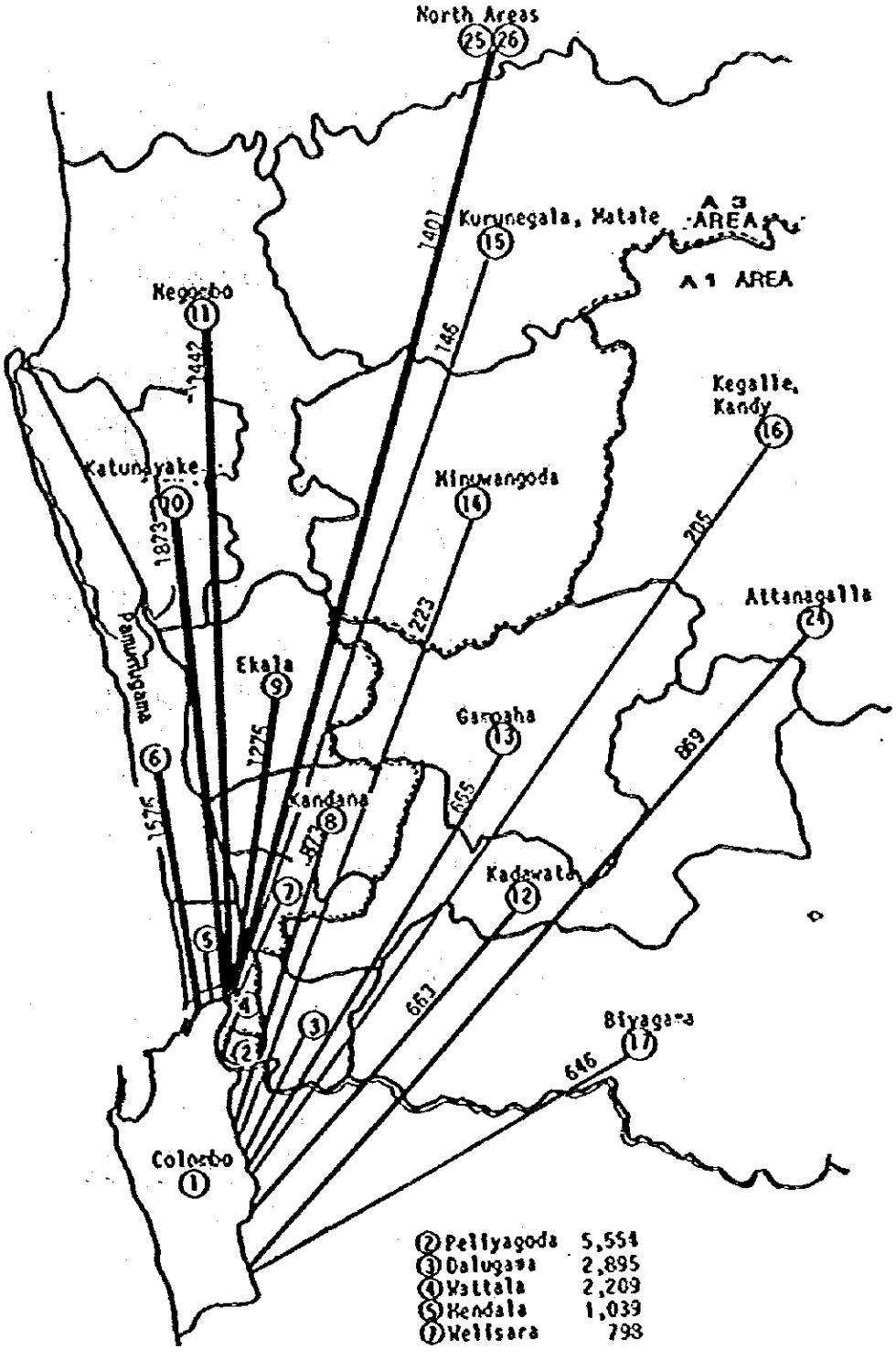



Fig. 3-5 Travel Desire Line Diagram (1990) All Vehicles (Vehicles/day)

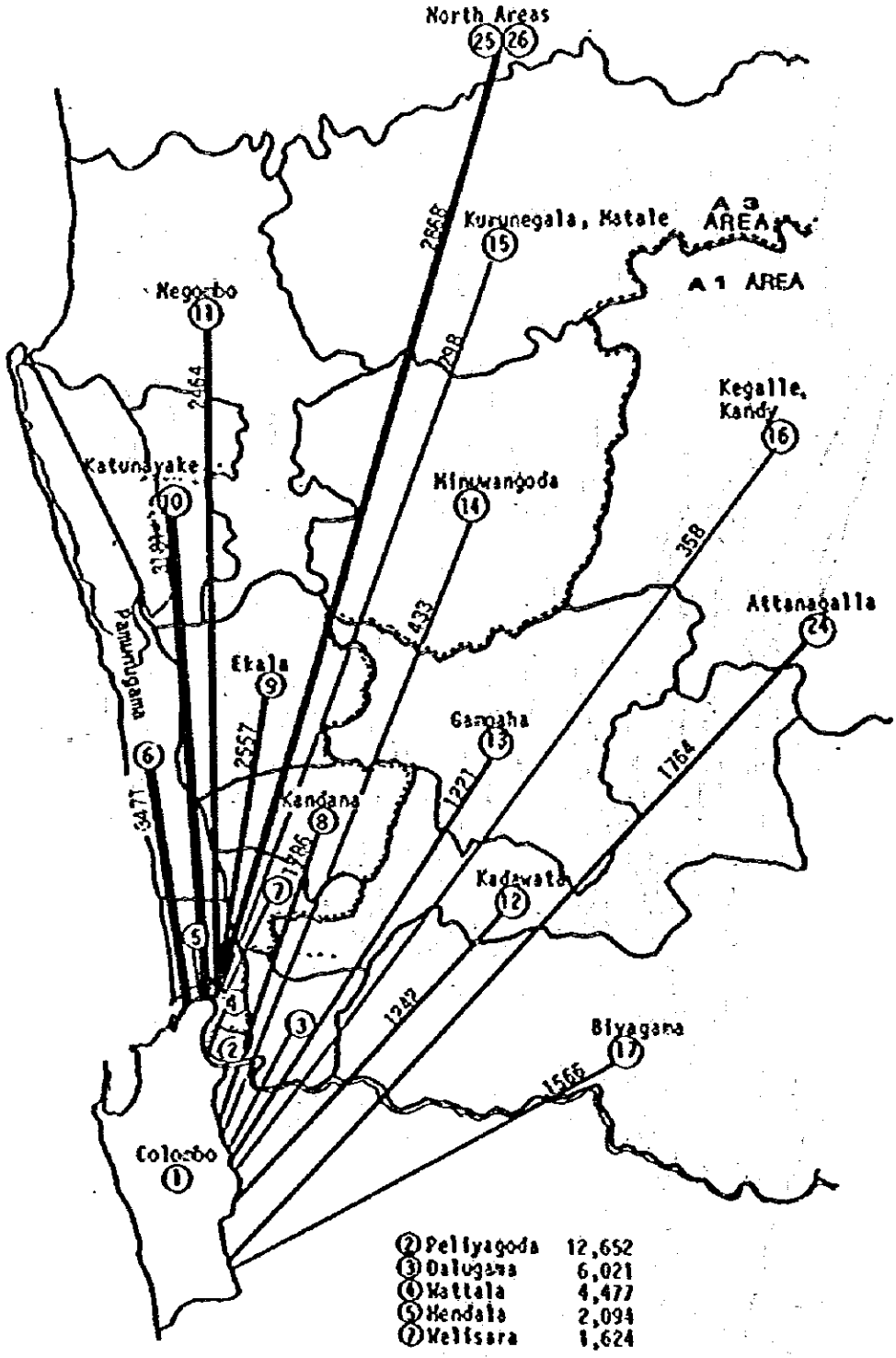



Fig. 3-6 Travel Desire Line Diagram (2000) All Vehicles (Vehicles/day)

c) The traffic volume between Colombo and Peliyagoda shows the highest growth rate (6.3 times) up to 2000 and is followed by Wattala (4.1 times) and Dalugama (3.7 times)

Fig. 3-5 and Fig. 3-6 show the traffic distribution pattern from Colombo City and Colombo Port.