



FINAL REPORT FOR THE STUDY ON THE FUTURE DEMAND OF THE INTER-ISLAND TRAFFIC IN THE REPUBLIC OF INDONESIA

STUDY REPORT (PART I)

FIELD TRAFFIC SURVEY
TRAFFIC DEMAND FORECAST
POTENTIAL NEW AIR ROUTES
STUDY ON AIRCRAFT
STUDY ON AIRPORT FACILITIES

MARCH 1966

JAPAN INTERNATIONAL COOPERATION AGENCY

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国際協力事業団

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SECTION 1
INTRODUCTION

SECTION 1
INTRODUCTION

1.01 PREAMBLE

(01) This is the Final Report for the Study on the Future Demand of Inter-Island Traffic in the Republic of Indonesia (hereinafter referred to as "the Study"), which had been conducted in accordance with the mutual agreement made between the Indonesian Authorities concerned and Japan International Cooperation Agency (hereinafter referred to as "JICA").

(02) The Objectives of the Study, as prescribed in the relevant Scope of Works, are to forecast the future demand of the inter and intra island traffic mainly focused on the air transportation in Indonesia. The scope of the Study encompasses:

- 1) Analysis and examination of the present traffic situations.
- 2) Review and evaluation of the existing development plan.
- 3) Forecast of inter-regional traffic volume by each mode of transportation.
- 4) Forecast of air traffic volume by air route.
- 5) Forecast of the regional traffic demand by each mode of transportation within each region.
- 6) Identification of the potential new air routes and appurtenant facilities required.
- 7) Investigation of the basic specifications of aircraft applicable to the new air routes identified.

(03) The Study has been in progress from January, 1987 until March, 1988. Prior to compilation of this Final Report (hereinafter referred to as "the Report"), the following reports had been produced and submitted.

- Inception Report : January, 1987
- Progress Report : March, 1987
- Interim Report : October, 1987
- Draft Final Report : January, 1988

(04) The Inception Report presents the general approach and methodology to be taken for the Study including clarification and confirmation of the scope of the Study.

(05) The Progress Report mainly concerned with the study items of 1) through 4) defined in the above paragraph (02). Out of these, the nationwide traffic demand forecast by each mode of transportation has been the main theme of the study in this stage.

(06) The Interim Report dealt with the study items of 5) and of a part of 6) and 7). The regional air and sea traffic demand forecast has been accomplished and the likely potential new air routes have tentatively been identified. In addition, the basic materials necessary for preparation of the aircraft specifications have been collected and analyzed. The airport facilities, Nav aids and telecommunication systems have also been studied.

(07) The Draft Final Report comprises all the outcomes of the Study executed under the Scope of Works, including the contents presented in the Progress Report and the Interim Report, and the consequences of final study which had been conducted after submission of the Interim Report. The potential new air routes are identified and the basic specifications on the aircraft, the airport facilities, the nav aids and the telecommunication systems necessary for the selected new air routes have been discussed.

(08) The Final Report consists of the Main Report, the Study Report, and the Data Book. The Main Report presents

condensed core of the Study, supported by the Study Report which gives the detailed explanation on the Study executed for understanding of the background and supporting data used for the Study. Data Book compiles the raw unprocessed data and information which had been employed or referred to in carrying out the Study.

(09) The Study was accomplished directly by the Study Team organized by JICA and Indonesian Counterparts composed of the officials from the Ministry of Communications and BPP. Technology. The above working group was supervised by the Japanese Advisory Committee as well as by the Indonesian Steering Committee. The organization chart of the Study is attached in Appendix 1.1.

1.02 GENERAL WORK FLOW

(10) The general work flow of the Study is as illustrated in Figure-1.1, covering the whole Scope of Works. As it is clear in the Figure, the Study has been conducted in 7-stage, out of which the works in stages-2,4 and 5 are essential parts of the Study.

(11) The major topics of studies in each stage are as presented below.

Stage-1: 0.3 month in Tokyo

- Inception works

Stage-2: 2.7 months in Jakarta

- Supplemental data collection
- Evaluation of present situations
- Inter-regional traffic demand forecast

Stage-3: 0.5 month in Tokyo

- Review and evaluation of Stage-2 study

Stage-4: 3.6 months in Jakarta

- Field traffic survey

FIGURE-1.1 WORK FLOW FOR THE ST

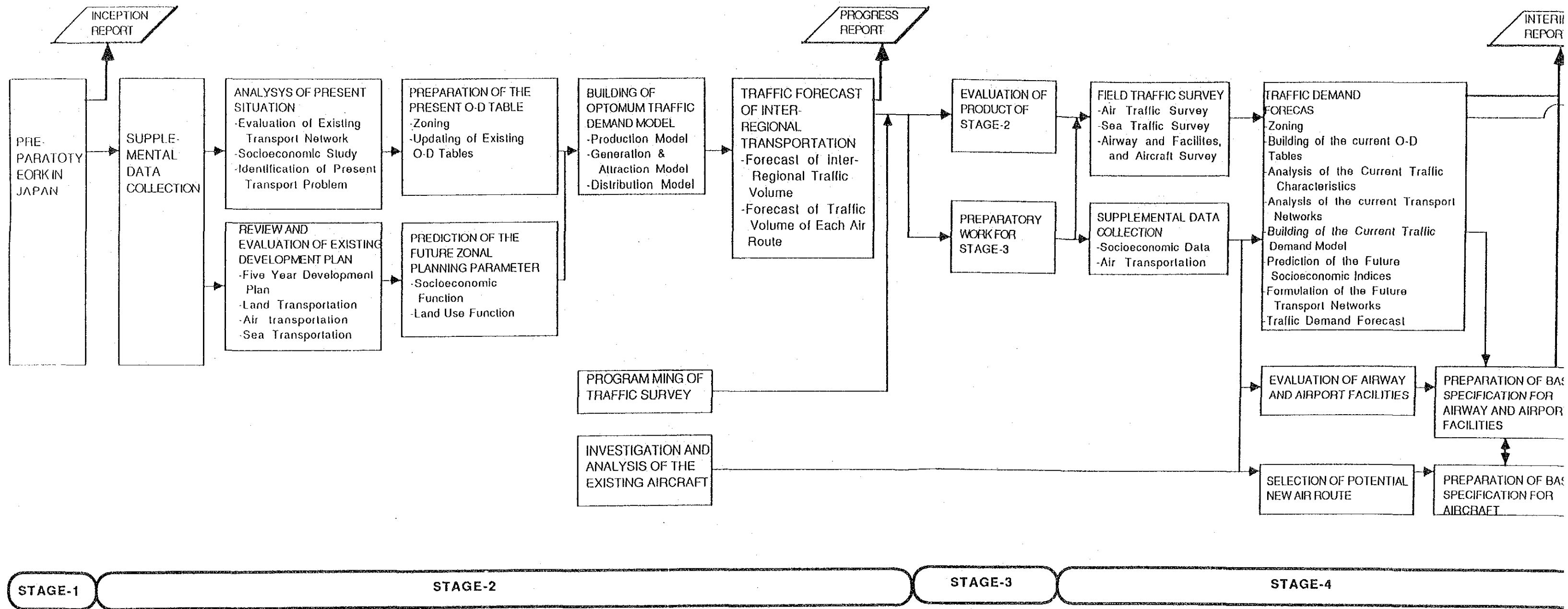
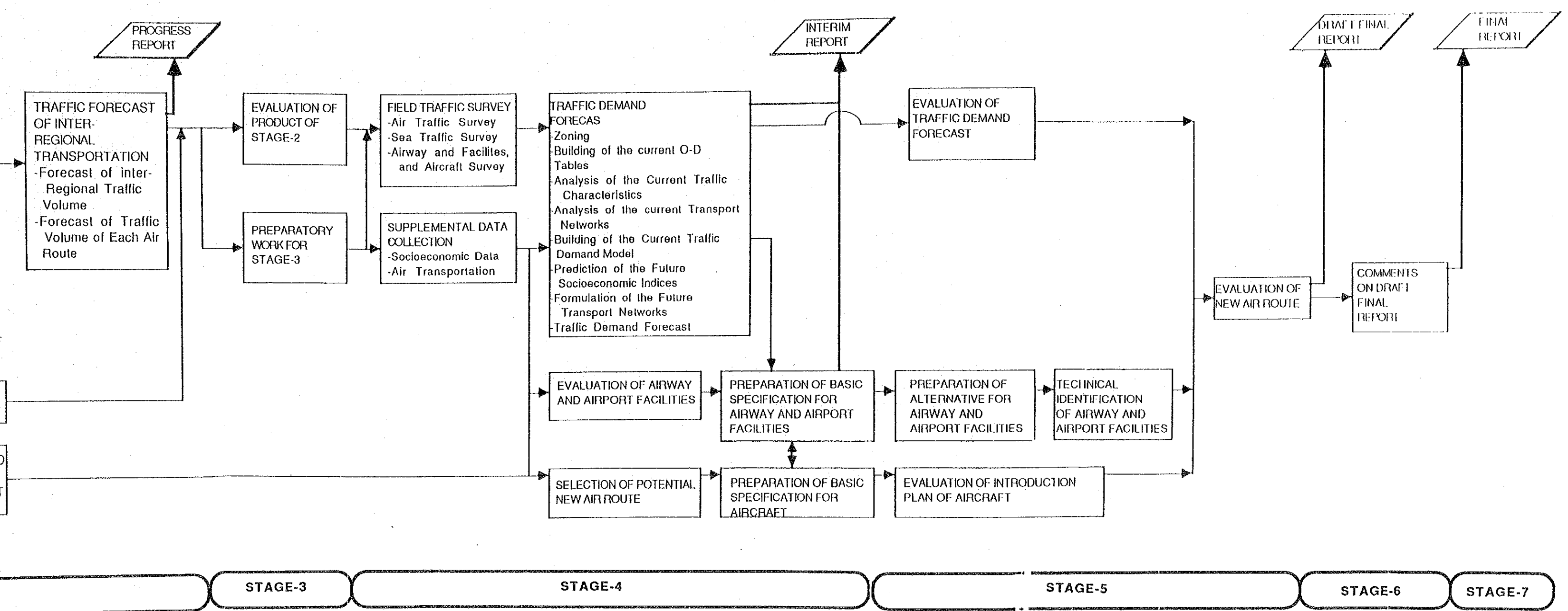


FIGURE-1.1 WORK FLOW FOR THE STUDY



- Zonal traffic demand forecast
 - Tentative selection of the potential new air routes
 - Study on aircraft, airport facilities, nav-aides and telecommunications
- Stage-5: 3.4 months in Tokyo
- Review and evaluation of Stage-4 study
 - Selection of the potential new air routes
 - Basic specifications of the aircraft
 - Basic specifications of airport facilities, nav-aids and telecommunications
- Stage-6: 0.5 month in Jakarta
- Discussion on the Draft Final Report
- Stage-7: 1.0 month in Tokyo
- Finalization of the Final Report

The net months consumed for the Study amount to 13 months in total.

(12) To identify the potential new air routes, firstly, the nationwide or inter-regional traffic demand has been assessed to draw an overall picture of a future traffic demand by dividing the whole Indonesia into 7 (seven) regions. The demand, thus forecast, has given the inter-regional gross movements of passenger and cargo by sea and air transport modes and referred to the results of subsequent study. Secondly, the inter-zonal traffic demand has been forecast to predict the more detailed future trend of demand by splitting the whole Indonesia to 181 zones based on the actual traffic survey. Thirdly, the potential new air routes have been set up from the realistic viewpoint based on the outcomes of the inter-zonal traffic demand, and again the demand has been assessed under the assumed new air traffic networks.

(13) In parallel with the above process of the traffic

demand forecast, studies on the aircraft, the airport facilities, the nav aids and the telecommunication systems have been conducted. The basic specifications of these above items, which are to become necessary for materialization of the prospective new air routes, have been worked out.

1.03 PRINCIPAL CONCEPTS OF THE STUDY

(14) The Study has been hampered, however, by shortage, lack, interruption and inconsistencies of the basic statistic data to be collected. Such deficiencies have been supplemented as much as possible by the actual traffic survey and analytical assessment of the collected data. However, it can not be denied that the Study results, by its nature of predicting future possible affairs, still unavoidably comprise uncertainties to some degree.

(15) As such, the Study results need to be updated and refined after several years from now based on the latest data which would become available by that time, in order to assess the most probable traffic demand volume. To enable such updating works in the future, emphasis has been placed in the Report on the explanation of the methodology that had been employed in the Study. The authorities concerned to the Study could repeat the updating by following the description of the Report.

(16) Definition of Airports: In the Study, the following definition of the airports has tentatively been set up for convenience of the respective study described hereinafter in each Section concerned.

Table-1.1 Definition of Airports

| CATEGORY | MAX. AIRCRAFT | MIN. RUNWAY | TENTATIVE CLASSIFICATION |
|----------|---------------|-------------|--------------------------|
| I | B-747 | 3,000 m | Major National Airports |
| II | DC-10, A-300 | 2,300 m | National Airports |
| III | F-28 | 1,800 m | |
| IV & V | F-27, DHC-6 | 800 m | Regional Airports |

In the above, the definition by Tentative Classification is applied to Section 6, Aircraft Study and the definition by Category is employed in Section 7, Civil Aviation Facility Study.

(17) Mode of Transport Studied: The objectives of the Study is to forecast the future demand of the inter and intra island traffic mainly focused on the air transportation. In the inter-regional traffic demand forecast, future demand of three modes of transport, i.e. air, sea and land are projected. In the inter-zonal traffic demand forecast, however, air and sea transportation are mainly studied, while land transportation is considered as access modes to/from airport/seaport. This is mainly because that the purpose of the inter-zonal traffic demand forecast is to identify potential new air routes in the whole Indonesia and these routes are supposed to be competitive with sea transport.

SECTION 2
FIELD TRAFFIC SURVEY

SECTION 2
FIELD TRAFFIC SURVEY

2.01 OBJECTIVES OF THE FIELD TRAFFIC SURVEY

(01) It was possible to obtain several kinds of statistical data concerning movements of passengers and cargo by each transport mode (e.g. Air Transport Statistics) in the course of the Study. However, since most of these data covered only gross movements, not net movements (Please refer to Section 3 para-(05) as for the "gross" and "net" movements), of passengers and cargo, they were inadequate for the comprehensive traffic demand forecast. In addition, data for some airports and ports were missing and the characteristics of passengers were also not available. Therefore, several assumptions had to be adopted to supplement these data.

(02) In order to forecast the actual movements of passengers and cargo, it was necessary to determine either the net movements of them or the correlation between the existing gross movement data and the net movements. For this purpose, field traffic surveys for air passengers (hereafter termed 'the air passenger survey') and sea passengers (hereafter termed 'the sea passenger survey') were planned and executed with the kind cooperation extended from several agencies concerned. This section describes the methods and results of these surveys.

(03) Up to the present, no actual field origin/destination survey on air transport movements has been carried out in Indonesia. As stated in the Report, the role of air transportation has been increasing yearly with the desire to save travel time and the gradual rise of time value. The actual traffic flow must be known to plan the future transportation system. In this regard, the actual survey con-

ducted for the Study provides information about the true origin/destination and characteristics of passengers, and gives an example of a survey to be carried out in the future.

2.02 SURVEY METHOD

2.02.1 Air Passenger Survey

2.02.1.1 Selection of Airports and Survey Schedule

(04) For the selection of airports to be surveyed, due consideration was paid to the number of passengers at each airport, the functional importance of airports in the current air transport network, the future potential for further development in each region, and the possible coverage of air routes by the survey. As a result, 19 airports as indicated in Table-2.1, which were mainly major airports in each region, were selected for the air passenger survey.

(05) After the selection of the 19 airports, the timetable of airlines (both scheduled and non-scheduled airlines) operating regular scheduled flights from these 19 airports were studied to check the daily frequency of flights and air route coverage of the week, and finally the air passenger survey schedule was determined. Table-2.1 shows the airports surveyed and the survey schedule. Due to weekly nature of flight operation schedules, the survey was carried out for two days at several airports, while Saturday and Sunday were chosen as survey days at Sorong and Palembang, and Biak Airports, respectively.

Table-2.1 Airports Surveyed and Survey Schedule

| Region | City | Airport Name | Survey Date |
|---------------|--|---|---|
| Jawa/Bali | Jakarta Surabaya Denpasar | Soekarno-Hatta Juanda Ngurah Rai | 22nd July (Wed) 4th & 6th August (Tue) & (Thu) 31st July (Fri) |
| Sumatera | Medan Padang Palembang | Polonia Tabing Talangbetutu | 27th & 28th July (Mon) & (Tue) 29th & 30th July (Wed) & (Thu) 31st July (Fri) & 1st August (Sat) |
| Kalimantan | Banjarmasin Balikpapan Pontianak | Syamsudin Sepinggan Supadio | 3rd & 4th August (Mon) & (Tue) 5th August (Wed) 6th & 7th August (Thu) & (Fri) |
| Sulawesi | Ujungpandang Palu Manado | Hasanudin Mutiara Sam Ratulangi | 3rd & 4th August (Mon) & (Tue) 27th & 28th July (Mon) & (Tue) 29th & 30th July (Wed) & (Thu) |
| Nusa Tenggara | Kupang Mataram | El Tari Selaparang | 28th & 29th July (Tue) & (Wed) 29th July (Wed) |
| Maluku | Ternate Ambon | Babullah Pattimura | 30th & 31st July (Thu) & (Fri) 5th, 6th & 7th August (Wed), (Thu) & (Fri) |
| Irian Jaya | Sorong Biak Jayapura | Jefman & Sorong Daratan Frans Kaisiepo Sentani | 1st August (Sat) 2nd August (Sun) 3rd & 4th August (Mon) & (Tue) |

2.02.1.2 Design of Questionnaire

(06) In parallel with the selection of airports and survey dates, a questionnaire was designed for the air passenger survey. The direct interview method was adopted for the air passenger survey, since some questions, especially origin/ destination/transit locations of trips had to be answered correctly. In the design of the questionnaire, due considerations was paid to the following points.

- Questions should be easy to understand, both by passengers and interviewers.
- Questions related to the privacy of passengers should not be included.
- The questionnaire should be easy for interviewers to fill in, in order that the duration of passenger interviews is reduced to a limited time.

- Completed questionnaires must be directly used as coding sheets for the input of data into the computer.

(07) The above mentioned considerations served as the bases to design a draft questionnaire, which was finalized after discussion with the agencies concerned. In addition, two kinds of questionnaires, one in Indonesian and one in English were prepared, since several airports were considered to serve a high proportion of foreigners. The contents of the questionnaire are summarized below.

- Origin/destination airports of flight.
- Trip purpose and travel frequency.
- Reason for travel by air transport.
- Past experience of traveling on the same route by another transport mode.
- Sex, occupation and address of passenger.
- Trip to the departure airport (origin, transit place, transport mode and travel time)
- Trip from the arrival airport (transit place, final destination, transport mode and travel time).
- Opinion for new air route.

2.02.1.3 Execution of the Air Passenger Survey

(08) Prior to the actual air passenger survey, interviewers were trained and carried out the a pre-survey at the Soekarno-Hatta Airport in order to confirm that interviewers understood the questionnaire.

(09) Since airports to be surveyed were spread across Indonesia, from Medan in Sumatera to Jayapura in Irian Jaya, the air passenger survey was executed by 3 survey teams according to the survey schedule mentioned in Para-(05). Each survey team consisted of one or two Japanese experts and their Indonesian counterparts, and several interviewers, while every member carried out the survey together at the Soekarno-Hatta Airport in Jakarta.

(10) At each airport, interviewers directly interviewed passengers waiting for flights, either at waiting lounge(s) or the transit lounge, if any. Military personnel and police officers in uniform were excluded from the interview. Interviewers had been instructed not to force reluctant passengers to answer questions. Passengers of the following airlines were interviewed.

- PT. Garuda Indonesia (GA)
- PT. Merpati Nusantara Airlines (MZ)
- PT. Bouraq Indonesia Airlines (BO)
- PT. Mandala Airlines (QH)
- PT. Sempati Air Transport (VJ)
- PT. Deraya (DC)
- PT. Dirgantara Air Service (DS)
- PT. Sabang Merauke Air Charter (SM)
- PT. International Nickel Indonesia (INCO)

(11) In General, passengers fully cooperated with the interview. However, early opening of boarding gates, especially at Soekarno-Hatta Airport, and cancellation and delay of flights at several airports, reduced the number of samples.

(12) In parallel with the direct interview of passengers, data related to the number of departing and transit passengers on each flight was collected either from airline offices or from actual counting. These data are essential to calculate sampling rate, load factors and expansion factors, used for analyses of both passenger characteristics and traffic demand forecasts.

2.02.2 Sea Passenger Survey

2.02.2.1 Selection of Ports and Survey Schedule

(13) The main objective of the sea passenger survey was

to obtain data of trips and characteristics of sea passengers on several types of sea routes, which would be utilized for construction of the modal split model in the Study. Therefore, for the selection of ports to be surveyed, due consideration was paid to whether the sea routes from the ports were competitive with air routes to be surveyed by the air passenger survey and those sea routes were placed under different categories. As a result, 4 ports with 6 sea routes were selected.

(14) The schedule of the sea passenger survey was determined on the basis of operation schedules of ships and ferries, and the schedule of the air passenger survey. Table-2.2 shows the surveyed ports, routes, and the survey schedule.

Table-2.2 Surveyed Ports, Routes and Survey Schedule

| Port Name | Ship Type & Route | Survey Date |
|-------------------------|--|------------------|
| Merak | Ferry (Merak - Bakauheni) | 24th July (Fri) |
| Tenau (Kupang) | 1. PT.PELNI (Km.KELIMUTU) *1 (Tenau - Ende, Waingapu, Bima) | 26th July (Sun) |
| | 2. Ferry (Tenau - Larantuka) | 27th July (Mon) |
| Lembar (Mataram) | 1. PT.PELNI (Km.KELIMUTU) *1 (Lembar - Padangbai, Tg.Perak) | 30th July (Thu) |
| | 2. Ferry (Lembar - Padangbai) | 30th July (Thu) |
| Tg. Perak (Surabaya) | PT.PELNI (Km.KAMBUNA) *2 (Tg.Perak - Makasar, Balikpapan) | 6th August (Thu) |

Note *1 Ports of call by Km.KELIMUTU from Tenau are as follows; Ende, Waingapu, Bima, Makasar, Lembar, Padangbai, Tg.Perak, Banjarmasin and Semarang
 *2 Ports of call by Km.KAMBUNA from Tg.Perak are as follows; Makasar, Balikpapan, Pantoloan and Bitung

2.02.2.2 Design of Questionnaire

(15) By the same logic of the air passenger survey, questionnaires for the sea passenger survey were prepared both in Indonesian and in English. The contents of these

questionnaires were similar to the questionnaires designed for the air passenger survey, as summarized below.

- Origin/destination ports of passengers.
- Trip purpose and travel frequency.
- Reason to travel by ship.
- Past experience of traveling on the same route by airplane.
- Sex, occupation and address of passenger.
- Trip to the departure port (origin, transit place, transport mode and travel time)
- Trip from the arrival port (transit place, final destination, transport mode and travel time).

2.02.2.3 Execution of the Sea Passenger Survey

(16) The sea passenger survey was executed according to the survey schedule mentioned in Para-(14). Interviewers who carried out the air passenger survey also conducted the sea passenger survey. At each port, interviewers interviewed passengers directly, either at a waiting room or on board.

(17) In parallel with the direct interview for passengers, the Team obtained the number of departing and transit passengers on each ship from operators.

2.02.3 Statistical Processing of the Survey Data

(18) After the execution of the air and the sea passenger surveys, collected questionnaires were checked manually, and respective codes, especially zone codes for origin, destination, transit places and address, were recorded on the questionnaires. These zone codes and their respective areas are described in Section 3. The questionnaire data were then entered as data files into a computer.

(19) Logical checks were carried out by computer to identify coding and data punching errors. Any errors found were corrected and the data files for the air and the sea passenger survey results were finalized. Several logical checks were carried out prior to the finalization of data files.

(20) The finalized data files of the air and the sea passenger survey results were then utilized for the air traffic demand forecast and the analyses of air and sea passenger characteristics. It should be noted that most of the analyses of air and sea passenger characteristics were carried out using supplemental data calculated according to sample rate at each airport and port.

2.03 SURVEY RESULTS

(21) This sub-section mainly describes the analyses of passenger characteristics based on the results of the air and sea passenger surveys. Most of the analyses of passenger characteristics were carried out separately for air and sea passengers, however, some comparisons of the characteristics between air and sea passengers were also conducted.

2.03.1 Air Passenger Survey

2.03.1.1 Sample Size

(22) The total number of passengers on board the flights during the survey period, number of interview samples and the sample rates at each airport are summarized in Table-2.3. In total, 17,687 air passengers were counted during the survey, while 6,795 of them were picked up as samples by the air passenger survey. As a result, the average sample rate for all the airports was 38.4%, while the sample rates varied from 78.3% at Kupang El Tari Airport to 24.3% at

Jakarta Soekarno-Hatta Airport.

Table-2.3 Sample Size at Surveyed Airport

| Name of Airport | Total No. of Passengers | | Number of Samples | | Sample Rate |
|-----------------|-------------------------|--------|-------------------|--------|-------------|
| Jakarta | 6296 | 35.6% | 1531 | 22.5% | 24.3% |
| Surabaya | 1935 | 10.9% | 797 | 11.7% | 41.2% |
| Denpasar | 1327 | 7.5% | 622 | 9.2% | 46.9% |
| Medan | 1104 | 6.2% | 454 | 6.7% | 41.1% |
| Padang | 474 | 2.7% | 192 | 2.8% | 40.5% |
| Palembang | 576 | 3.3% | 253 | 3.7% | 43.9% |
| Banjarmasin | 789 | 4.5% | 304 | 4.5% | 38.5% |
| Balikpapan | 354 | 2.0% | 120 | 1.8% | 33.9% |
| Pontianak | 490 | 2.8% | 251 | 3.7% | 51.2% |
| Ujung Pandang | 1749 | 9.9% | 860 | 12.7% | 49.2% |
| Palu | 332 | 1.9% | 167 | 2.5% | 50.3% |
| Manado | 390 | 2.2% | 166 | 2.4% | 42.6% |
| Mataram | 290 | 1.6% | 190 | 2.8% | 65.5% |
| Kupang | 327 | 1.8% | 256 | 3.8% | 78.3% |
| Ambon | 444 | 2.5% | 227 | 3.3% | 51.1% |
| Ternate | 90 | 0.5% | 70 | 1.0% | 77.8% |
| Jayapura | 366 | 2.1% | 149 | 2.2% | 40.7% |
| Biak | 219 | 1.2% | 105 | 1.5% | 47.9% |
| Sorong | 135 | 0.8% | 81 | 1.2% | 60.0% |
| Total | 17687 | 100.0% | 6795 | 100.0% | 38.4% |

(23) In order to examine the reliability of collected data, the confidence limit of the ratio of one specific OD pair and a relative error are calculated using the following equations;

$$LP1 = P1 \pm W \sqrt{\frac{P1 \times P2}{S \times R} (1 - R)}$$

$$E = W \sqrt{\frac{P1 \times P2}{S \times R} (1 - R)} / P1$$

where;

LP1 : Confidence limit of one specific OD pair.

P1 : Ratio of one specific OD pair.
(1/Total number of OD pairs)

P2 : 1 - P1.

R : Sample rate.

S : Total number of trips in the area.

W : Coefficient of confidence degree.

Confidence degree 95% --- W = 1.96

E : Relative error.

These equations are used to obtain the following confidence limit of one specific OD pair and the relative error assuming that the total yearly number of trips amounts to 7,000,000.

$$LP1 = 0.000030524 \pm 0.00000518378$$

$$E = 0.16996$$

Since the relative error calculated is less than 20% (17.0%), it can be considered that the sampling rate of the air passenger survey is acceptable from the statistical perspective.

2.03.1.2 Load Factors of Flights

(24) The load factors of flights by airline during the air passenger survey are summarized in Table-2.4. In this table, flight capacity is calculated based on the type of aircraft utilized for each flight in operation on the survey dates, including some flights which were excluded from the survey, but for which the Team was able to obtain the number of passengers for the flights from airline offices.

Table-2.4 Load Factors of Flights during Air Passenger Survey

| Airline Name | Capacity of Flights | | Total Number of Passengers | | Load Factor |
|----------------------|---------------------|--------|----------------------------|--------|-------------|
| GARUDA | 23808 | 74.4% | 14265 | 70.5% | 59.9% |
| DIRGANTARA | 237 | 0.7% | 196 | 1.0% | 82.7% |
| PT.DERAYA | 38 | 0.1% | 24 | 0.1% | 63.2% |
| BOURAQ | 2451 | 7.7% | 1782 | 8.8% | 72.7% |
| INCO | 19 | 0.1% | 15 | 0.1% | 78.9% |
| MERPATI | 4157 | 13.0% | 3026 | 15.0% | 72.8% |
| MANDALA | 1060 | 3.3% | 684 | 3.4% | 64.5% |
| SMAC | 19 | 0.1% | 11 | 0.1% | 57.9% |
| SEMPATI | 220 | 0.7% | 217 | 1.1% | 98.6% |
| Sub-Total Non-GARUDA | 8201 | 25.6% | 5955 | 29.5% | 72.6% |
| Total | 32009 | 100.0% | 20220 | 100.0% | 63.2% |

(25) In total, the average load factor for all flights is 63.2%. However, the load factors for Garuda flights (59.9%) is much lower than those for flights of other airlines (72.6%). This finding may be attributed to the fact that other airlines utilize smaller aircraft and also offer

cheaper air fares to passengers than Garuda.

2.03.1.3 Characteristics of Air Passengers

(26) Figure-2.1 illustrates the breakdown of trip purpose for all air passengers, passengers at major airports in each region and by airline. In total, 28.8% of passengers took air transport for 'official' purposes, followed by 'go back home' (19.6%), 'social' (19.1%), 'tourism' (16.9%) and 'business' (14.0%).

(27) These composition rates, however, are much different at each airport. For instance, nearly half of the passengers at Jayapura and Kupang Airports responded with 'official' purpose, while more than half of the passengers at Denpasar Airport and almost 35% of passengers at Medan Airport responded with 'tourism'.

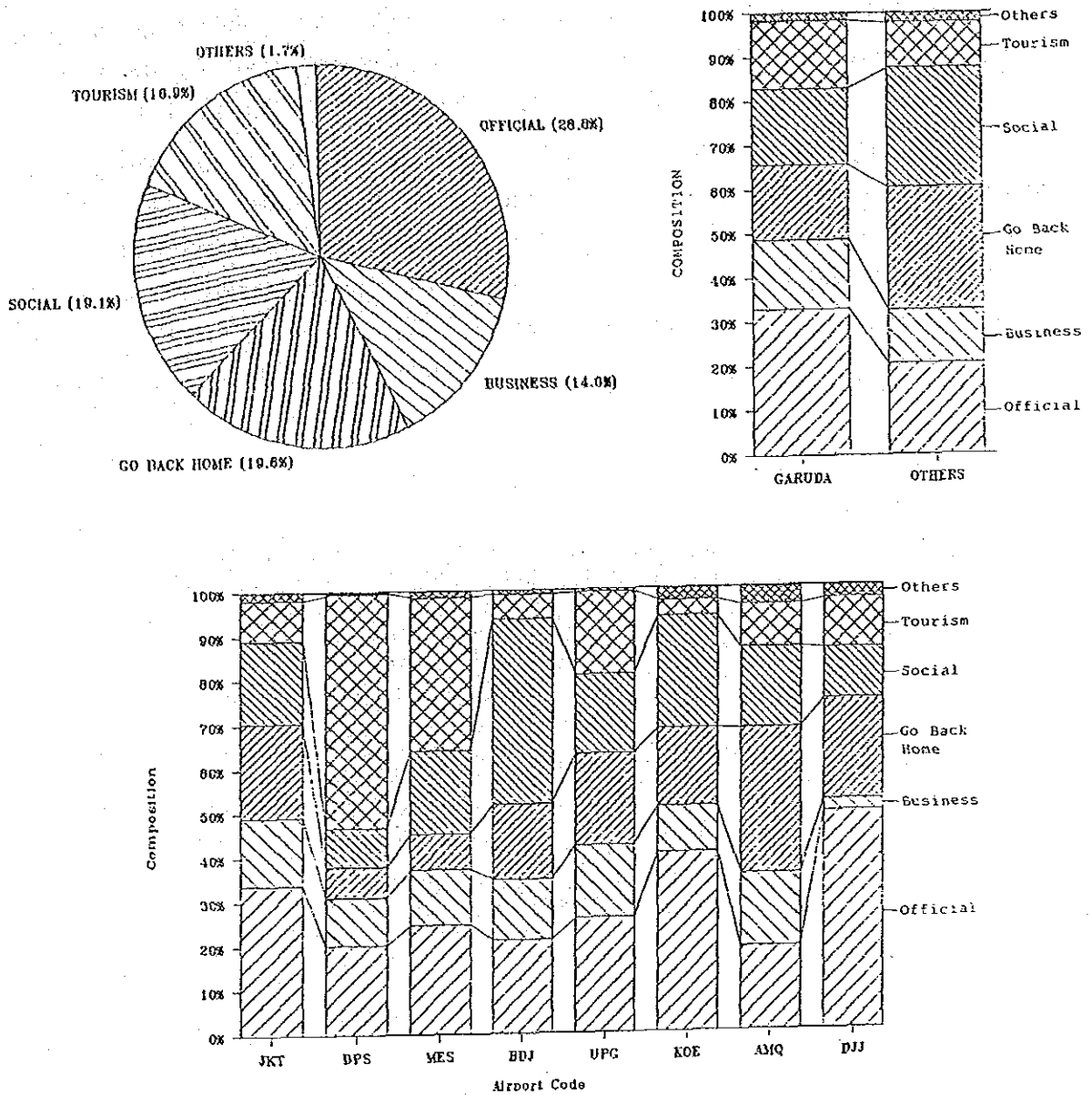


Figure-2.1 Trip Purpose of Air Passengers

(28) In addition, differences in trip purpose between passengers on Garuda flights and other flights are observed. Nearly half of the passengers on Garuda flights are responded with 'official' or 'business' purpose. In contrast,

'go back home' and 'social' purposes, which are more personal, accounted for more than half of the passengers on other flights, while responses of 'official' and 'business' purpose were limited to about 30% of the passengers.

(29) Regarding the travel frequency of air passengers, 80.8% of passengers took airplanes on the same routes less than 5 times per year, while only 4.5% of passengers are classified as frequent air travelers flying more than 2 times a month, as shown in Figure-2.2. The average travel frequency of air passengers is calculated to be 4.5 times per year.

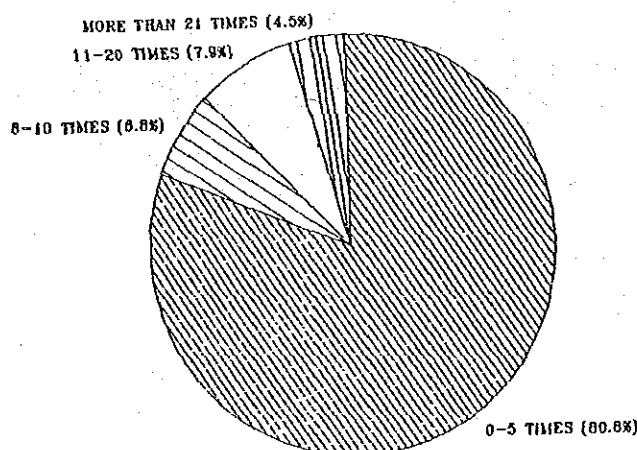


Figure-2.2 Travel Frequency of Air Passengers

(30) Figure-2.3 illustrates the breakdown of air passengers' reasons for choosing air transport for their trips in total and at major airports in each region. This figure clearly shows that the majority of passengers (81.8%) choose air transport because it is faster than other modes of transport, while only 6.6% and 5.8% of the passengers replied 'by order' (from their offices) and 'no alternative', respectively.

(31) In general, this same tendency is observed at most of the airports surveyed. However, at Jayapura Airport,

more than half of the passengers chose air transport for the reason of 'no alternative', because other modes of transport (especially roads) have not been developed yet in Irian Jaya, and Jayapura is a gateway to the inland of Irian Jaya.

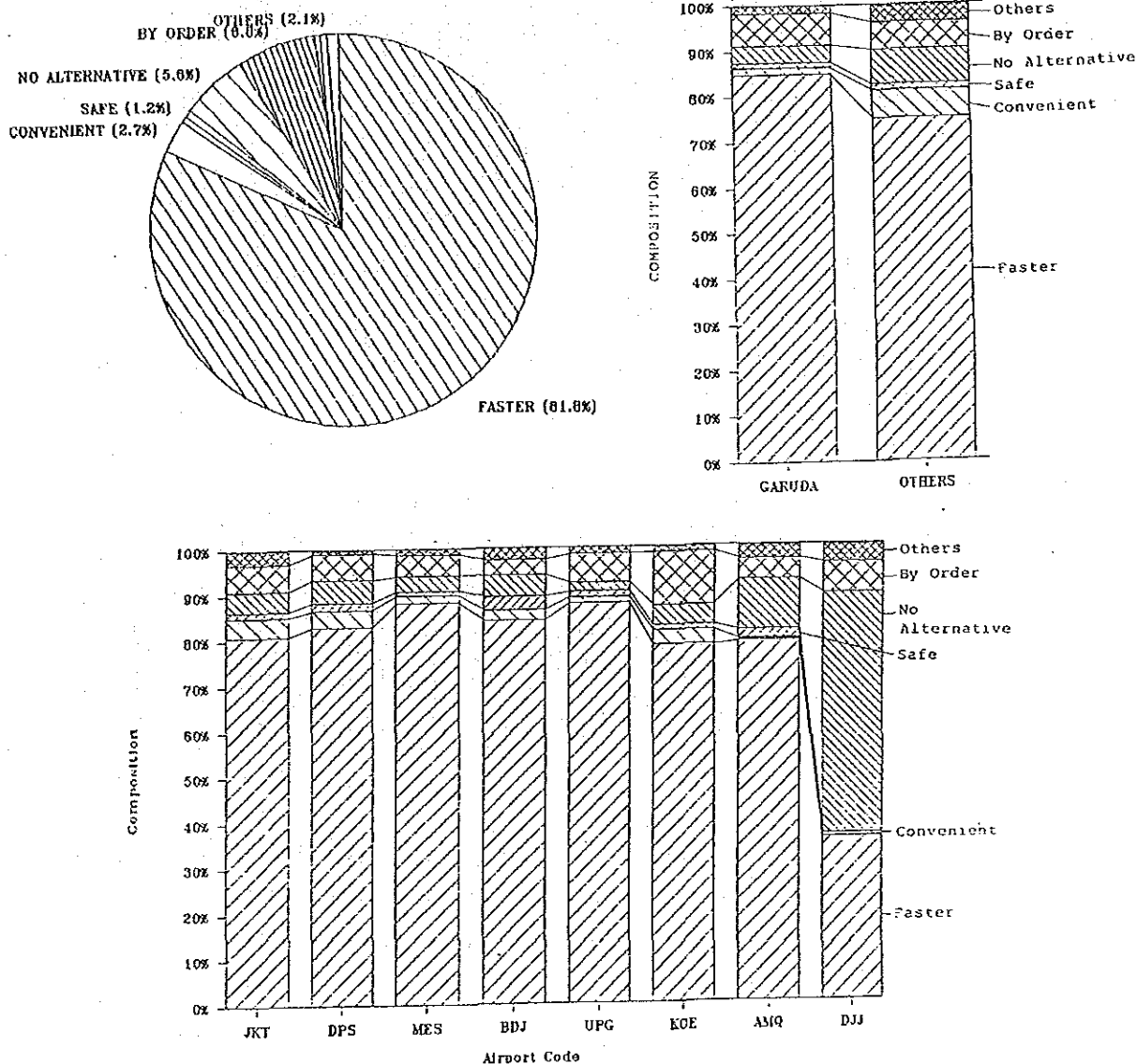


Figure-2.3 Reason for Traveling by Air Transport

(32) Figure-2.4 shows the distribution of past travel of passengers through the same route by another transport mode. In total, 71.7% of passengers have no past experience of traveling through the same route by another transport mode,

while 16.9% and 11.4% of passengers have traveled by land transport modes (bus, taxi, private car and railway) and ships, respectively.

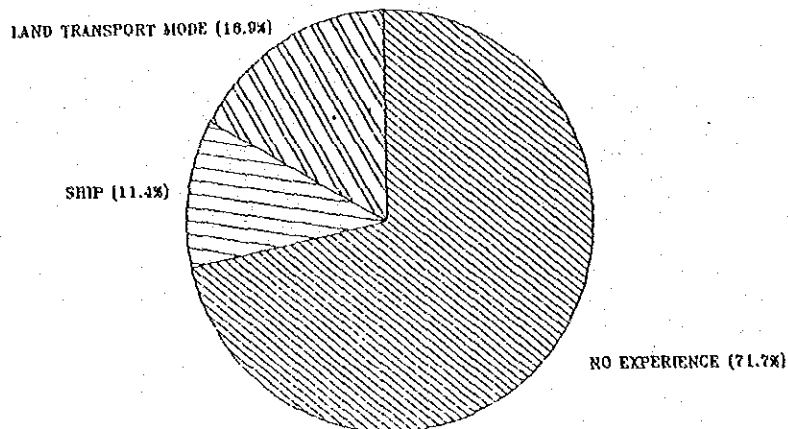


Figure-2.4 Past Experience of to Traveling on Same Route by Another Transport Mode

(33) Figure-2.5 depicts the distribution of air passengers' occupations in total, at major airports and by airline. In total, 25.8% of passengers are company staff, followed by government officials (22.9%), foreigners (17.2%), housewives (11.1%) and company executives (9.7%). In contrast, however, the ratio of farmers and workers is as low as 1.9%.

(34) Composition rates differed greatly between airports, and tended toward a similar distribution to that of trip purpose. For example, government officials accounts for about half of the passengers at Jayapura and Kupang Airports, while about half of the passengers at Denpasar Airport and 35% of the passengers at Medan Airports are foreigners.

(35) In addition, Garuda flights are found to carry more company executives and foreigners than other flights, while the proportions of housewives, students, farmers and workers are higher on other flights.

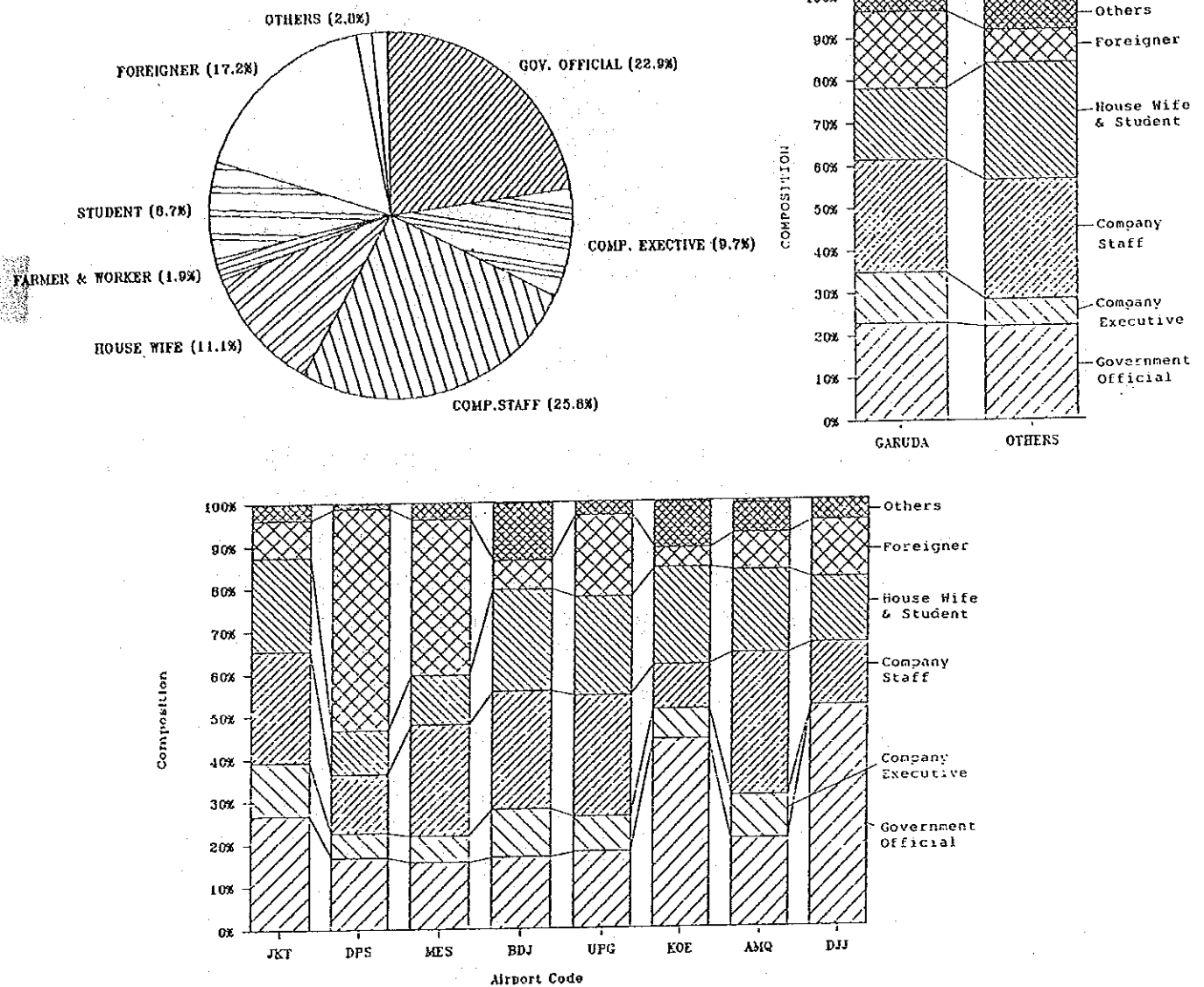


Figure-2.5 Occupation of Air Passengers

(36) In total, 70.3% of air passengers are male, while 29.7% are female.

(37) Figure-2.6 summarizes the number of flights taken by passengers from their origin to destination. It is clear that the majority of passengers took only one flight (through flight) to their destinations. However, the remaining 19.4% of passengers had to take more than two flights to reach their destinations, resulting in losses of some of their precious time waiting for connecting flights.

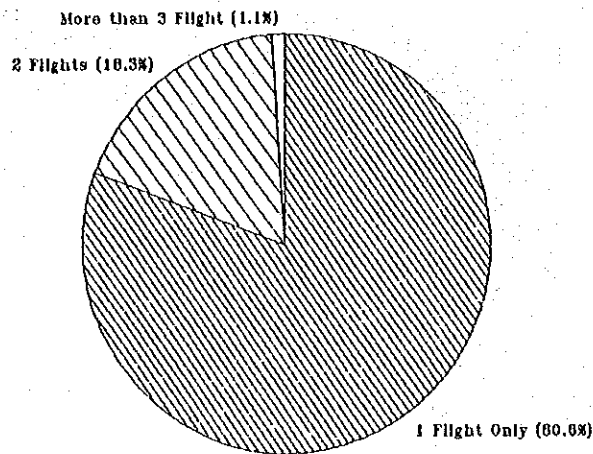


Figure-2.6 Number of Flights Taken by Passengers

(38) Figure-2.7 summarizes the access modes taken by passengers to/from airports. In fact, most passengers used land transport modes for access to/from airports; by private cars (36.9%), taxis (38.1%) and buses (20.7%).

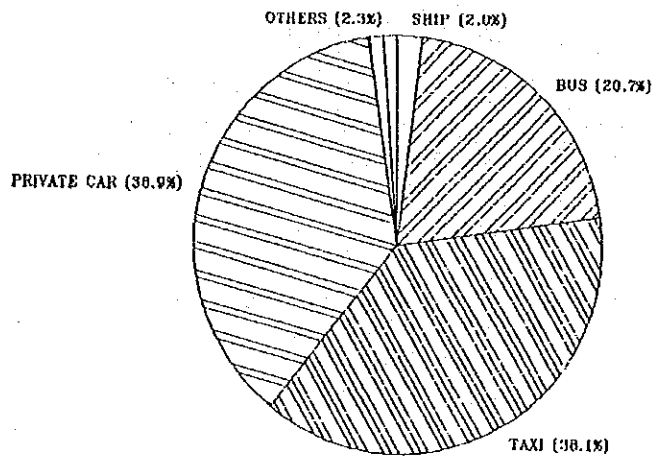


Figure-2.7 Access Mode To/From Airports

2.03.2 Sea Passenger Survey

2.03.2.1 Sample Size

(39) The total number of passengers on board the ships/ferries during the survey period, the number of interview samples and the sample rates on each sea route are summarized in Table-2.5. In total, 4,354 sea passengers were counted during the survey, while 953 of them were picked up as samples by the sea passengers survey. As a result, the average sample rate for all the sea routes surveyed is 21.9%.

Table-2.5 Sample Size at Surveyed Ports

| Name of Port | Total No. of Passengers | Number of Samples | Sample Rate |
|------------------|-------------------------|-------------------|-------------|
| Merak (Ferry) | 2055 47.2% | 332 34.8% | 16.2% |
| Tenau (PELNI) | 932 21.4% | 26 2.7% | 2.8% |
| Tenau (Ferry) | 204 4.7% | 130 13.6% | 63.7% |
| Lembar (PELNI) | 470 10.8% | 217 22.8% | 46.2% |
| Lembar (Ferry) | 245 5.6% | 115 12.1% | 46.9% |
| Tg.Perak (PELNI) | 448 10.3% | 133 14.0% | 29.7% |
| Total | 4354 100.0% | 953 100.0% | 21.9% |

2.03.2.2 Characteristics of Sea Passengers

(40) Figure-2.8 illustrates the distribution of trip purpose of sea passengers. In total, 36.6% of passengers took ships/ferries for 'go back home' purpose, followed by 'social' (29.7%), 'business' (15.1%), 'official' (9.0%) and 'tourism' (8.0%).

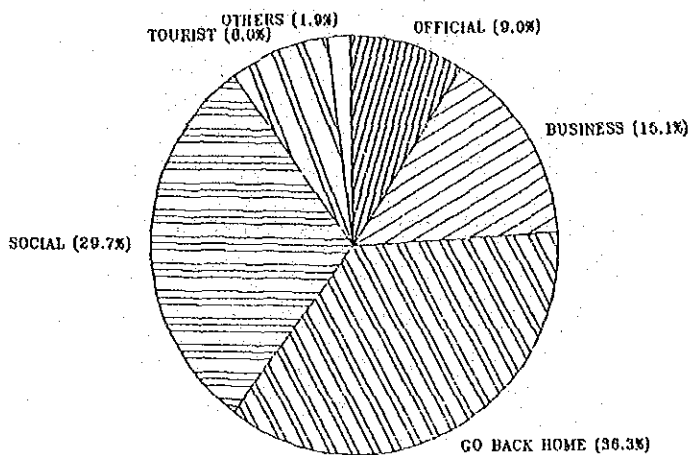


Figure-2.8 Trip Purpose of Sea Passengers

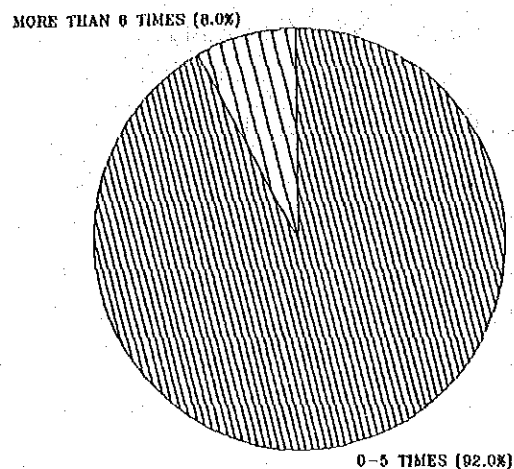


Figure-2.9 Travel Frequency of Sea Passengers

(41) Regarding the travel frequency of sea passengers, 92.0% of passengers took ships/ ferries on the same routes less than 5 times per year, as shown in Figure-2.9. The average travel frequency of sea passengers is calculated to be 4.3 times per year.

(42) Figure-2.10 illustrates the breakdown of passengers' reasons for choosing ships/ferries for their trips. This figure shows that about 70% of passengers chose ships/ferries because they are cheaper than other transport modes (probably air transport). In addition, it is rather interesting that 15% of passengers, mostly passengers on the PT.PELNI passenger ships, chose ships because they are convenient.

(43) Figure-2.11 shows the distribution of past travel of passengers on the same route by air transport. In total, only 16% of passengers have ever traveled by air transport on the same routes.

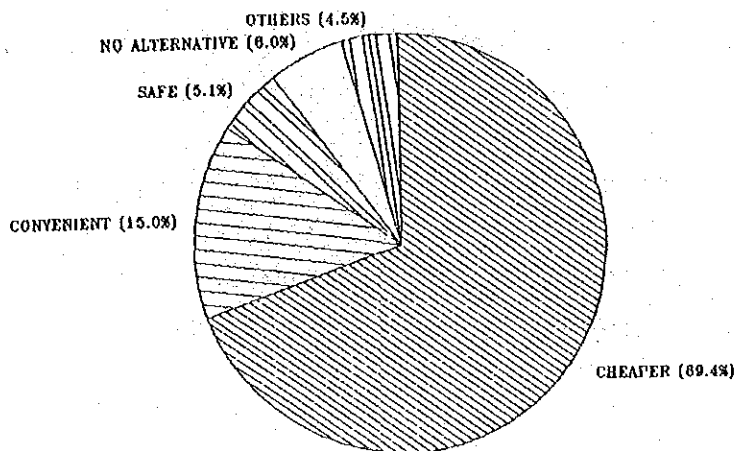


Figure-2.10 Reason for Traveling by Sea Transport

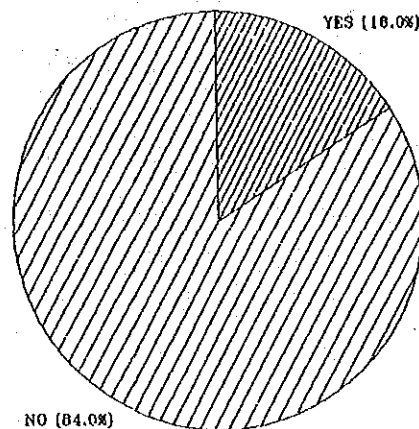


Figure-2.11 Past Experience of Traveling on Same Route by Air Transport

(44) Figure-2.12 shows the distribution of sea passengers' occupations. This figure indicates that 22.6% of passengers are farmers, followed by students (17.6%), company staff (17.1%), housewives (13.1%) and government officials (10.1%). In contrast, the ratio of foreigners is low at 5.0%.

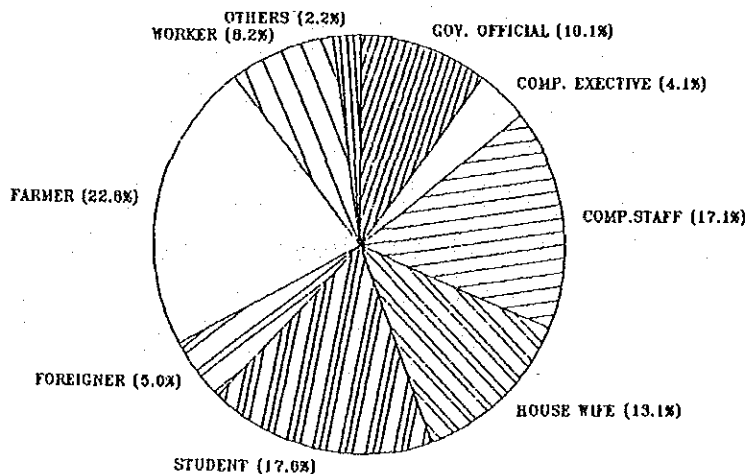


Figure-2.12 Occupation of Sea Passengers

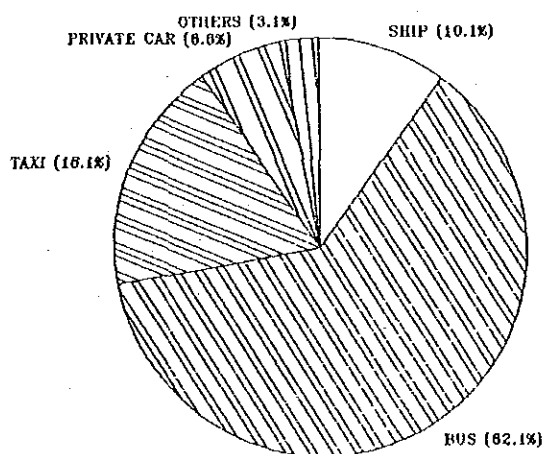


Figure-2.13 Access Modes to/from Ports

(45) In total, 70.3% of sea passengers are male, while 29.7% are female.

(46) Figure-2.13 summarizes the access modes taken by passengers to/from ports. This figure shows that 62.1% of passengers took buses to/from ports, followed by taxis (18.1%) and ships (10.1%). In contrast, only 6.6% of passengers took private cars to/from ports.

2.03.3 Comparison of Characteristics between Air and Sea Passengers

(47) This sub-section discusses some comparisons of characteristics between air and sea passengers. Figure-2.14 summarizes the comparison of trip purpose between air and sea passengers. As indicated, about 40% of air passengers replied with 'official' and 'business' purposes, and 'go back home' and 'social' purpose also accounted about 40%. On the other hand, about 65% of sea passengers responded that 'go back home' and 'social' was the trip purpose, while 'official' and 'business' purposes accounted for only about 25%. In fact, the distribution of trip purpose for sea passengers is rather similar to that of the non-Garuda passengers.

(48) Figure-2.15 summarizes the comparison of travel frequencies of air and sea passengers. The majority of both air and sea passengers have traveled on the same routes less than 5 times per year, however, air passengers tend to travel more frequently than sea passengers.

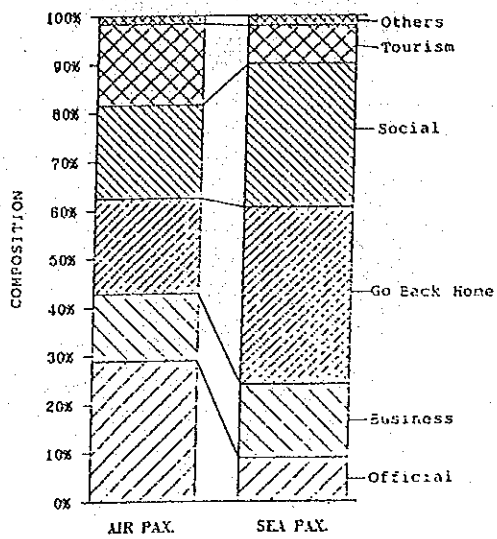


Figure-2.14 Trip Purpose of Air and Sea Passengers

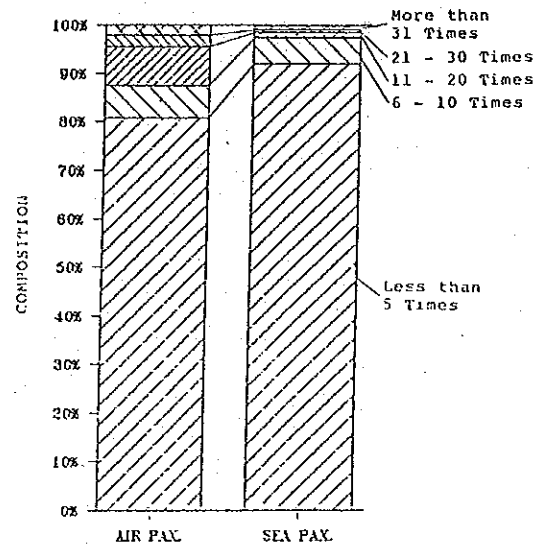


Figure-2.15 Travel Frequency of Air and Sea Passengers

(49) Figure-2.16 illustrates the comparison of occupations of air and sea passengers. About 60% of air passengers are government officials and company executives/staff, while about 15% are foreigners. In contrast, the proportion of government officials and company executives/staff is limited to about 30% of the sea passengers, and farmers and workers accounts for about 30%.

(50) Figure-2.17 illustrates the comparison of the access modes to/from airports/ports. It is clear from this figure that the majority of air passengers took taxis and private cars to/from airports, while 60% of sea passengers preferred buses, which are a cheaper transport mode than others.

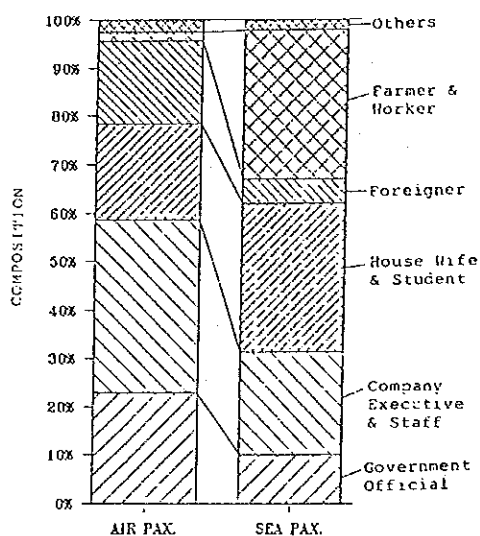


Figure-2.16 Occupation of Air and Sea Passengers

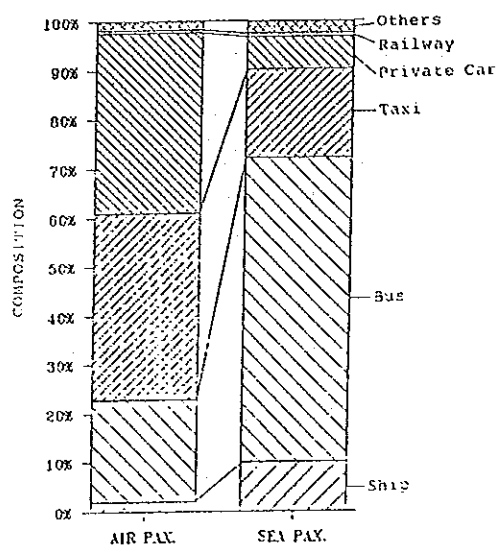


Figure-2.17 Access Modes to/from Airports/Ports

2.03.4 Opinions for Conceivable New Air Routes

(51) During the course of the air passenger survey, the survey team queried passengers about desired new air routes. As a result, 368 passengers responded with ideas for 204 new air routes. These requests include direct connections, instead of existing through flights or connecting flights, and even completely new air routes to locations without existing airports.

(52) In addition, the survey team interviewed DGAC regional officers and airport officers for their opinion on the potential new air routes in their jurisdictions. As a result, 26 new air routes are suggested as potential new air routes in the future.

(53) Since the information obtained consisted only of personal opinions, including some impossible requests, it cannot be used all of them directly to determine conceivable new air routes. However, this information could be used as a reference to verify new air routes to be studied through the traffic demand forecast.

SECTION 3

TRAFFIC DEMAND FORECAST

SECTION 3
TRAFFIC DEMAND FORECAST

3.01 METHODOLOGY

(01) The major objectives of the traffic demand forecast in the Study are:

- To analyze the existing traffic demand in order to identify the time-series trend, the modal split and existing problems.
- To forecast future traffic demand in the years 1994 and 2004.
- To identify potential new air routes based on future air traffic demand.

3.01.1 Phasing of the Study

(02) The demand forecast of inter-island traffic for all of Indonesia was conducted in two separate phases as defined below:

- Phase-1 : Inter-Regional traffic demand forecast
- Phase-2 : Inter-Zonal traffic demand forecast

(03) The terms "Regional or Region" and "Zonal or Zone" used herein are defined as follows:

- "Region" refers to a unit area defined by dividing all of Indonesia into 7 unit areas (Primary Zones). Unit areas are represented by one of the seven major islands in Indonesia, i.e. Sumatera, Jawa/Bali, Nusa Tenggara, Kalimantan, Sulawesi, Maluku and Irian Jaya. Thus, "Inter-Regional Traffic" refers to traffic movement between respective Regions.
- "Zone" refers to a unit area defined by dividing all of Indonesia into 181 unit areas (Secondary Zones). A unit zone largely corresponds to the administrative unit of a Kabupaten. Thus, "Inter-Zonal Traffic" refers to the traffic movement between respective Zones.

3.01.2 Relationship between Phases

(04) The relationship between the Phase-1 and the Phase-2 studies is illustrated in a flow chart shown in Figure-3.1. The Phase-1 study of the comparatively large 7 zones provided an approximate inter-regional traffic demand volume, combined with the net and gross movements, which was employed as a reference indicator for the subsequent Phase-2 study, by examining the available data. The Phase-2 study of 181 zones determined the inter-zonal traffic demand with sufficient accuracy to allow the identification of specific potential new air routes.

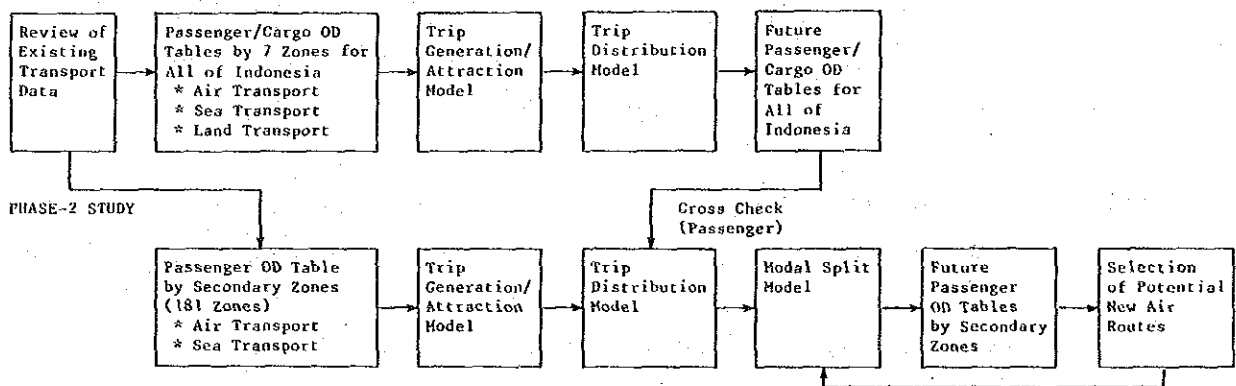


Figure-3.1 Relation Between Phases

(05) There are two types of passenger/cargo movements; i.e., gross movement and net movement. As illustrated in Figure-3.2, from the standpoint of gross movement, every movement carried out using any mode of transport was counted as 1 trip and the total the number of trips was considered as the number of trips from an origin to a destination. Alternatively, from the standpoint of net movement, any trip from an origin to a destination was considered as 1 trip regardless of the mode of transport used.

GROSS MOVEMENT

Air OD : 1 trip
 Sea OD : 1 trip
 Land OD : 3 trips

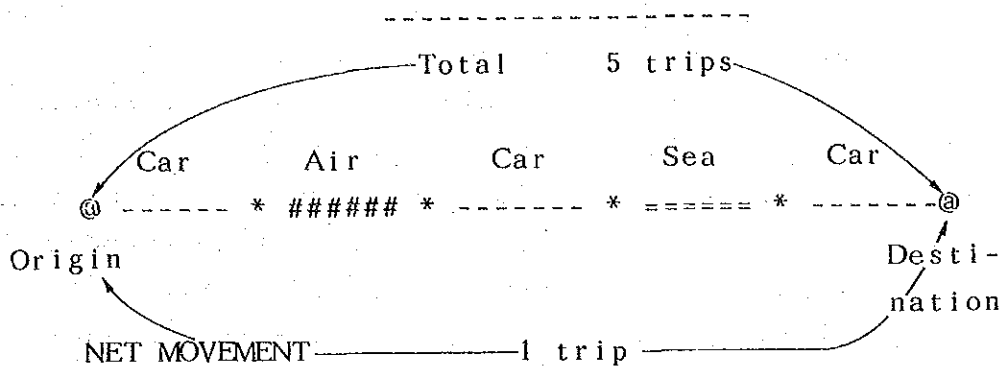


Figure-3.2 Relation between Gross Movement and Net Movement

(06) The inter-regional traffic demand forecast covers three modes of transport, air, sea and land, and was based on existing traffic and socioeconomic data. No substantial traffic survey was conducted in this step.

(07) The projections for inter-zonal traffic demand were principally based on the results of the actual traffic survey delineated in Section 2 of this Main Report (Part 1). The daily net movements of air passengers obtained by the air passenger survey was expanded to a yearly basis to provide the present net movement origin/destination (hereafter referred as "OD") table of air passengers. The study mainly focused on air transport and the zonal demand forecast was designed to assess potential new air routes.

3.01.3 Modes of Transport Studied and Base Year

(08) Modes of transport processed in traffic demand forecasts are as follows:

- Air : Air transport.
- Sea : Sea transport, including ferry.
- Land : Road, railway and inland waterway transport.

(09) Table-3.1 shows the OD data for each mode of transport which were utilized for the traffic demand forecasts of the Phase-1 study. In considering the availability of data, especially air and sea transport data, 1984 was established as the base year, and the OD data for land transport was calibrated to the base year values. Each demand forecast was made in 10 year intervals from the base year; i.e. 1994 and 2004.

Table-3.1 List of Collected Data Utilized for Traffic Demand Forecast

| Type of Data | Year | Source |
|---|---------|---|
| Air Transport 1. Passenger/Cargo OD between Major Airports | 1976-85 | Air Transport Statistics, BPS. |
| Sea Transport 1. Passenger OD between Ports by RLS Fleet | 1981-84 | Lalu Lintas Angkutan Antar Pulau dan Angkutan Samudera, DOC & BPS |
| 2. Cargo OD between Ports by RLS, Local & Rakyat Fleet | 1983-84 | - do - |
| 3. Passenger/Cargo OD between Ports by Ferry | 1978-85 | DGLC |
| 4. Total Passenger Volume by Local Fleet | 1980-84 | Studi Kelayakan Kapal Penumpang 7 & 8, DGSC. |
| 5. Total Passenger Volume by Rakyat Fleet | 1981-84 | - do - |
| 6. Total Passenger Volume by Pioneer Fleet | 1981-85 | - do - |
| 7. Total Cargo Volume by Pioneer Fleet | 1981-85 | Data dan Informasi Sektor Perhubungan, DOC. |
| 8. Passenger OD between Ports by Passenger Fleet | 1983-86 | PT.PELNI |
| 9. Passenger/Cargo OD between Ports by Pioneer Fleet | 1984-86 | PT.PELNI |
| Land Transport - Road 1. Passenger/Cargo OD between 215 Zones | 1982 | Studi Asal-Tujuan Transportasi Nasional, DOC & DPW |
| 2. Traffic Volume at Road | 1982-83 | Highway Transport Planning Project, BINA MARGA |
| - Railway 3. Passenger/Cargo OD between Stations | 1981 | Masterplan on Main Trunk Railway Electrification in Jawa, JICA |
| 4. Passenger/Cargo Volume by Region | 1975-86 | PJKA |
| - Inland Waterway 5. Total Passenger/Cargo Volume by Inland Waterway | 1981-86 | DGLC |

3.01.4 Agencies Concerned with Each Transport Mode

(10) Since no comprehensive nationwide person trip surveys and physical distribution had been carried out to grasp movements of passengers and cargo in Indonesia, individual data prepared either by agencies or companies concerned with each mode of transport were collected. Table-3.2 summarizes agencies concerned with each transport mode and their jurisdictions. In the course of the Study, these authorities provided valuable data, information and advice in respect to each mode of transport.

Table-3.2 Agencies Concerned with Each Transport Mode

| Agency | Transport Mode |
|---|---|
| Directorate General of Air Communications (DGAC) | Air Transportation |
| Directorate General of Sea Communications (DGSC) | Sea Transportation Ferry Boats |
| Directorate General of Land Communications (DGLC) | Railway Ferry Boats Inland Waterway Transport |
| Directorate General of BINA MARGA (BINA MARGA) | Road |
| Indonesian State Railways (PJKA) | Railway |

3.02 INTER-ZONAL TRAFFIC DEMAND FORECAST

3.02.1 Work Flow

(11) As shown in Figure-3.1, the final results of the traffic demand forecast for the Study were obtained by conducting the Phase-2 study, which was supported or verified by the outcomes of the Phase-1 study. Thus, we will mainly focus on the Phase-2 study here. Figure-3.3 presents the work flow for the Phase-2 study, which may be broadly itemized as follows:

- Actual air and sea passenger survey
- Zoning
- Preparation of present air passenger OD table
- Preparation of present sea passenger OD table
- Forecast of future trip generation/attraction volume
- Preparation of future OD table combined with air and sea passenger volume
- Construction of Modal Split Models
- Identifying potential new air routes goes hand in hand with the demand forecast
- Forecast of future air and sea passenger demand
- Sensitivity analysis
- Preparation of present and future air cargo OD tables

The first of these work items, the actual air and sea passenger surveys, was dealt with in the previous Section 2. The other items will be described hereafter.

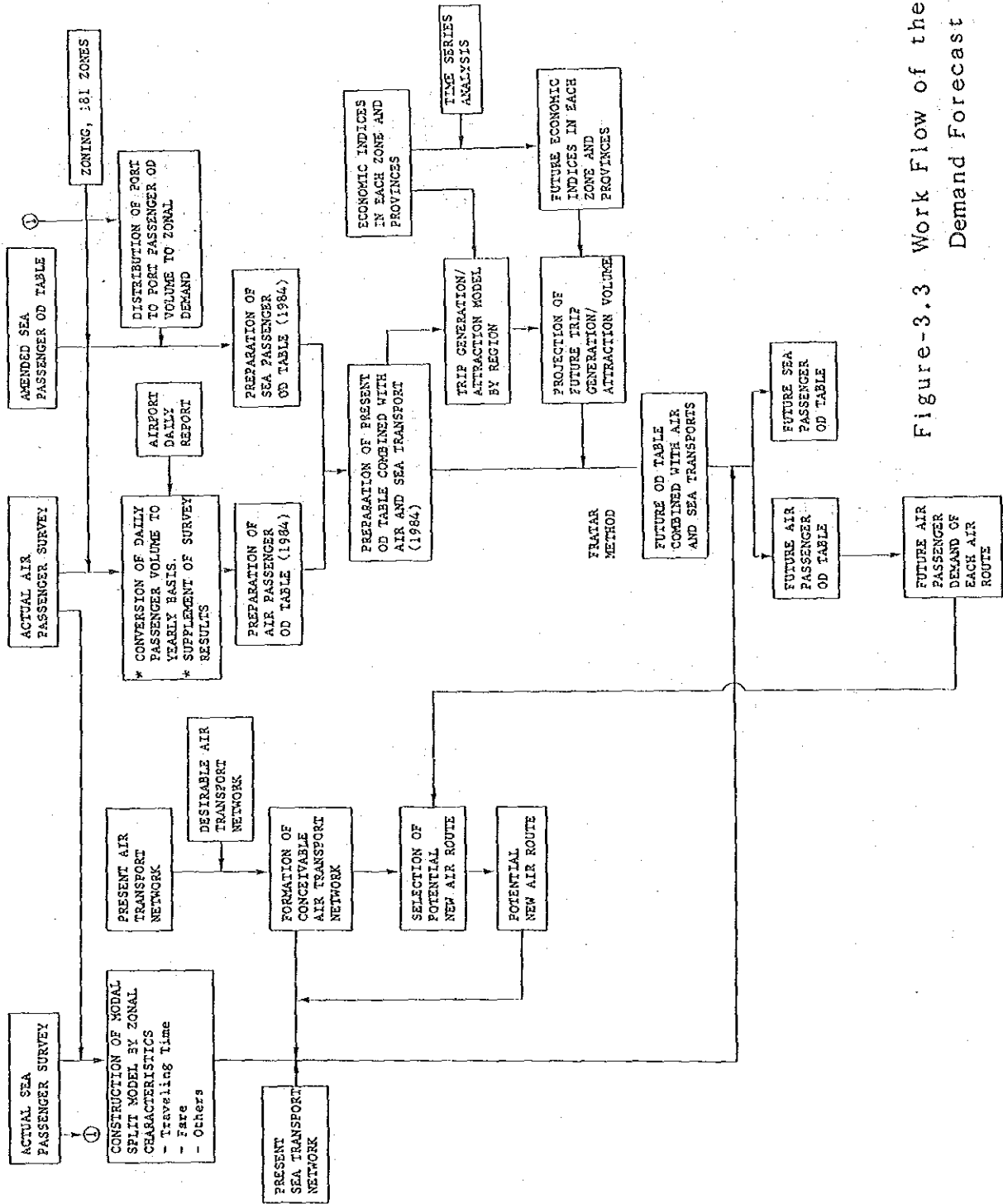


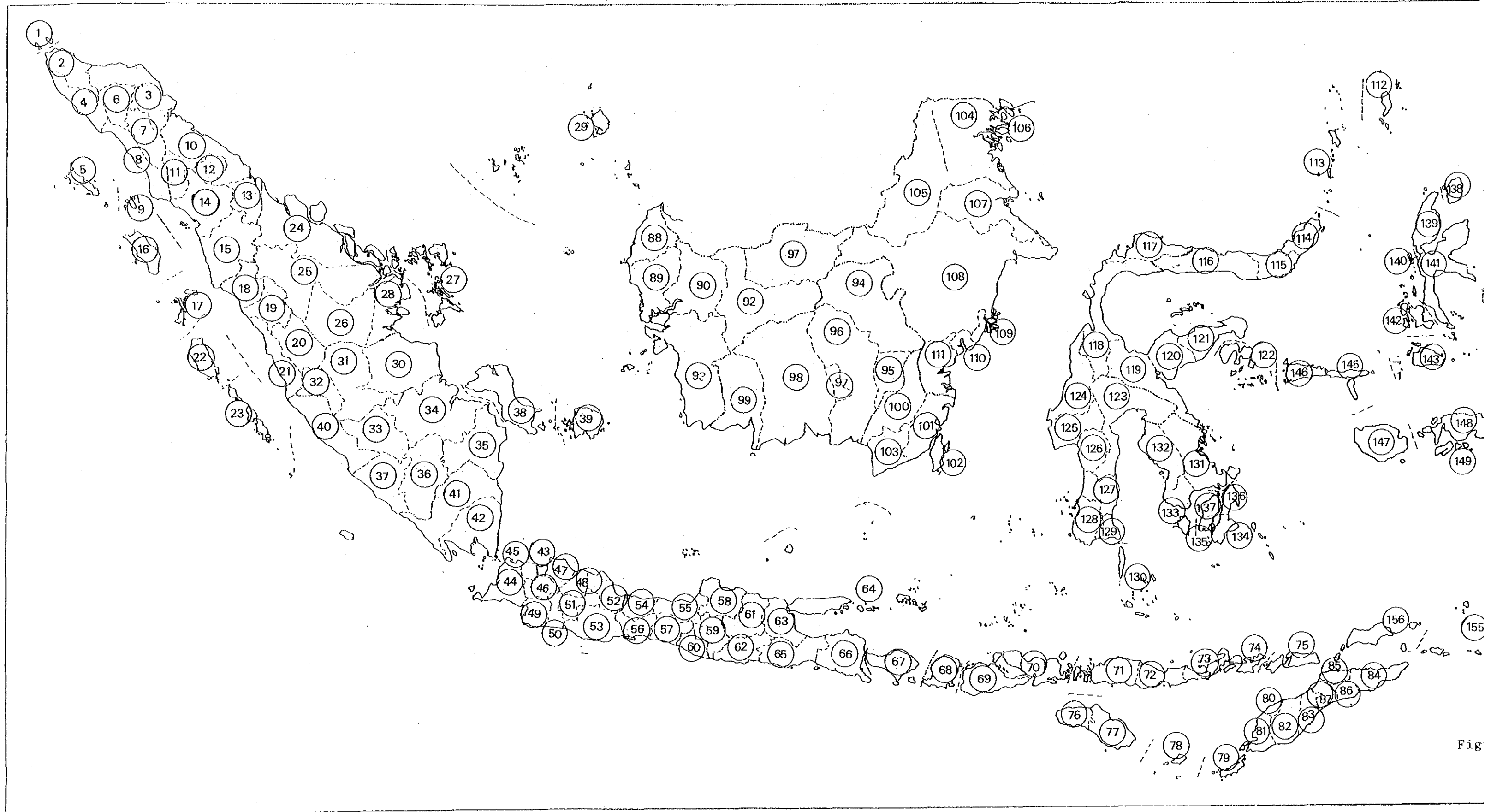
Figure-3.3 Work Flow of the Inter-Zonal Demand Forecast Traffic

3.02.2 Zoning

(12) The determination of zones is a very important factor in traffic demand forecasts and considerable attention was paid to this task. In the Phase-1 study, Indonesia was divided into 7 regions (primary zones) in order to forecast inter-regional traffic demand (as described in Para-(03)). In the Phase-2 study, those primary zones were subdivided into 181 secondary zones.

(13) Basically, a kabupaten is considered as a minimum unit of a zone due to the availability of socioeconomic data. For the final determination of zones, however, three factors were taken into account; i.e., the accessibility to airports, the development potential of zones and the composition of the transport network. Consequently, in several kabupatens had to be combined into one zone, especially in Jawa and south Sulawesi due primarily to the small size of kabupatens in those regions. In contrast, a kecamatan, which is a lower administrative unit than a kabupaten, was considered as a zone in regions, especially Irian Jaya, where kabupatens are very large.

(14) Figure-3.4 illustrates boundaries of secondary zones applied for the inter-zonal traffic demand forecast, while the number of zones in each region are summarized in Table-3.3. In addition, details of zones are provided in Appendix 3.1.



Fig

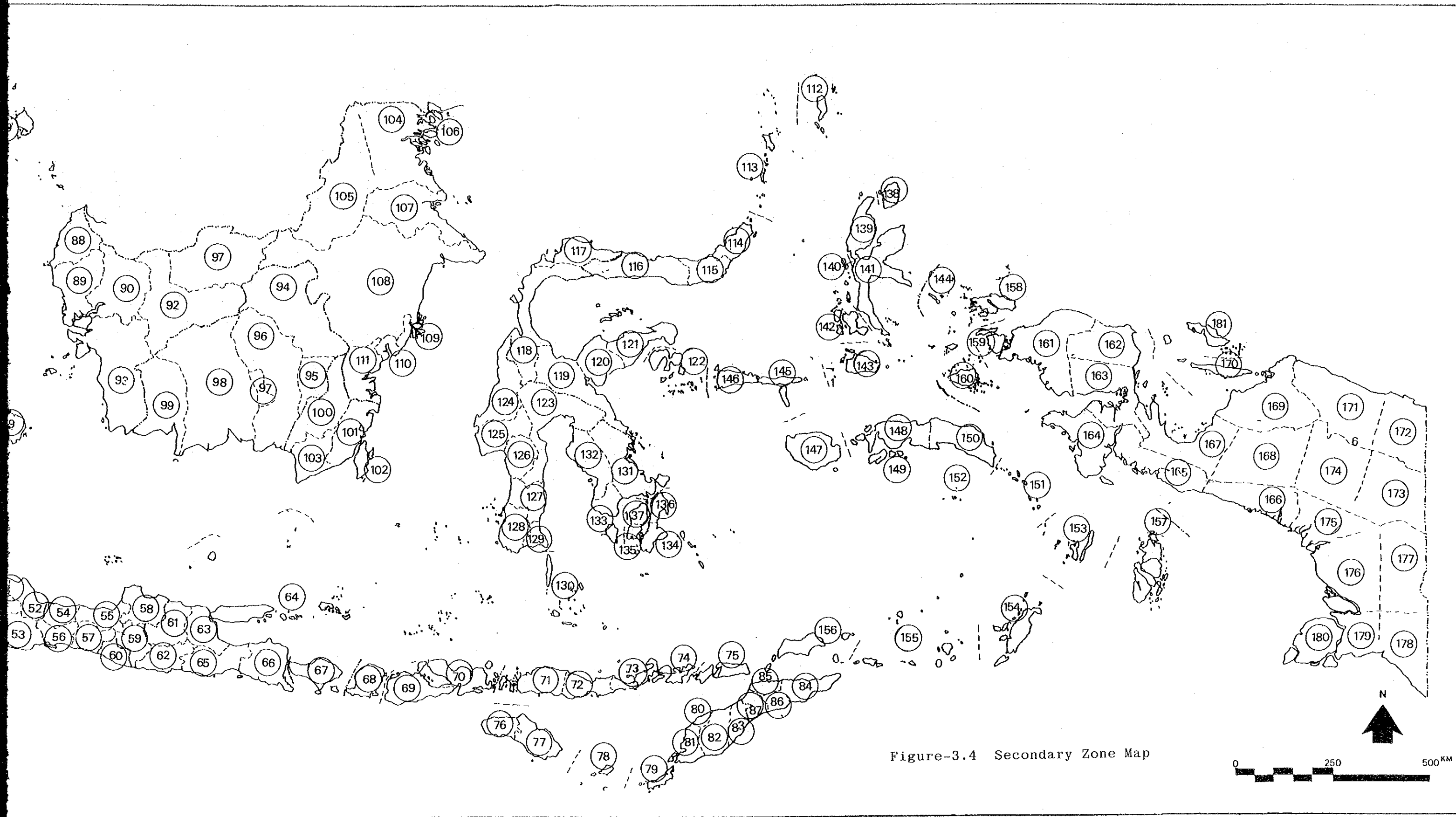


Figure-3.4 Secondary Zone Map

Table-3.3 Number of Secondary Zones in each Region

| Region | No. of Secondary Zone |
|-------------------|-----------------------|
| Sumatera | 42 |
| Jawa/Bali | 25 |
| Nusa Tenggara | 20 |
| Kalimantan | 24 |
| Sulawesi | 26 |
| Maluku | 20 |
| Irian Jaya | 24 |
| Total | 181 |
| Foreign Countries | 1 |

3.02.3 Preparation of Present Air Passenger OD Table

3.02.3.1 Processing of Survey Results

(15) As mentioned in Section 2, the air passenger survey was executed in order to obtain data regarding net movements of passengers. In fact, passengers of more than 80% of all air routes, including most trunk air routes and secondary air routes, were picked up as samples by the survey. Thus, the results of the air passenger survey were considered to be valid and reliable to use as the bases for the present net movement OD Table.

(16) The following tasks were required to prepare the present net movement OD table of air passengers based on the results of the air passenger survey:

- Conversion of daily passenger volume to yearly basis.
- Supplement of survey results, mainly for OD pairs not covered by the survey.
- Conversion of the 1987 OD table to 1984 level, in order to keep pace with other transport modes.

3.02.3.2 Conversion of Daily Passenger Volume to Yearly Basis

(17) The conversion of daily passenger volume to yearly basis was carried out in three steps. Prior to it, samples of transit passengers were examined in detail, and samples which appeared to have overlap with samples from another airport were deleted from the original data file.

(18) Then, the daily passenger volume obtained from the air passenger survey conducted at each airport was expanded to weekly passenger volume. In this case, expansion factors were determined individually at each airport for flights to the same direction, under considerations of sample rates of flights, frequencies of flights per week and coverages of flights by the survey.

(19) Finally, these weekly passenger volume data at each airport were converted to 2 months' volume and then to a yearly basis by using expansion factors calculated from the seasonal fluctuations in the number of air passengers at major airports. Tables-3.4 and 3.5 summarize expansion factors utilized for conversion of weekly volume to a yearly basis.

Table-3.4 Expansion Factors from Weekly Volume to 2 Months Volume (July & August)

| Areas | Week | Weekly Vol. Avg. Weekly Vol. (1) | Expansion Factor (1)X62/7 |
|---|---------------|--|---------------------------------|
| Jawa/Bali Sumatera Kalimantan | 3rd week Jul. | 1.026 | 9.08 |
| | 4th week Jul. | 0.927 | 8.21 |
| | 1st week Aug. | 0.965 | 8.52 |
| Sulawesi Maluku Nusa Tenggara Irian Jaya | 4th week Jul. | 0.910 | 8.06 |
| | 1st week Aug. | 1.017 | 9.01 |

Source : Based on Daily Reports of 17 major airports

Table-3.5 Expansion Factors from 2 Months' Volume to Yearly Volume

| Areas | Vol. in Jul & Aug Avg. 2 Months Vol. (1) | Expansion Factor (1)X6 |
|---|--|------------------------------|
| Jawa/Bali Sumatera Kalimantan | 0.88 | 5.28 |
| Sulawesi Maluku Nusa Tenggara Irian Jaya | 0.91 | 5.49 |

Source : Based on Daily Reports of 20 major airports

3.02.3.3 Supplementation

(20) Yearly passenger volume data at every airport was then combined to form a tentative net movement OD table based on the survey results. However, there were many OD pairs without passenger volume at all. These phenomena are due to either one of the following two reasons:

- The first one is due to the definition of a trip that any air trip is defined so as to be completed within one day. This means that a trip from Sumatera to Irian Jaya, say for instance, that requires one night stay somewhere in between the origin and destination has to be counted as 2 trips, but not 1 trip, so that the OD pair between Sumatera and Irian Jaya (vice versa as well) has to remain void, any passenger volume not assigned at all.
- The second reason is that because of the nature of flight schedule which is on weekly basis and also because of the restricted number of days on which the air passenger survey was conducted, there were some numbers of OD pairs, samples of which could not have been surveyed nor interviewed. For this second type of OD pair blank, however, reasonable number of passengers was later inserted by the procedure described in para-(21), so as to make OD table reasonable.

(21) To supplement the second type of OD pair blank mentioned above, therefore, two kinds of gravity models were constructed for the inter-region OD pairs and the intra-region OD pairs, in order to insert reasonable number of passengers. The basic formula of these gravity models is shown below, while parameters for each formula are presented in Table-3.6.

$$T_{ij} = K \frac{(P_i \times P_j)^X}{D_{ij}^Y}$$

$$T_{ij} = K \frac{(P_i * P_j)^X}{D_{ij}^Y}$$

where T_{ij} : Trip distribution between i and j zones
 P_i : Population in i zone
 P_j : Population in j zone
 D_{ij} : Distance between i and j zones
 $K, X, Y,$: Parameters

Table-3.6 Parameters of Gravity Models for Trip Distribution Projection

| Model Type | Parameters | | | Correlation Coefficient R |
|--------------|------------|----------|-----------|---------------------------|
| | K | X | Y | |
| Intra-Region | 380.8098 | 0.027842 | -0.038591 | 0.512 |
| Inter-Region | 13959.2828 | 0.014513 | -0.49094 | 0.492 |

3.02.3.4 Conversion of 1987 OD Table to 1984 OD Table

(22) The formulation of the net movement OD table of air passengers in 1987 was followed by converting it to the 1984 OD table, because most OD data for other transport modes are only available up to year 1984. To carry out this operation, a conversion factor from 1987 OD volume to 1984 OD volume was determined based on the annual growth rate in the number of passengers at 9 major airports between 1984 and 1987. The annual growth rate of air passengers between 1986 and 1987 was assumed to be the same as that of 1985 and 1986. Table-3.7 shows the annual growth rate of passengers and conversion factors.

Table-3.7 Conversion Factor between 1984 and 1987 Air Passenger Volumes

| Item $\frac{1}{3}$ Year | 1984 | 1985 | 1986 | 1987 |
|-------------------------|-------|-------|-------|--------|
| Annual Growth Rate | - | 0.42% | 5.83% | 5.83%* |
| Conversion Factor | 1.000 | 1.004 | 1.120 | 1.185 |

Note : * Estimated figure.

Source : Based on passenger volume data of 9 major airports

(23) The net movement OD table of air passengers in 1984 was generated by using this conversion factor. Then, in order to verify the reliability of this OD table, it was converted into a gross movement OD table by traffic assignment, and compared with the OD table prepared in the Phase-1 study. Since OD patterns of these two tables were found to be similar, the net movement OD table of air passengers in 1984 was finalized.

3.02.3.5 Assessment of Present Air Passenger Demand

(24) Table-3.8 shows the net movement OD table of air passengers between provinces in 1984. The air passenger OD table between zones in 1984 are presented in the "Data Book", Section 1. The total net movement demand of air passengers in 1984 was projected as approximately 6,869,000 trips. This table shows that the greatest traffic demand is related to Jakarta (about 25% of the total demand) with major destinations (more than 100,000 trips) such as Jawa Timur (including Surabaya), Sumatera Selatan (including Palembang), Jawa Tengah (including Semarang and Solo), Sumatera Utara (including Medan) and Riau (including Pekanbaru). Other than Jakarta, large traffic demand is related to Jawa

Table-3.8 Present Air Passenger OD Table Between Provinces - 1984

| 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | TOTAL | | |
|--------|---------|--------|--------|-------|--------|--------|--------|---------|--------|--------|--------|--------|--------|-------|--------|--------|--------|--------|--------|--------|--------|---------|--------|--------|--------|--------|---------|-------|--------|--------|
| ACEH | SUM.LUT | SUM.BA | RIAU | JAMBI | SUM.SE | BENKUL | LAMPUN | JAKARTA | JAW.BA | JAW.TE | YOGYA | JAW.TM | BALI | NT.BA | NT.TM | TTM.TM | KAL.BA | KAL.SE | KAL.TE | KAL.TE | KAL.TM | SUL.LUT | SUL.TE | SUL.SE | SUL.TR | MALUKU | IRIAN | TOTAL | | |
| 3775 | 1753 | 5801 | 14199 | 3043 | 10571 | 3114 | 11251 | 35652 | 5635 | 1568 | 4205 | 7919 | 4205 | 0 | 0 | 0 | 2304 | 0 | 3589 | 180 | 267 | 0 | 289 | 0 | 0 | 0 | 0 | 0 | 121625 | |
| 3123 | 3077 | 921 | 24020 | 2423 | 10843 | 1880 | 6668 | 126004 | 20112 | 4388 | 14523 | 1696 | 12356 | 295 | 0 | 0 | 5432 | 2518 | 4645 | 4365 | 2595 | 1602 | 4542 | 2906 | 0 | 0 | 0 | 0 | 289142 | |
| 3001 | 9921 | 1886 | 8224 | 1627 | 7502 | 1048 | 3058 | 87362 | 3118 | 1688 | 7233 | 3747 | 4266 | 0 | 0 | 0 | 3631 | 2424 | 2986 | 2747 | 287 | 735 | 4505 | 109 | 204 | 0 | 0 | 0 | 186591 | |
| 14199 | 24050 | 8324 | 1764 | 2237 | 14353 | 2476 | 6935 | 121843 | 6206 | 966 | 2462 | 3408 | 4873 | 0 | 0 | 0 | 1563 | 1653 | 3193 | 663 | 1214 | 0 | 2058 | 0 | 0 | 0 | 0 | 0 | 223850 | |
| 3043 | 2423 | 1627 | 2237 | 0 | 2887 | 0 | 53644 | 1178 | 840 | 0 | 2319 | 1777 | 0 | 0 | 0 | 0 | 1454 | 0 | 1536 | 0 | 299 | 0 | 1010 | 0 | 0 | 0 | 0 | 0 | 37344 | |
| 10571 | 10841 | 7502 | 14352 | 9070 | 43621 | 6731 | 2844 | 305548 | 17095 | 4880 | 2068 | 11283 | 3761 | 0 | 0 | 0 | 5565 | 3296 | 4525 | 3725 | 2177 | 1455 | 5025 | 3218 | 0 | 0 | 0 | 0 | 379500 | |
| 3114 | 1880 | 1028 | 2476 | 0 | 6731 | 0 | 1023 | 9459 | 2924 | 0 | 0 | 600 | 615 | 0 | 0 | 0 | 459 | 516 | 0 | 0 | 0 | 0 | 342 | 0 | 0 | 0 | 0 | 0 | 31167 | |
| 11531 | 6648 | 5058 | 6935 | 2887 | 2844 | 1023 | 0 | 38789 | 3982 | 0 | 3850 | 1985 | 0 | 0 | 0 | 0 | 881 | 0 | 1072 | 0 | 540 | 0 | 666 | 0 | 0 | 0 | 0 | 0 | 0 | 86671 |
| 35652 | 126004 | 87362 | 121843 | 55644 | 405548 | 9459 | 38789 | 10113 | 21720 | 138365 | 75606 | 205756 | 75195 | 16865 | 10871 | 4104 | 89179 | 18474 | 34988 | 54309 | 20566 | 10235 | 50178 | 7778 | 32182 | 14672 | 1571457 | 0 | 0 | |
| 5635 | 20112 | 5318 | 6206 | 1178 | 17095 | 2924 | 3982 | 21720 | 2735 | 11945 | 6428 | 23809 | 19325 | 2081 | 1740 | 304 | 11481 | 2130 | 11017 | 10357 | 4899 | 1624 | 8556 | 7087 | 5117 | 3726 | 218531 | 0 | 0 | |
| 1568 | 4568 | 1668 | 986 | 840 | 4880 | 0 | 0 | 158365 | 11945 | 840 | 0 | 13727 | 6889 | 1664 | 1935 | 2540 | 5416 | 3543 | 9353 | 12001 | 3727 | 0 | 3761 | 7087 | 2323 | 3143 | 242769 | 0 | 0 | |
| 0 | 14523 | 7255 | 2462 | 0 | 2068 | 0 | 0 | 75406 | 6428 | 0 | 0 | 4709 | 22489 | 1663 | 1012 | 6562 | 2378 | 271 | 1391 | 8063 | 400 | 306 | 2239 | 0 | 0 | 0 | 0 | 0 | 163701 | |
| 3917 | 7656 | 3147 | 3408 | 2319 | 11282 | 600 | 3850 | 205756 | 23809 | 13727 | 4709 | 1731 | 41176 | 12290 | 21084 | 1539 | 9715 | 20788 | 55796 | 77602 | 4993 | 8855 | 49587 | 13506 | 13888 | 9651 | 626421 | 0 | 0 | |
| 4205 | 12356 | 4266 | 4873 | 1777 | 3761 | 615 | 1985 | 75195 | 13735 | 6889 | 23489 | 41176 | 17812 | 28989 | 20409 | 8310 | 2396 | 4085 | 2787 | 4423 | 664 | 4300 | 44620 | 5334 | 6781 | 5955 | 355977 | 0 | 0 | |
| 0 | 295 | 0 | 0 | 0 | 0 | 0 | 0 | 16863 | 2081 | 1664 | 1663 | 12290 | 28989 | 14899 | 10840 | 2090 | 1113 | 0 | 2202 | 0 | 981 | 0 | 2105 | 0 | 0 | 0 | 182 | 0 | 0 | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10871 | 1740 | 1935 | 1012 | 21084 | 20809 | 10640 | 53460 | 11472 | 346 | 6648 | 3108 | 6648 | 3108 | 4628 | 0 | 10921 | 0 | 1681 | 0 | 0 | 163808 | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13104 | 3704 | 2540 | 6542 | 1539 | 8910 | 2090 | 14672 | 874 | 874 | 1518 | 385 | 1385 | 1256 | 0 | 1889 | 0 | 0 | 0 | 0 | 0 | 42803 | |
| 2304 | 6432 | 3637 | 1363 | 1454 | 5563 | 489 | 881 | 89179 | 11481 | 5416 | 2328 | 9715 | 2296 | 1113 | 3631 | 874 | 21812 | 13574 | 4959 | 12684 | 2497 | 1577 | 5747 | 3407 | 0 | 0 | 0 | 0 | 214699 | |
| 0 | 2518 | 2424 | 1633 | 1536 | 3236 | 0 | 1032 | 34988 | 11017 | 5355 | 1391 | 20788 | 4085 | 0 | 348 | 0 | 13524 | 5224 | 23910 | 11824 | 2374 | 0 | 3249 | 0 | 0 | 0 | 0 | 0 | 0 | 116992 |
| 3599 | 4643 | 2366 | 3193 | 1536 | 4525 | 516 | 1032 | 34988 | 11017 | 5355 | 1391 | 20788 | 4085 | 2202 | 6648 | 1518 | 4599 | 20910 | 11932 | 23058 | 4597 | 3993 | 6581 | 5033 | 0 | 0 | 0 | 0 | 232395 | |
| 180 | 4365 | 2747 | 663 | 0 | 3725 | 0 | 0 | 54309 | 10357 | 12001 | 8083 | 77603 | 4423 | 0 | 3708 | 385 | 12684 | 11824 | 23058 | 49356 | 7263 | 2757 | 11480 | 0 | 0 | 0 | 0 | 0 | 0 | 303682 |
| 257 | 2595 | 287 | 1214 | 299 | 2177 | 0 | 540 | 20566 | 4899 | 3727 | 400 | 4993 | 664 | 981 | 4628 | 1256 | 2497 | 2374 | 4597 | 7563 | 22223 | 8564 | 11236 | 16308 | 8772 | 145187 | 0 | 0 | 0 | |
| 0 | 1602 | 735 | 0 | 0 | 1455 | 0 | 0 | 10235 | 1624 | 0 | 306 | 8855 | 4300 | 0 | 0 | 0 | 1577 | 0 | 3993 | 2757 | 8564 | 21526 | 19520 | 11911 | 3577 | 1155 | 103692 | 0 | 0 | |
| 289 | 4542 | 4505 | 2058 | 1010 | 5025 | 342 | 666 | 50178 | 8556 | 3761 | 2259 | 49589 | 44620 | 2105 | 10921 | 1889 | 5747 | 3249 | 8581 | 11480 | 11560 | 19520 | 8122 | 17363 | 19439 | 24639 | 321995 | 0 | 0 | |
| 0 | 2906 | 109 | 0 | 0 | 3218 | 0 | 0 | 7778 | 7087 | 7087 | 0 | 13506 | 5334 | 0 | 0 | 0 | 3447 | 0 | 5033 | 0 | 11236 | 11911 | 17363 | 0 | 4252 | 371 | 100638 | 0 | 0 | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 32182 | 5117 | 2323 | 389 | 13888 | 6781 | 1681 | 0 | 0 | 0 | 0 | 0 | 851 | 16208 | 3577 | 19439 | 4252 | 44990 | 10597 | 162679 | 0 | 0 | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14672 | 3726 | 3143 | 3537 | 9652 | 5955 | 182 | 0 | 0 | 0 | 347 | 0 | 0 | 8772 | 1155 | 24639 | 371 | 10697 | 208426 | 295621 | 0 | 0 | |
| 121623 | 289142 | 166591 | 223829 | 87344 | 379500 | 31167 | 88671 | 1571457 | 218531 | 342769 | 163701 | 626428 | 355977 | 98059 | 163808 | 42843 | 214499 | 116992 | 232395 | 303681 | 145187 | 403692 | 321993 | 100638 | 162679 | 295620 | 8668816 | 0 | 0 | |

Timur (9.8%), Sumatera Selatan (5.9%), Bali (4.8%) and Kalimantan Timur (4.6%) with more than 300,000 trips annually and respectively.

(25) Figure-3.5 illustrates the present desire lines of air passenger demand between provinces. Strong desire lines are clearly observed on intra-region OD pairs of Jawa/Bali region, and inter-region OD pairs between Jawa/Bali, and Sumatera and Kalimantan. In contrast, air passenger demands related to Sulawesi, Nusa Tenggara, Maluku and Irian Jaya are limited.

(26) Figures-3.6 to 3.12 illustrate the present desire lines of air passenger demand in each region. The major findings from these figures are as follows.

- Sumatera :

The majority of demand in Sumatera is attributed to inter-region traffic with Jawa, and demand to/from Palembang, Medan and Padang are especially outstanding. Most of the intra-region traffic demand is limited, with the exception of Medan-Pekanbaru and Palembang-Jambi pairs.

- Jawa/Bali :

A very strong desire line between Jakarta and Sumatera indicates high inter-region traffic demand, as are the inter-region demands of Jakarta-Kalimantan and Surabaya-Kalimantan. High intra-region traffic demand is observed for Jakarta-Surabaya, Jakarta-Yogyakarta, Jakarta-Semarang and Yogyakarta-Bali.

- Nusa Tenggara :

The majority of demand in Nusa Tenggara is concentrated in inter-region traffic with Jawa/Bali, especially to/from Mataram and Kupang. Inter-region traffic demands are limited, with the exception of Kupang-Maumere.

- Kalimantan :

High intra-region traffic demand is seen for Balik-

papan-Tarakan, Balikpapan-Banjarmasin, Balikpapan-Samarinda and Banjarmasin-Kotabaru, however the majority of passenger trips are related to Jawa.

- Sulawesi :

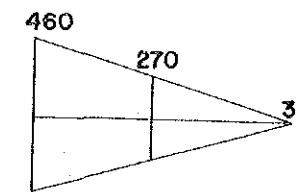
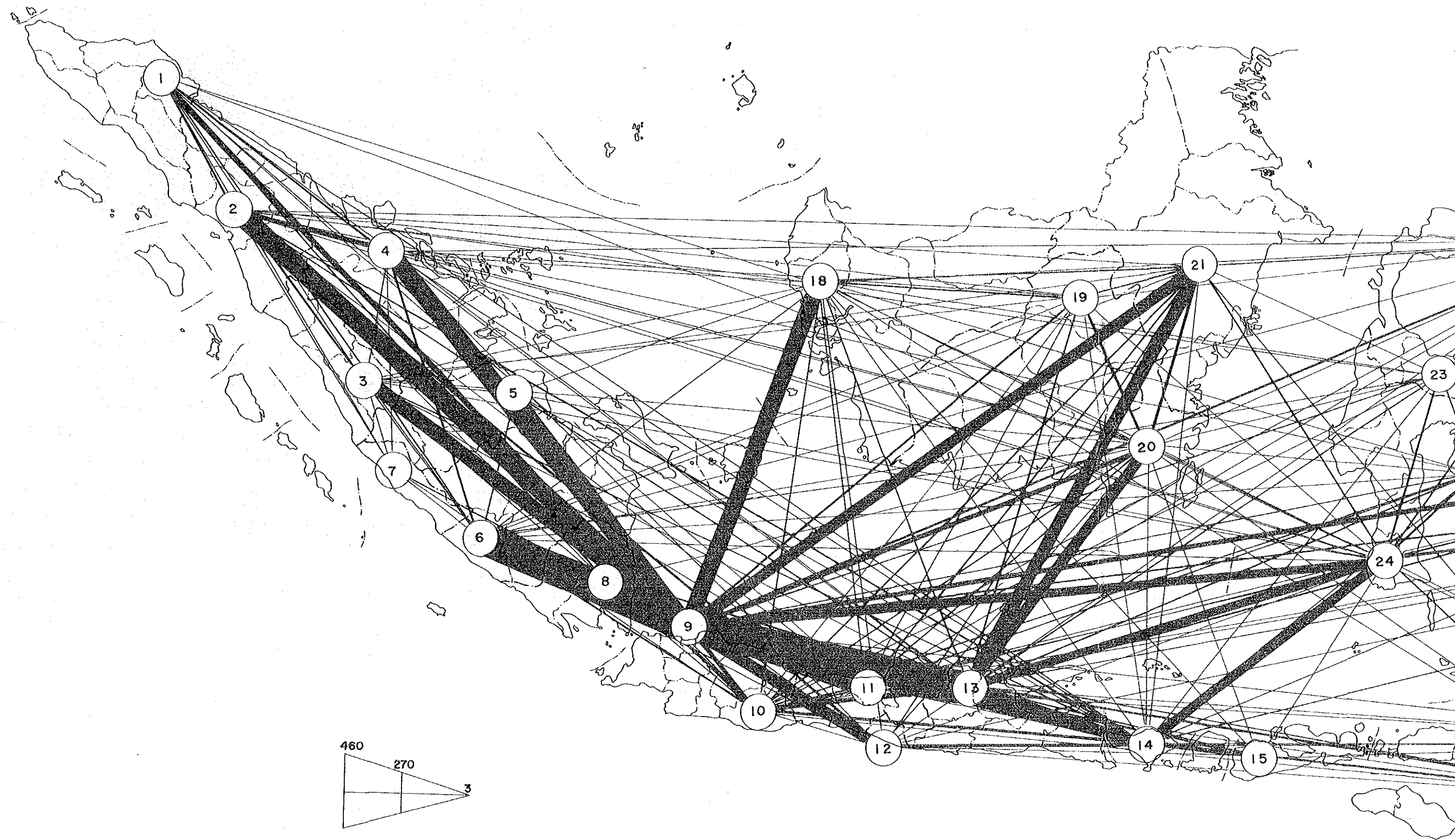
Strong desire lines can be observed readily on inter-region demands of Ujung Pandang-Jawa/Bali, followed by Manado-Jawa/Bali, Ujung Pandang-Kalimantan, Kendari-Jawa/Bali, and Ujung Pandang-Sumatera.

- Maluku :

Ambon-Ternate and Ambon-Mangole are higher demand OD pairs in this region, however, the majority of passenger trips are related to Jawa/Bali and Sulawesi.

- Irian Jaya :

Strong desire lines for intra-region traffic demand can be found on Jayapura-Wamena and Jayapura-Biak pairs, followed by Biak-Nabire, Biak-Timika, Jayapura-Merauke and Biak-Sorong pairs. Inter-region traffic demands of Jawa/Bali-Jayapura and Jawa/Bali-Sorong are also high.



Unit : 1,000 Trips

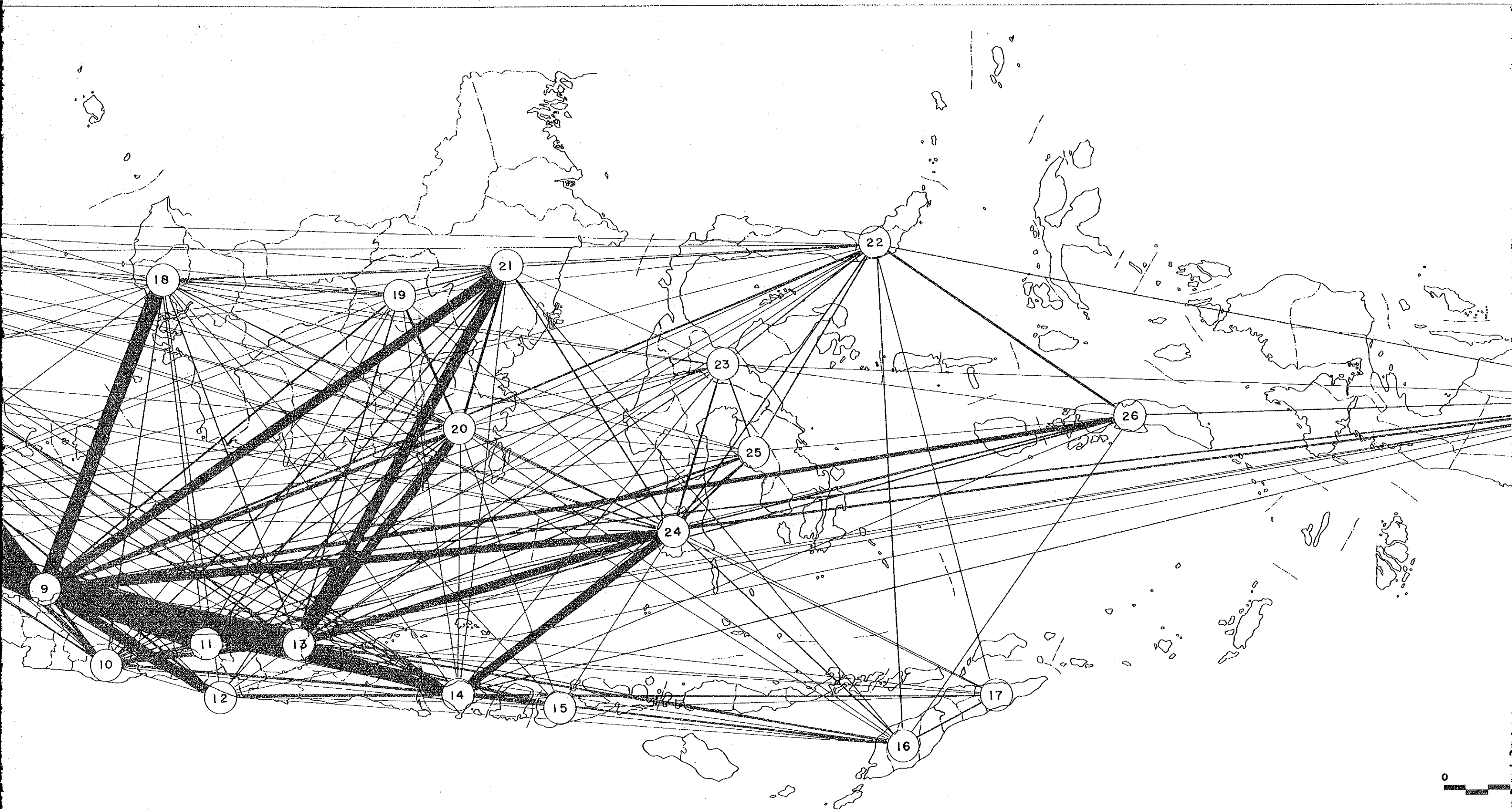


Figure-3.5 Present Desire Line of Air Passenger Demand Between Provinces - 1984

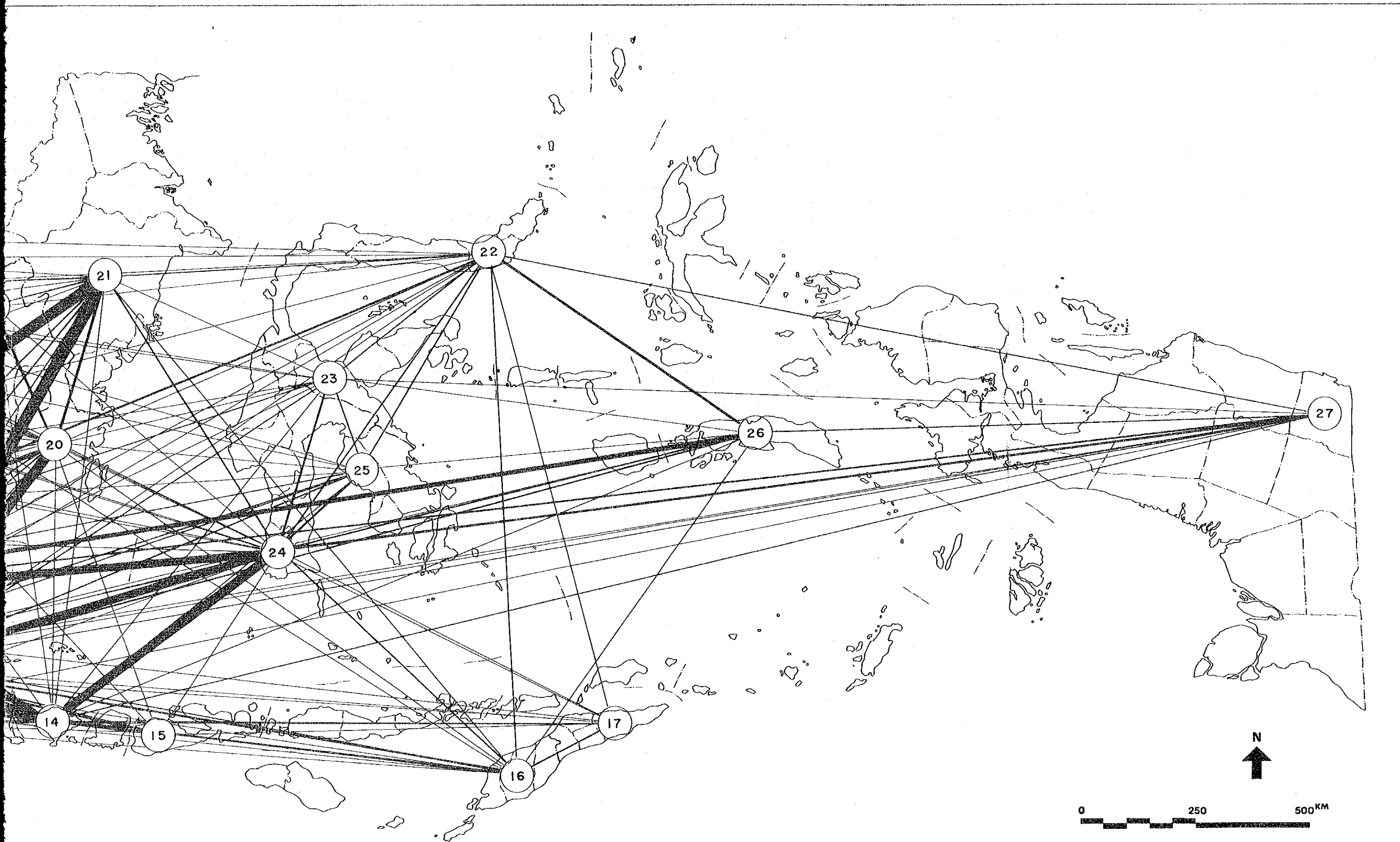


Figure-3.5 Present Desire Line of Air Passenger Demand Between Provinces - 1984

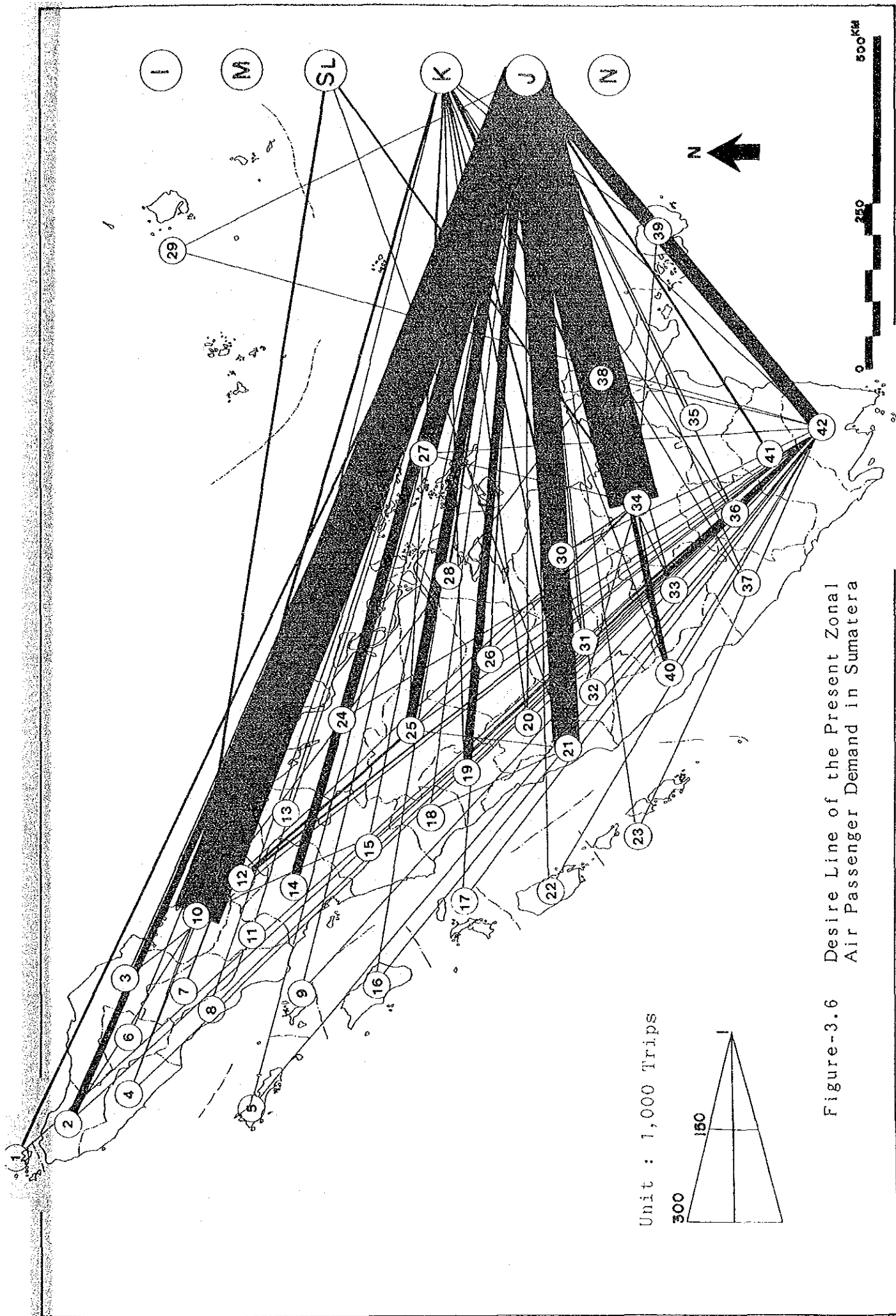
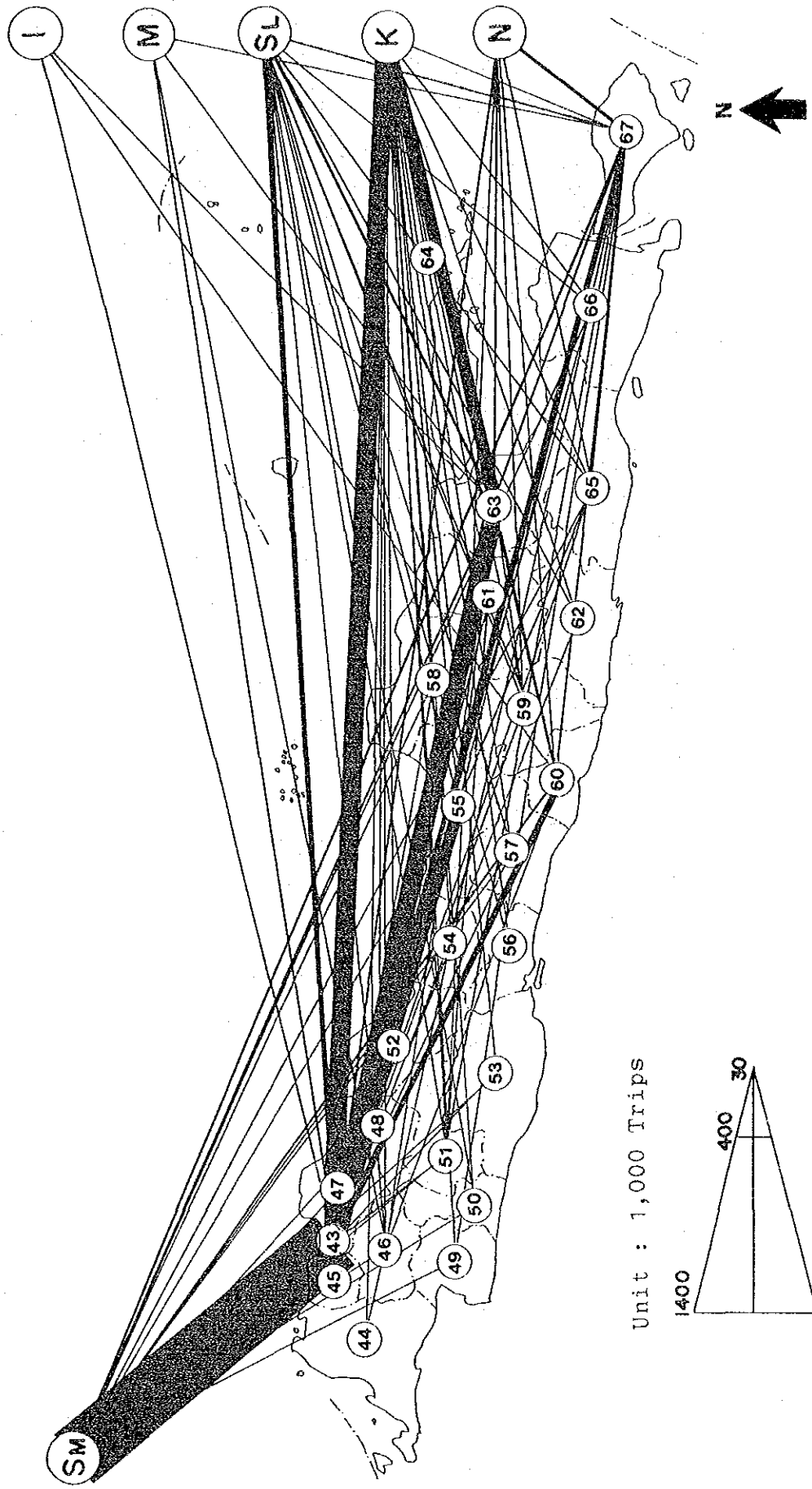


Figure-3.6 Desire Line of the Present Zonal Air Passenger Demand in Sumatera



Unit : 1,000 Trips

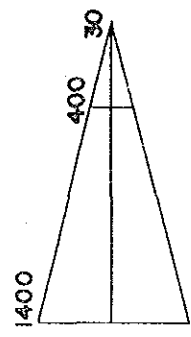


Figure-3.7 Desire Line of the Present Zonal Air Passenger Demand in Jawa/Bali

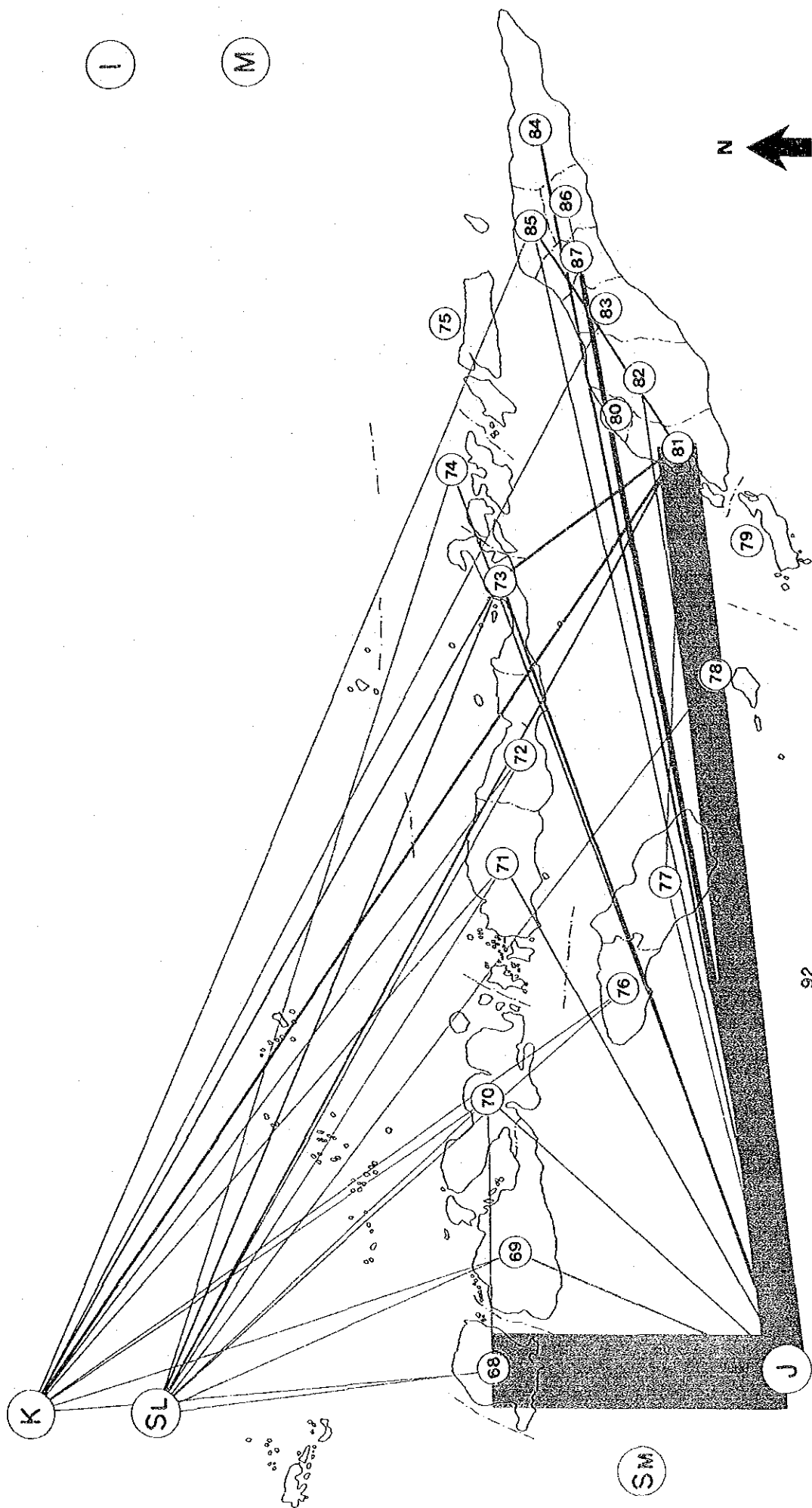


Figure-3.8 Desire Line of the Present Zonal Air Passenger Demand in Nusa Tenggara

Unit : 1,000 Trips

