# Appendix 1 Transportation Surveys

Situation regarding the usage of railways and other modes by both passengers and freight transport in the Central Java region was investigated by implementing the Railway Traffic Survey, Road Traffic Survey, Travel Speed Survey, Stated Preference Survey on Railway Use and Weigh Bridge Interview Survey.

## 1.1 Railway Traffic Survey

Railway Passenger Count Survey, Railway OD Survey, and Free Ridership Survey were implemented to understand situation regarding railway usage in the Central Java region.

### (1) Railway Passenger Count Survey

#### 1) Survey Objective

Although ticket sales data is available, railway passenger count survey was conducted to acquire accurate passenger count data and this data can be used not only for basic information to understand the railway usage situation in the Central Java region but also for calibrating origin destination table.

#### 2) Survey Contents

##### a. Survey Station

The survey was conducted at 15 stations in the Central Java region. Stations are selected based on number of passengers, whether it is a branch station or terminal station of major line, or located in a major city. (See the following table and figure)

**Table 1.1.1 Railway Passenger Count Survey Stations**

| Survey Station Names | | | |
|---|---|---|---|
| Tegal | Brumbung | Kutoarjo | Purwosari |
| Pekalongan | Gundih | Yogyakarta | Solo Balapan |
| Semarang Poncol | Purwokerto | Lempuyangan | Solo Jebres |
| Semarang Tawang | Kroya | Klaten | |


**Figure 1.1.1 Stations Covered by Railway Traffic Survey**

**b. Survey Method**

Survey Method is counting all passengers getting on or off each train at the station. The following figure shows an example of passenger count at Solo Balapan station on March 4, 2008.

Source: CJRR Study Team, Railway Traffic Survey, 2008

**Figure 1.1.2 Railway Passenger Count Survey Situation at Solo Balapan Station**

### c. Survey Schedule

The survey was conducted from 3rd to 18th March, 2008.

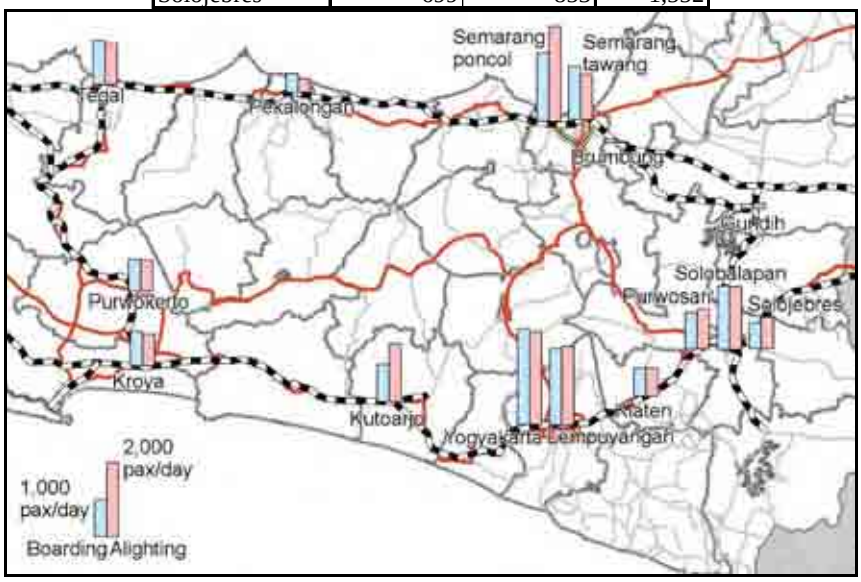
## 3) Survey Result

### a. Passenger volume by station

Railway passenger count survey result by station is shown as follows. Semarang Yogyakarta station is the largest with 5,063 boarding and alighting passengers per day. Passenger volumes of Semarang Poncol, Solo Balapan, Solo Jebres, and Lempuyangan exceeds 3,000 boarding and alighting passengers per day.

**Table 1.1.2 Passenger Volume by Station**

| Station name | Boarding Passengers (pax/day) | Boarding Passengers (pax/day) | Total (pax/day) |
|---|---|---|---|
| Tegal | 1,182 | 1,097 | 2,279 |
| Pekalongan | 504 | 367 | 871 |
| Semarangponcol | 1,835 | 2,565 | 4,400 |
| Semarangtawang | 1,430 | 1,210 | 2,640 |
| Brumbung | 95 | 15 | 110 |
| Gundih | 107 | 152 | 259 |
| Purwokerto | 857 | 836 | 1,693 |
| Kroya | 928 | 869 | 1,797 |
| Kutoarjo | 992 | 1,553 | 2,545 |
| Yogyakarta | 2,567 | 2,496 | 5,063 |
| Lempuyangan | 2,055 | 2,105 | 4,160 |
| Klaten | 778 | 757 | 1,535 |
| Purwosari | 976 | 1,069 | 2,045 |
| Solobalapan | 1,684 | 1,658 | 3,342 |
| Solojebres | 699 | 853 | 1,552 |




Source: CJRR Study Team,. Railway Traffic Survey, 2008

**Figure 1.1.3 Passenger Volume by Station**

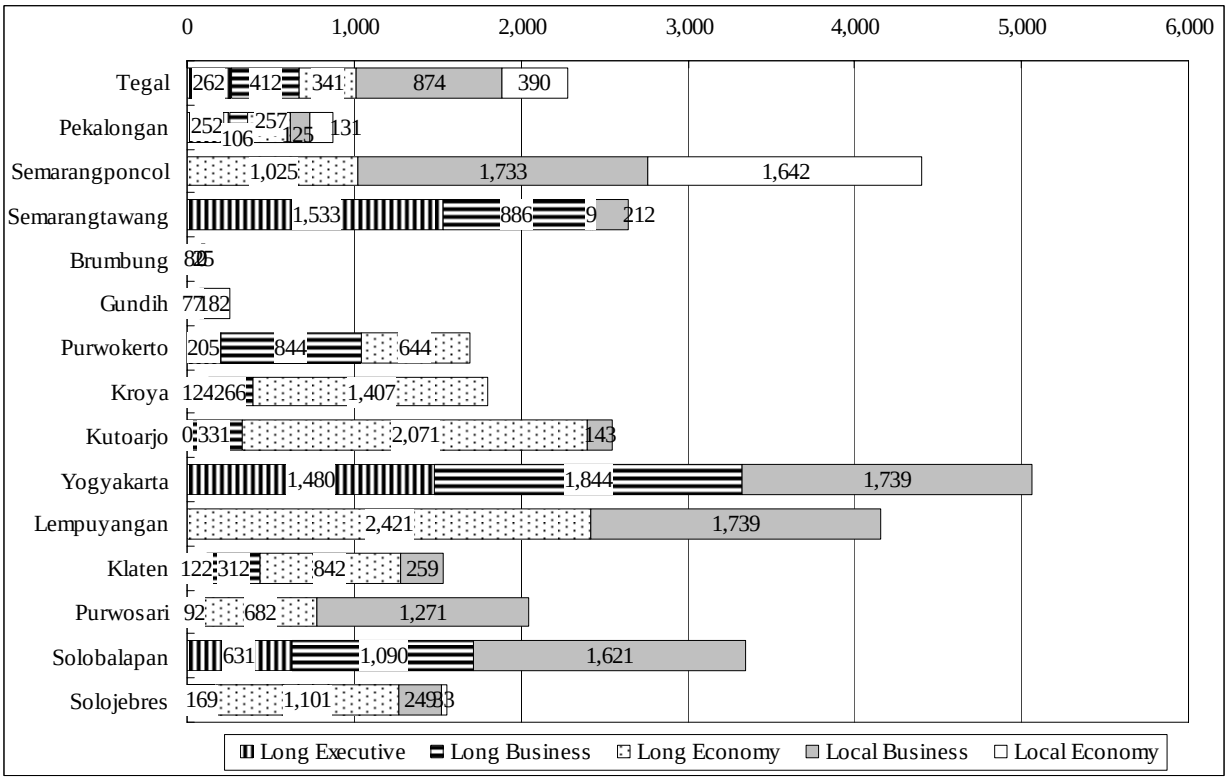
**b. Passenger volume by train type by station**

There are three classes; executive, business and economy, for long distance train and there are two classes; business and economy for short distance train in the Central Java region. Railway passenger by these train types is shown as follows. Total Passenger volume by train types are 4,609 for long distance executive train, 6,435 for long distance business train, 10,877 for long distance economy class train, 9,967 for local business train and 2,403 for local economy train respectively. Approximately 64 percent is long distance train passengers and 39 percent is economy class passengers.

**Table 1.1.3 Boarding and Alighting Passenger Volume by Train Type by Station**

| Station name | Long Dist. Executive (pax/day) | Long Dist. Business (pax/day) | Long Dist. Economy (pax/day) | Local Business (pax/day) | Local Economy (pax/day) |
|---|---|---|---|---|---|
| Tegal | 262 | 412 | 341 | 874 | 390 |
| Pekalongan | 252 | 106 | 257 | 125 | 131 |
| Semarangponcol | 0 | 0 | 1,025 | 1,733 | 1,642 |
| Semarangtawang | 1,533 | 886 | 9 | 212 | 0 |
| Brumbung | 0 | 83 | 0 | 2 | 25 |
| Gundih | 0 | 0 | 77 | 0 | 182 |
| Purwokerto | 205 | 844 | 644 | 0 | 0 |
| Kroya | 124 | 266 | 1,407 | 0 | 0 |
| Kutoarjo | 0 | 331 | 2,071 | 143 | 0 |
| Yogyakarta | 1,480 | 1,844 | 0 | 1,739 | 0 |
| Lempuyangan | 0 | 0 | 2,421 | 1,739 | 0 |
| Klaten | 122 | 312 | 842 | 259 | 0 |
| Purwosari | 0 | 92 | 682 | 1,271 | 0 |
| Solobalapan | 631 | 1,090 | 0 | 1,621 | 0 |
| Solojebres | 0 | 169 | 1,101 | 249 | 33 |
| Total | 4,609 | 6,435 | 10,877 | 9,967 | 2,403 |

Source: CJRR Study Team,. Railway Traffic Survey, 2008

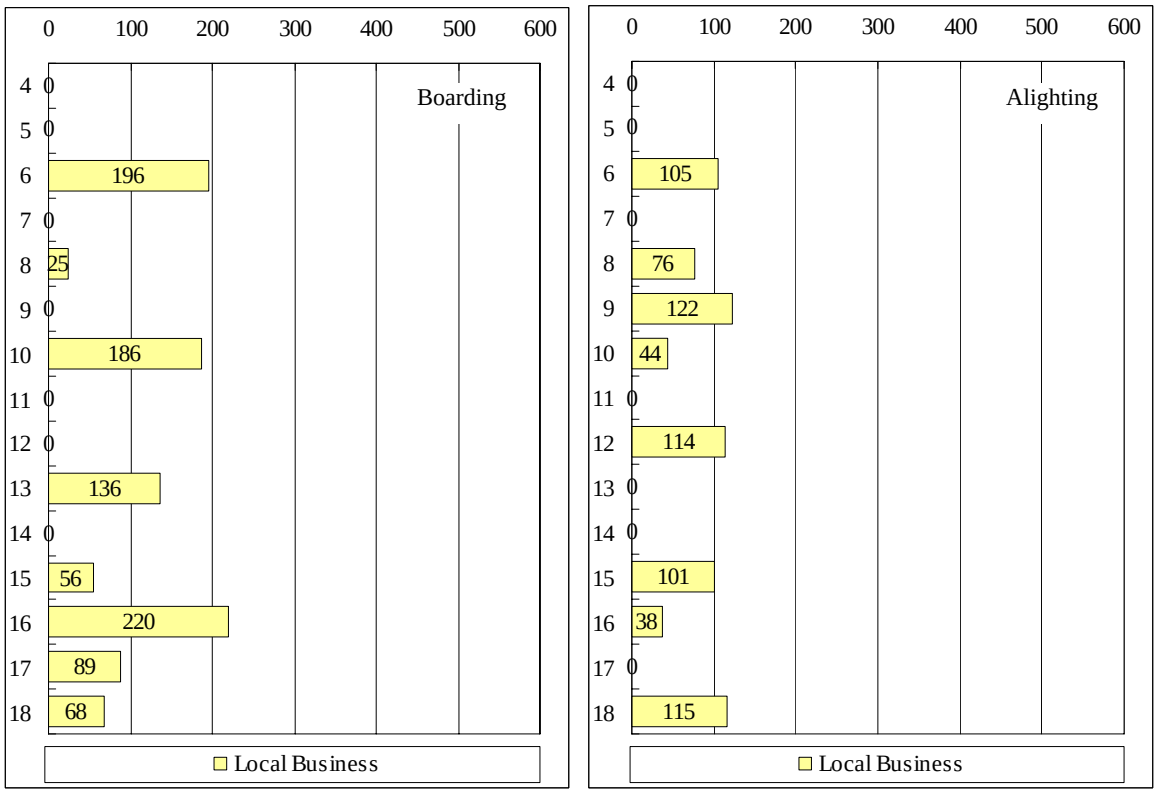



Source: CJRR Study Team,. Railway Traffic Survey, 2008

**Figure 1.1.4 Passenger Volume by Train Type by Station**

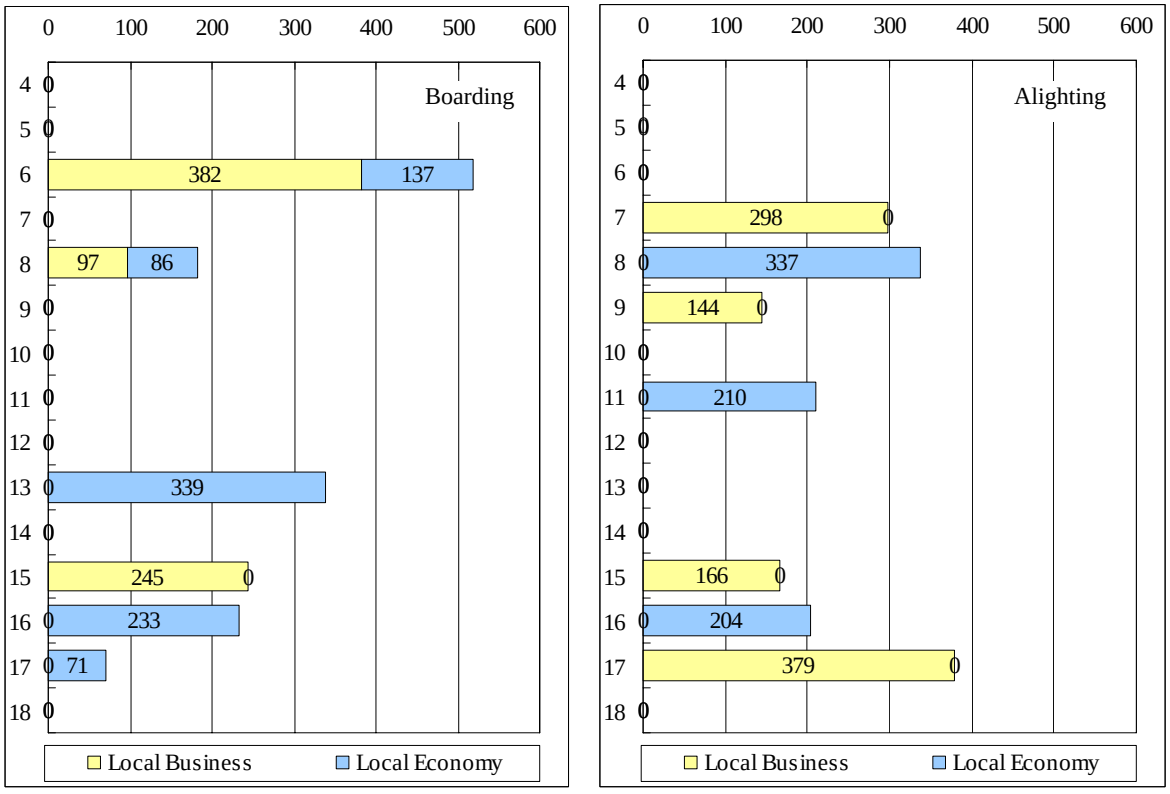
### c. Hourly Boarding Passenger volume of local train by station

Hourly passenger volumes of Yogyakarta and Solo Balapan station are shown as follows. Although hourly passenger volumes are generally shows its peak in the morning and evening in case of local commuter train, hourly volumes in the Central Java region do not shows clear peak.




Source: CJRR Study Team,. Railway Traffic Survey, 2008

**Figure 1.1.5 Hourly Passenger Volume of Local Train at Yogyakarta Station**



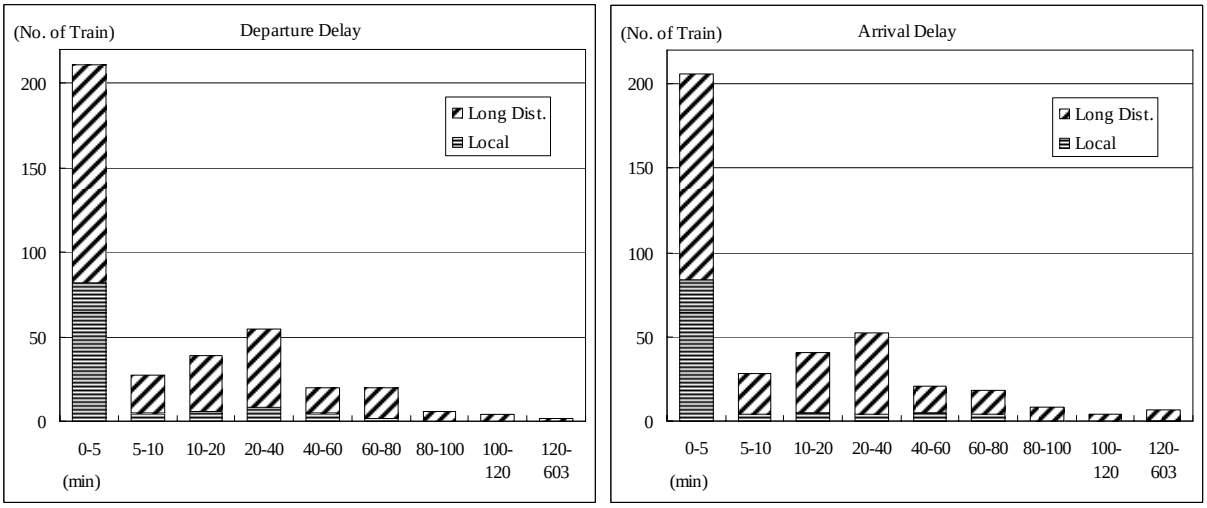

Source: CJRR Study Team,. Railway Traffic Survey, 2008

**Figure 1.1.6 Hourly Passenger Volume of Local Train at Semarangponcol Station**

### d. Delay of Trains

The delay of train is also recorded during the passenger count survey (Source: CJRR Study Team,. Railway Traffic Survey, 2008

Figure 1.1.7). The results are shown as follows. Almost 45 percent of the train delays. The average delay is approximately 20 minutes for arrival and 18 minutes for departure and maximum delay was 10 hours.




Source: CJRR Study Team,. Railway Traffic Survey, 2008

**Figure 1.1.7 Train Delay during Railway Passenger Count Survey**

## (2) Railway OD Survey

### 1) Survey Objective

A Railway OD Survey is indispensable to this Study for understanding the OD of railway users. A Railway OD Survey was most recently conducted in 2005 but Yogyakarta was not part of the study area. Furthermore, since almost 6 years have passed since the 2001 survey, a Railway OD Survey was carried out to find out the changes in usage and to make an appropriate forecast of traffic demand.

### 2) Survey Contents

#### a. Survey Station

The same 15 stations in the Central Java region selected for the Railway Passenger Count Survey (See Figure 1.1.1).

#### b. Survey Subject:

10% of boarding passengers were targeted.

**c. Survey Method**

Obtain OD and OD station data through interviews conducted in waiting rooms and concourse area of the selected stations. The following figure shows an example of passenger count at Solo Balapan station on March 4, 2008.

Source: CJRR Study Team,. Railway Traffic Survey, 2008

**Figure 1.1.8 Railway OD Survey Situation at Solo Balapan Station**

**d. Survey Schedule**

The survey was conducted from 3rd to 18th March, 2008.

**e. Survey Questions**

Train name, class, origin location, origin station, destination location, destination station, transfer station, access transportation mode, egress transportation mode, trip purpose, alternative transportation mode, the reasons why they use railway.

**3) Origin and Destination Table Calibration**

**a. Sampling Ratios**

Sampling Ratios of Railway OD Survey is shown in Table 1.1.4. Average sampling ratio was 23 %. Even the smallest sampling ratio, 13.3 % at Lempuyangan station, is more than expected sampling ration of 10%. This will increase data reliability of tabulated OD table.

**Table 1.1.4 Sampling Ratios of Railway OD Interview Survey**

| Station Name | Boarding Passengers | No. of Respondents | Sampling Ratios |
|---|---|---|---|
| Tegal | 1,182 | 326 | 27.6% |
| Pekalongan | 504 | 176 | 34.9% |
| Semarangponcol | 1,835 | 252 | 13.7% |
| Semarangtawang | 1,430 | 334 | 23.4% |
| Brumbung | 95 | 20 | 21.1% |
| Gundih | 107 | 22 | 20.6% |
| Purwokerto | 857 | 367 | 42.8% |
| Kroya | 928 | 199 | 21.4% |
| Kutoarjo | 992 | 301 | 30.3% |
| Yogyakarta | 2,567 | 550 | 21.4% |
| Lempuyangan | 2,055 | 273 | 13.3% |
| Klaten | 778 | 225 | 28.9% |
| Purwosari | 976 | 206 | 21.1% |
| Solobalapan | 1,684 | 365 | 21.7% |
| Solojebres | 699 | 224 | 32.0% |
| Total | 16,689 | 3,840 | 23.0% |

Source: CJRR Study Team,. Railway Traffic Survey, 2008

**b. Origin Destination Table Calibration Methodology**

Origin and destination table of railway users in the Central Java region was calibrated by railway passenger count survey and railway OD survey results. Expansion factor by train by survey station were calculated by dividing boarding passengers of the train by the number of OD survey respondents. Since the passengers who will alight at non-surveyed stations can represent boarding passengers at non-surveyed stations, these samples with opposite OD were added for OD table.

**4) Survey Results**

**a. Origin Destination Table by Major Stations**

Daily passenger flow between major stations were surveyed in Railway Traffic Survey (Table 1.1.5). Passenger volumes from / to Jakarta is the largest amongst all stations except Yogyakarta and Solo station. In the Central Java region, Yogyakarta – Solo, Semarang – Tegal, Semarang – Cepu, Kutoarjo – Yogyakarta, Semarang – Pekalongan have larger number of passengers in order.

**Table 1.1.5 Daily Passenger Flow between Major Stations**

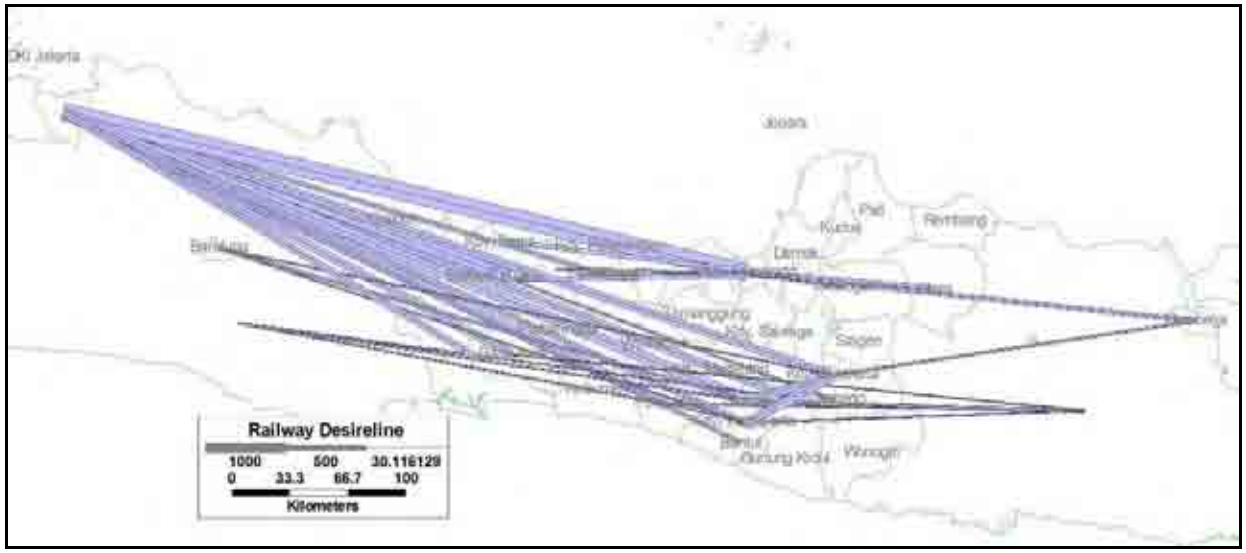
| From/To | The Central Java Region | | | | | | | | | | External Zone | | | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cepu | Klaten | Kroya | Kutoarjo | Pekalonga | Purwokert | Semarang | Solo | Tegal | Yogyakarta | Jakarta | Bandung | Surabaya | |
| Cepu | - | - | - | - | 15 | - | 332 | - | - | - | - | - | - | 346 |
| Klaten | - | - | 5 | 1 | - | 4 | - | 66 | - | 81 | 420 | 39 | 39 | 656 |
| Kroya | - | 5 | - | 12 | - | 15 | 3 | 55 | - | 60 | 313 | 99 | 41 | 604 |
| Kutoarjo | - | 4 | 12 | - | - | 93 | - | 42 | - | 257 | 848 | 186 | 96 | 1,537 |
| Pekalongan | 15 | - | - | - | - | - | 100 | - | 63 | - | 239 | 14 | 52 | 482 |
| Purwokerto | - | - | 15 | 34 | - | - | - | 10 | - | 22 | 455 | - | 50 | 587 |
| Semarang | 332 | - | - | - | 116 | - | - | 92 | 508 | 24 | 1,746 | 39 | 280 | 3,137 |
| Solo | - | 43 | 26 | 11 | 5 | 69 | 39 | - | 9 | 1,514 | 670 | 251 | 215 | 2,852 |
| Tegal | - | - | - | - | - | - | 685 | 6 | - | - | 588 | 7 | 37 | 1,323 |
| Yogyakarta | - | 22 | 19 | 184 | - | 97 | - | 1,307 | - | - | 1,251 | 390 | 281 | 3,551 |
| Jakarta | - | 424 | 313 | 848 | 239 | 455 | 1,747 | 711 | 588 | 1,251 | - | - | - | 6,576 |
| Bandung | - | 39 | 99 | 186 | 14 | - | 39 | 251 | 7 | 390 | - | - | - | 1,024 |
| Surabaya | - | 39 | 41 | 96 | 52 | 50 | 283 | 215 | 37 | 281 | - | - | - | 1,093 |
| Total | 346 | 575 | 531 | 1,372 | 440 | 784 | 3,228 | 2,753 | 1,211 | 3,881 | 6,531 | 1,024 | 1,090 | 23,766 |

Note: Semarang, Solo, Yogyakarta, Jakarta, Bandung, Surabaya include all the stations in each city.
Source: CJRR Study Team,. Railway Traffic Survey, 2008

### b. Desire Line of the Central Java Region

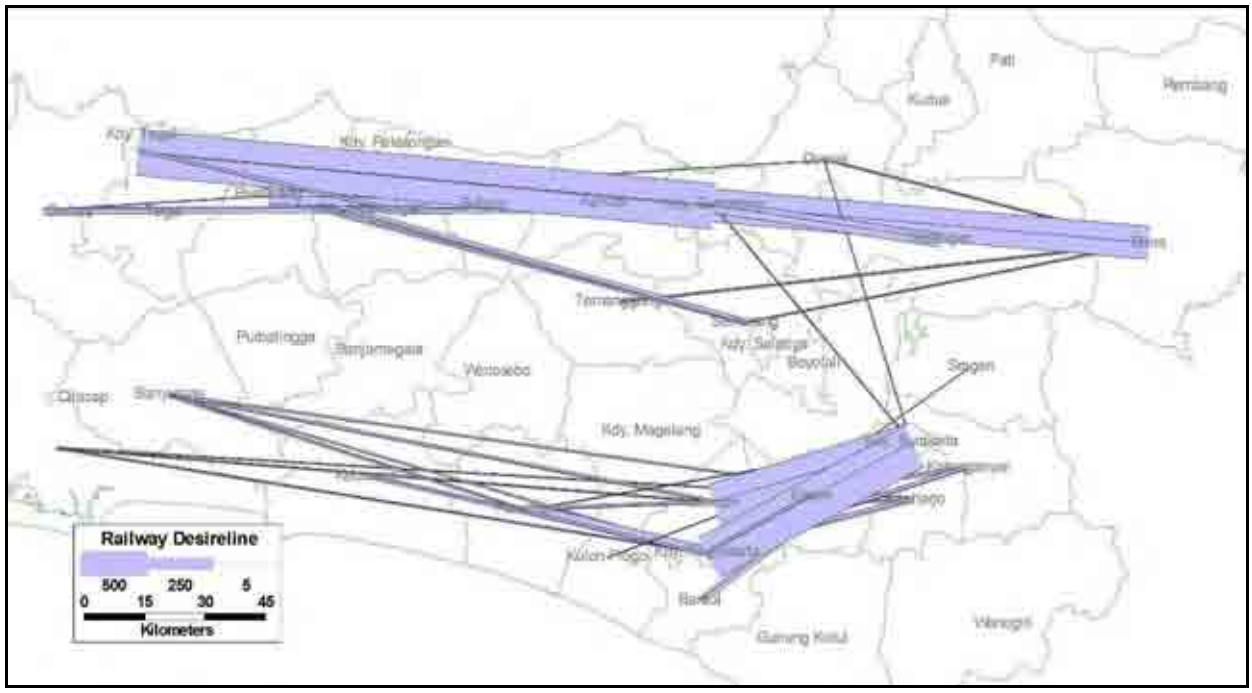
Railway passenger boarding and alighting in the Central Java region is shown in Source: CJRR Study Team,. Railway Traffic Survey, 2008
Figure 1.1.9. Passenger volume from / to Jakarta is larger than other OD pairs such as intra the Central Java region and passenger from / Surabaya, Bandung. Passenger volume of intra the Central Java region is also shown in Source: CJRR Study Team,. Railway Traffic Survey, 2008

Figure 1.1.10. Although railway passenger volume of OD pairs connecting large cities in the Central Java region such as Semarang – Tegal, Semarang – Blora, Surakarta – Yogyakarta, Surakarta – Sleman exceeds 600 passengers per day (both directions), Semarang – Surakarta pair is only about 40 passengers per day for both directions.




Source: CJRR Study Team,. Railway Traffic Survey, 2008

**Figure 1.1.9 Desire Line of Railway Passengers Boarding and Alighting in the Central Java Region**



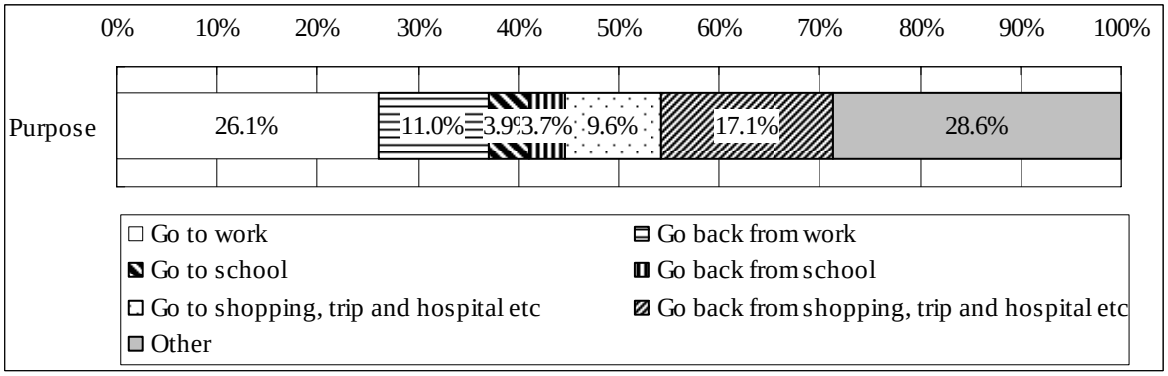

Source: CJRR Study Team,. Railway Traffic Survey, 2008

**Figure 1.1.10 Desire Line of Railway Passengers intra Central Java Region**

**c. Trip Purpose**

Trip purpose of railway passenger is show in Source: CJRR Study Team,. Railway Traffic Survey, 2008

Figure 1.1.10. Commuters (trip from / to work and school) shares approximately 45 % of total trips. Private purposes including shopping, trip and hospital has share of 26.1 %.



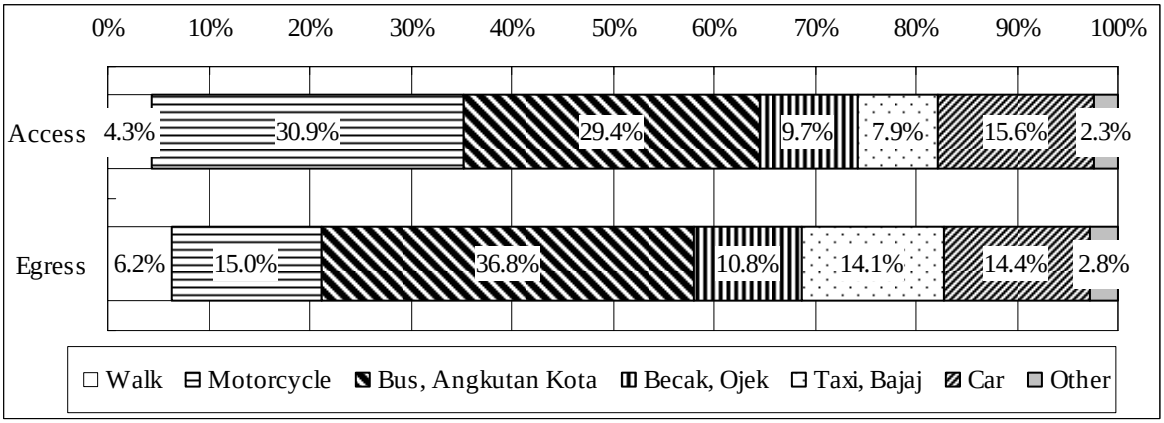

Source: CJRR Study Team,. Railway Traffic Survey, 2008

**Figure 1.1.11 Trip Purpose of Railway Passengers**

### d. Access and Egress Transportation Mode

Access and egress transportation mode to a railway station was surveyed in Railway Traffic Survey (Source: CJRR Study Team,. Railway Traffic Survey, 2008

Figure 1.1.12). Since the survey was conducted for boarding passengers, the shares for access transportation mode of motorcycle and bus including Angkutan Kota (small intra-city bus) are the largest, approximately 30% each. The share for egress transportation of bus and Angkutan Kota is approximately 37%. The share for egress transportation of taxi and bajaj (small taxi), walking, bus, becak (cycle rickshaw) and ojek (motorcycle taxi) is larger than their shares of access transportation mode.




Source: CJRR Study Team,. Railway Traffic Survey, 2008

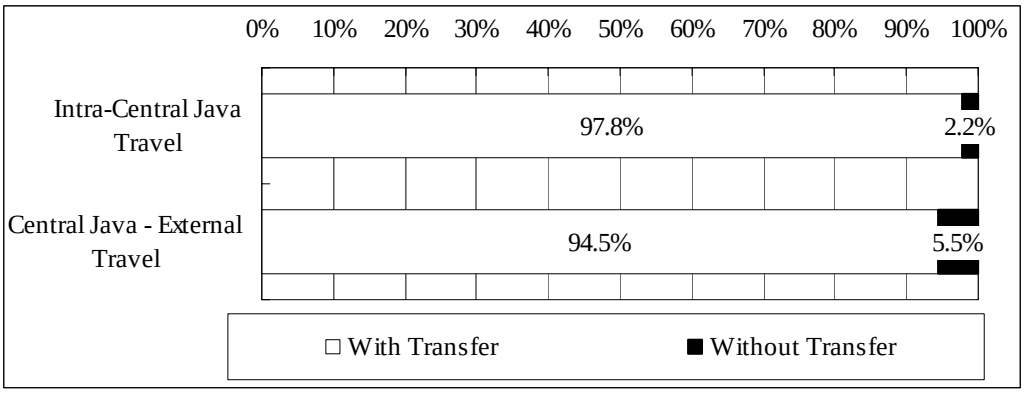
**Figure 1.1.12 Access and Egress Transportation Mode to a Railway Station**

### e. Transfer Behavior of Railway Passengers

Train transfer behaviors were surveyed in Railway Traffic Survey (Source: CJRR Study Team,. Railway Traffic Survey, 2008

Figure 1.1.13). More than 90% of passengers do not transfer when they use railway in the Central Java region. In fact, approximately 98% of passengers do not transfer when they

travel within the Central Java region.



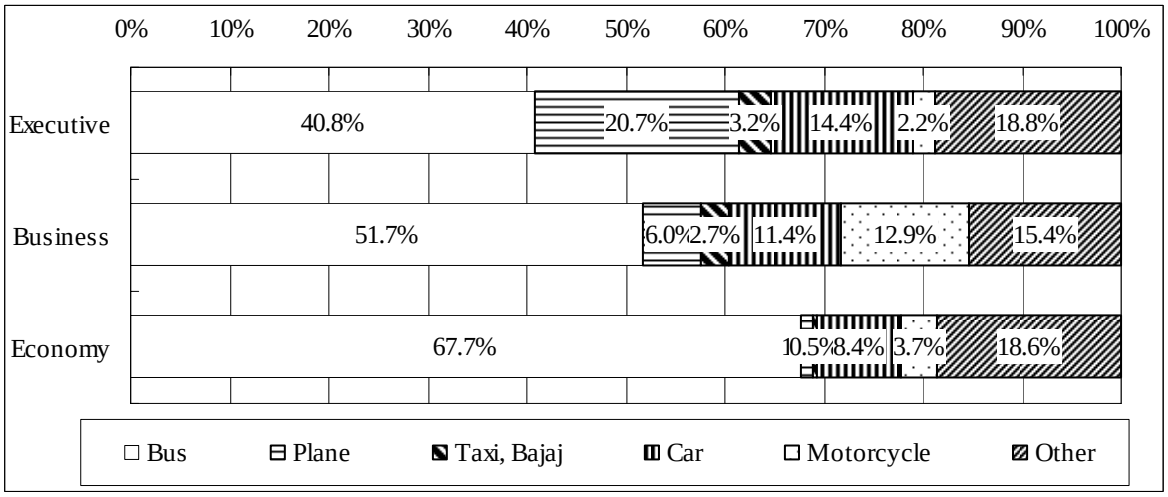

Source: CJRR Study Team,. Railway Traffic Survey, 2008

**Figure 1.1.13 Transfer Behavior of Railway Passengers**

### f. Alternative Transport Mode

Alternative transportation mode for railway user was also surveyed in Railway Traffic Survey (Source: CJRR Study Team,. Railway Traffic Survey, 2008

Figure 1.1.14). Although share of bus is the largest for all classes, shares of car, railway and plane are relatively higher for executive and business class. More than 65% of economy class passenger answered they would use bus if railway is not available.




Source: CJRR Study Team,. Railway Traffic Survey, 2008

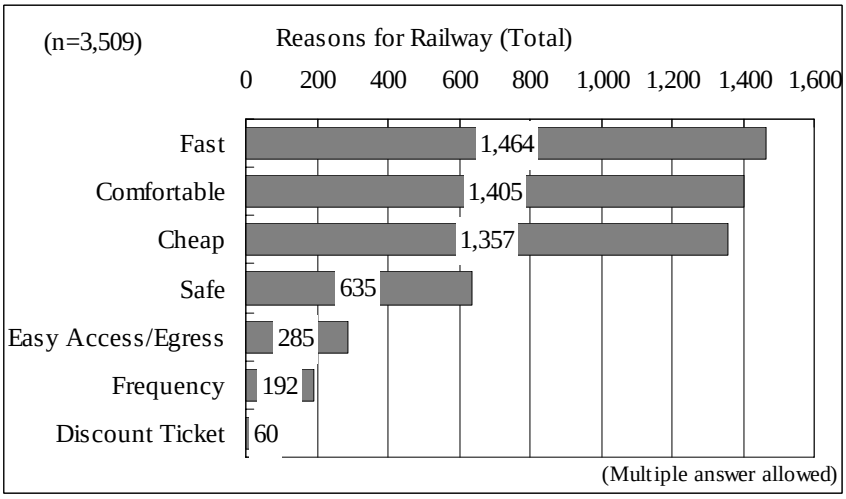
**Figure 1.1.14 Alternative Transportation Mode for Railway**

### g. Reasons for Railway Use

Reasons for railway use were asked to railway users (Source: CJRR Study Team,. Railway Traffic Survey, 2008

Figure 1.1.15). Speed, comfort and price are the three major reasons why they choose railway for more than 1,350 respondents. Another major reason is safety with about 600 respondents.

These factors are considered as showing the strength of railway transport for existing customers. On the other hand, ease of access / egress, frequency of train and discount ticket counted for less than 300 respondents.




Source: CJRR Study Team,. Railway Traffic Survey, 2008

**Figure 1.1.15 Reasons for Railway Use**

## (3) Free Ridership Survey

### 1) Survey Objective

The impact that free ridership has on Indonesian railway management has been highlighted. The aim is to quantify and analyze its impact on railway management, and to also investigate the situation in order to come up with countermeasures. The approximate free ridership number can be obtained by calculating the difference between the number of passengers and number of tickets sold at a particular station. However, since one cannot know of the number of commuter pass users or of tickets issued by places other than that station, a sample survey was carried out on one section of the train to calculate the ratio of Free Ridership.

### 2) Survey Contents

#### a. Survey Target

Sample survey is targeting 9 trains. Trains were selected considering line, operation time, operation distance and class.

#### b. Survey Method

The surveyors go on onboard and count the number of the passengers and the free riders following the train conductor.

**c. Survey Schedule**

Survey schedule of free ridership survey is abovementioned in. The survey was conducted from 10th to 15th March, 2008.

**3) Survey Results**

**a. Free Riders by Train Type**

The impact that free ridership has on Indonesian railway management has been highlighted. For the purpose of understanding impact of free riders on railway management, free ridership survey was conducted at 9 major trains in the Central Java region. The number of Free Riders by train type is shown in Table 1.1.6. The average ratio of train free rider in the Central Java region is 5.2%. Free rider ratio is comparatively high for local train, longitudinal line, day train and business and economy class train. Pandanwangi, a local train connecting Surakarta and Semarang, had the highest ratio of 23.6%.

**Table 1.1.6 Free Riders by Train Type**

| Train Type | # of Survey Trains | # of Pax | # of Free Rider | Free Rider Ratio |
|---|---|---|---|---|
| Long Distance | 5 | 1,392 | 49 | 3.5% |
| Local Train | 4 | 996 | 75 | 7.5% |
| North Corridor | 6 | 1,737 | 51 | 2.9% |
| South Corridor | 2 | 469 | 30 | 6.4% |
| Longitudinal | 1 | 182 | 43 | 23.6% |
| Day Train | 8 | 2,157 | 124 | 5.7% |
| Night Traing | 1 | 231 | 0 | 0.0% |
| Executive Class | 3 | 520 | 13 | 2.5% |
| Business Class | 4 | 1,205 | 90 | 7.5% |
| Economy Class | 2 | 663 | 21 | 3.2% |
| Total | 9 | 2,388 | 124 | 5.2% |

Source: CJRR Study Team,. Railway Traffic Survey, 2008
Note: Free Rider Survey Data of DAOP IV and V

## 1.2 Road Traffic Survey

Road Traffic Survey was conducted for the purpose of acquiring information on the characteristics of road users in the Central Java region. The data is used to develop and examine the current OD matrices especially in this area.

## (1) Classified Hourly Traffic Count Survey

### 1) Survey Objective

For the purpose of obtaining the classified traffic count and road usage status of roads the classified traffic count survey was conducted. The results are compared with previously implemented surveys to understand the change in usage over the years.

### 2) Survey Contents

#### a. Survey Location

Since the Yogyakarta – Surakarta – Semarang corridor is considered as Case Study area at the survey commencement point in time, the survey was conducted at 18 locations along the corridor. (See Figure 1.2.5)

#### b. Survey Method

Conduct a manual count at each survey location.

#### c. Vehicle Classification

In keeping with the standard used in Indonesia, the vehicle categories to be used are 10 classifications; motorbikes, passenger cars, small buses, middle buses, large buses, pickup and small 2 axles truck, large 2 axles truck, 3 axles truck, 4 axles truck and more than 5 axles truck.

#### d. Survey Period

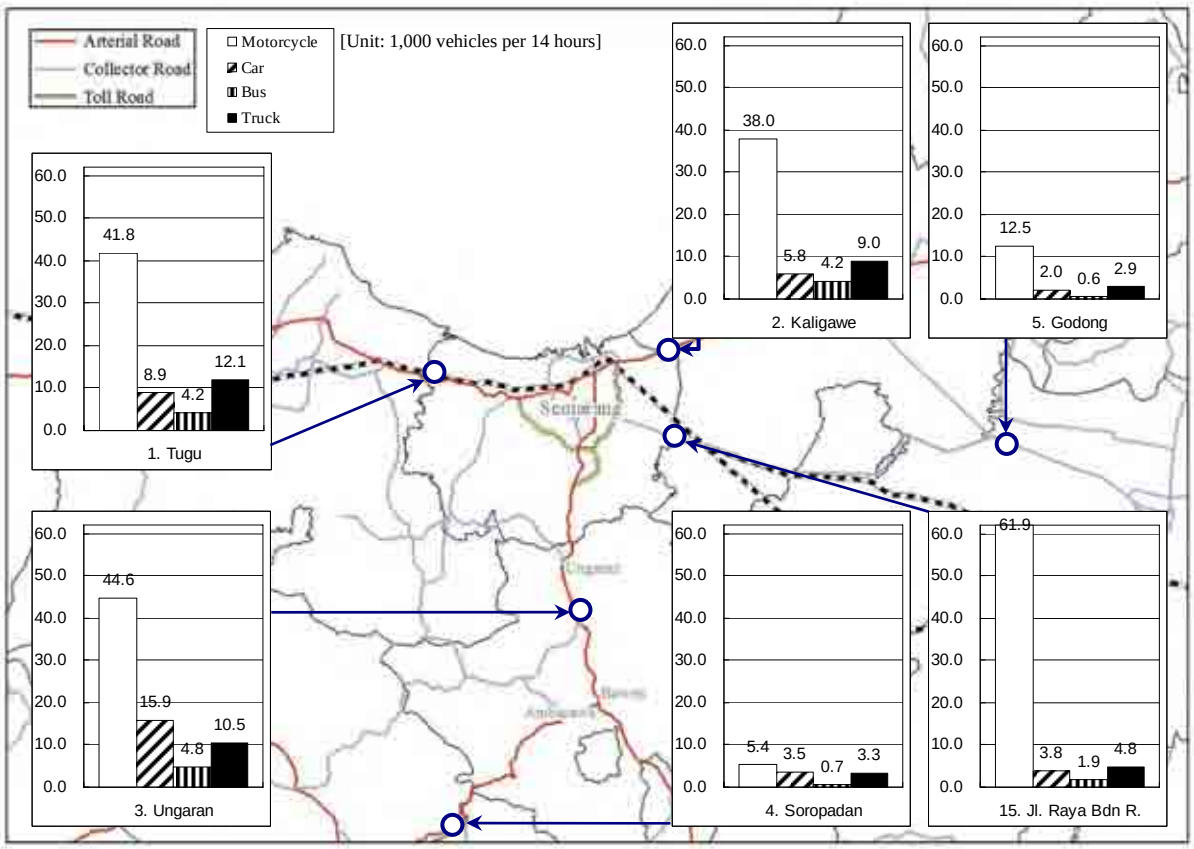
In keeping with the working hours in regional cities, it was from 6:00 to 20:00, a total of 14 hours on Tuesday, Wednesday or Thursday. The survey was conducted from June to July, 2008.

### 3) Survey Results

Traffic volumes of major road around Semarang, Surakarta and Yogyakarta city are shown in Source: CJRR Study Team,. Road Traffic Survey, 2008
Figure 1.2.1, Source: CJRR Study Team,. Road Traffic Survey, 2008
Figure 1.2.2 and Source: CJRR Study Team,. Road Traffic Survey, 2008

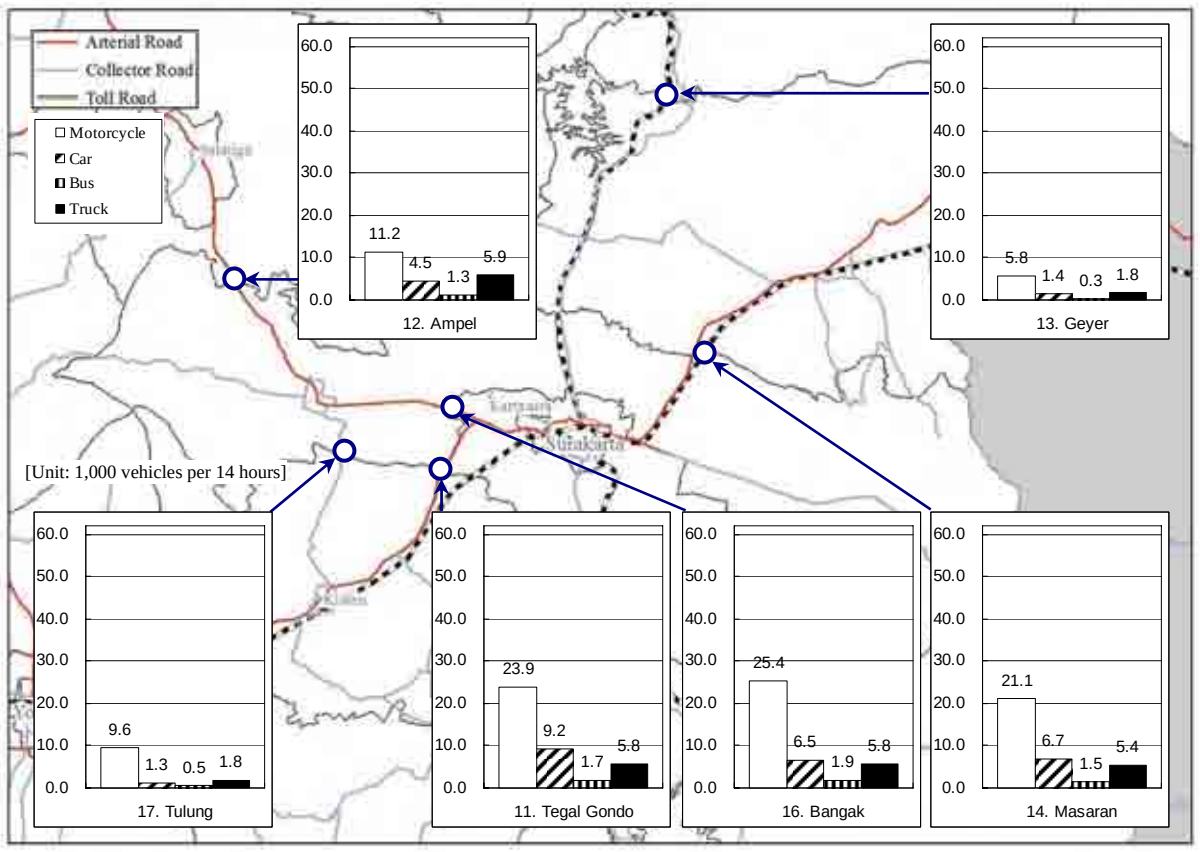
Figure 1.2.3 respectively. Traffic volumes of motorcycle exceed more than 35,000 in 14 hours at locations close to Semarang. Traffic volumes of truck are relatively higher, approximately 10,000 vehicles in 14 hours, at national road survey locations surrounding Semarang city. Although traffic volume around Surakarta city is relatively lower than that of Semarang, more than 10,000 vehicles (excluding motorcycle) pass national roads toward Semarang, East Java and Yogyakarta. Focusing on Yogyakarta city, traffic volumes of national roads toward northern, eastern and western direction from Yogyakarta city are

relatively higher compared with other provincial roads.



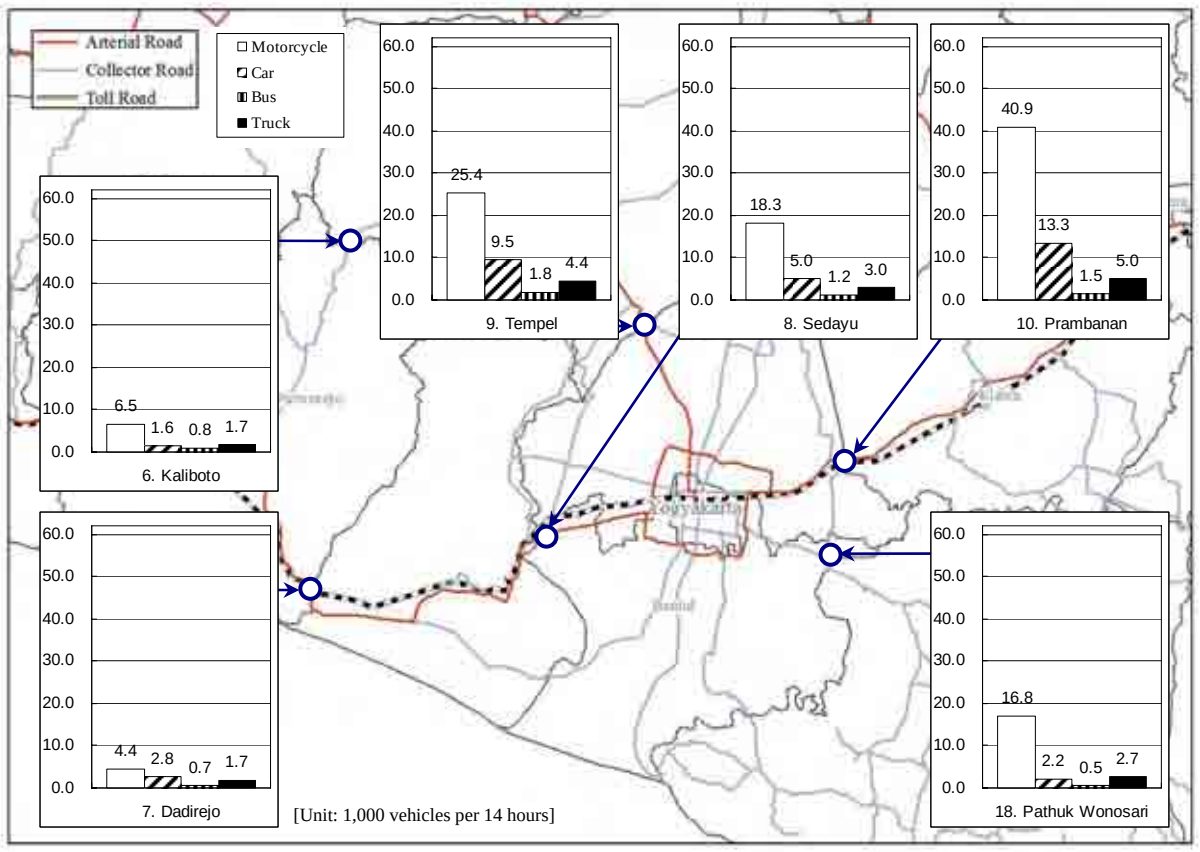

Source: CJRR Study Team,. Road Traffic Survey, 2008

**Figure 1.2.1 Traffic Volume of Major Roads around Semarang City**




Source: CJRR Study Team,. Road Traffic Survey, 2008

**Figure 1.2.2 Traffic Volume of Major Roads around Surakarta City**




Source: CJRR Study Team,. Road Traffic Survey, 2008

**Figure 1.2.3 Traffic Volume of Major Roads around Yogyakarta City**

## Table 1.2.1 Classified Hourly Traffic Count Survey Results (1/2)

| Code | Location | Date | Survey Period | Direction | | | Private Car | | Public Transport | | | Cargo Vehicle | | | | | Total | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 1-2 | 3-5 | 6-10 | 2-10 | 1-10 |
| | | | | | From | To | Motor Cycle | Sedan, Jeep, Kijang, Taksi | Small Bus | Medium Bus | Large Bus | Pick-up, Truck 2 Axle | Truck 2 Axles | Truck 3 Axles | Truck 4 Axles | Truck 5 Axles and More | Private Car | Public Transport | Cargo Vehicle | Fourwheel Vehicle | Total Vehicle |
| R-1 | Tugu | June 17th, 2008 | 14 Hours | A | Semarang | Kendal | 21,900 | 4,277 | 880 | 835 | 547 | 3,297 | 820 | 949 | 354 | 183 | 26,177 | 2,262 | 5,603 | 12,142 | 34,042 |
| | | | | B | Kendal | Semarang | 19,897 | 4,670 | 695 | 864 | 363 | 3,960 | 818 | 982 | 497 | 198 | 24,567 | 1,922 | 6,455 | 13,047 | 32,944 |
| | | | | | | | **41,797** | **8,947** | **1,575** | **1,699** | **910** | **7,257** | **1,638** | **1,931** | **851** | **381** | **50,744** | **4,184** | **12,058** | **25,189** | **66,986** |
| | | | | | | | *62.40%* | *13.36%* | *2.35%* | *2.54%* | *1.36%* | *10.83%* | *2.45%* | *2.88%* | *1.27%* | *0.57%* | *75.75%* | *6.25%* | *18.00%* | *37.60%* | *100.00%* |
| R-2 | Kaligawe | June 19th, 2008 | 14 Hours | A | Semarang | Demak | 18,508 | 2,978 | 1,440 | 236 | 274 | 2,477 | 553 | 791 | 491 | 168 | 21,486 | 1,950 | 4,480 | 9,408 | 27,916 |
| | | | | B | Demak | Semarang | 19,491 | 2,864 | 1,355 | 366 | 524 | 2,278 | 768 | 792 | 451 | 225 | 22,355 | 2,245 | 4,514 | 9,623 | 29,114 |
| | | | | | | | **37,999** | **5,842** | **2,795** | **602** | **798** | **4,755** | **1,321** | **1,583** | **942** | **393** | **43,841** | **4,195** | **8,994** | **19,031** | **57,030** |
| | | | | | | | *66.63%* | *10.24%* | *4.90%* | *1.06%* | *1.40%* | *8.34%* | *2.32%* | *2.78%* | *1.65%* | *0.69%* | *76.87%* | *7.36%* | *15.77%* | *33.37%* | *100.00%* |
| R-3 | Ungaran | June 24th, 2008 | 14 Hours | A | Semarang | Bawen | 17,585 | 9,011 | 1,162 | 317 | 596 | 3,371 | 406 | 488 | 181 | 51 | 26,596 | 2,075 | 4,497 | 15,583 | 33,168 |
| | | | | B | Bawen | Semarang | 27,028 | 6,853 | 1,670 | 257 | 816 | 4,843 | 491 | 418 | 215 | 60 | 33,881 | 2,743 | 6,027 | 15,623 | 42,651 |
| | | | | | | | **44,613** | **15,864** | **2,832** | **574** | **1,412** | **8,214** | **897** | **906** | **396** | **111** | **60,477** | **4,818** | **10,524** | **31,206** | **75,819** |
| | | | | | | | *58.84%* | *20.92%* | *3.74%* | *0.76%* | *1.86%* | *10.83%* | *1.18%* | *1.19%* | *0.52%* | *0.15%* | *79.76%* | *6.35%* | *13.88%* | *41.16%* | *100.00%* |
| R-4 | Soropadan | June 24th, 2008 | 14 Hours | A | Semarang | Magelang | 2,541 | 1,819 | 44 | 28 | 299 | 1,314 | 113 | 183 | 35 | 14 | 4,360 | 371 | 1,659 | 3,849 | 6,390 |
| | | | | B | Magelang | Semarang | 2,894 | 1,655 | 40 | 42 | 241 | 1,292 | 132 | 154 | 42 | 9 | 4,549 | 323 | 1,629 | 3,607 | 6,501 |
| | | | | | | | 5,435 | 3,474 | 84 | 70 | 540 | 2,606 | 245 | 337 | 77 | 23 | 8,909 | 694 | 3,288 | 7,456 | 12,891 |
| | | | | | | | 42.16% | 26.95% | 0.65% | 0.54% | 4.19% | 20.22% | 1.90% | 2.61% | 0.60% | 0.18% | 69.11% | 5.38% | 25.51% | 57.84% | 100.00% |
| R-5 | Godong | June 19th, 2008 | 14 Hours | A | Semarang | Purwodadi | 6,220 | 1,025 | 110 | 115 | 104 | 1,325 | 53 | 119 | 2 | 2 | 7,245 | 329 | 1,501 | 2,855 | 9,075 |
| | | | | B | Purwodadi | Semarang | 6,241 | 997 | 72 | 122 | 125 | 1,199 | 68 | 82 | 6 | 5 | 7,238 | 319 | 1,360 | 2,676 | 8,917 |
| | | | | | | | **12,461** | **2,022** | **182** | **237** | **229** | **2,524** | **121** | **201** | **8** | **7** | **14,483** | **648** | **2,861** | **5,531** | **17,992** |
| | | | | | | | *69.26%* | *11.24%* | *1.01%* | *1.32%* | *1.27%* | *14.03%* | *0.67%* | *1.12%* | *0.04%* | *0.04%* | *80.50%* | *3.60%* | *15.90%* | *30.74%* | *100.00%* |
| R-6 | Kaliboto | June 26th, 2008 | 14 Hours | A | Magelang | Purworejo | 3,199 | 808 | 228 | 74 | 106 | 682 | 33 | 100 | 7 | 7 | 4,007 | 408 | 829 | 2,045 | 5,244 |
| | | | | B | Purworejo | Magelang | 3,309 | 803 | 228 | 83 | 69 | 771 | 29 | 44 | 10 | 9 | 4,112 | 380 | 863 | 2,046 | 5,355 |
| | | | | | | | **6,508** | **1,611** | **456** | **157** | **175** | **1,453** | **62** | **144** | **17** | **16** | **8,119** | **788** | **1,692** | **4,091** | **10,599** |
| | | | | | | | *61.40%* | *15.20%* | *4.30%* | *1.48%* | *1.65%* | *13.71%* | *0.58%* | *1.36%* | *0.16%* | *0.15%* | *76.60%* | *7.43%* | *15.96%* | *38.60%* | *100.00%* |
| R-7 | Dadirejo | July 1st, 2008 | 14 Hours | A | Wates | Purworejo | 2,070 | 1,403 | 94 | 25 | 270 | 650 | 72 | 135 | 44 | 8 | 3,473 | 389 | 909 | 2,701 | 4,771 |
| | | | | B | Purworejo | Wates | 2,288 | 1,384 | 95 | 15 | 212 | 594 | 77 | 97 | 52 | 5 | 3,672 | 322 | 825 | 2,531 | 4,819 |
| | | | | | | | **4,358** | **2,787** | **189** | **40** | **482** | **1,244** | **149** | **232** | **96** | **13** | **7,145** | **711** | **1,734** | **5,232** | **9,590** |
| | | | | | | | *45.44%* | *29.06%* | *1.97%* | *0.42%* | *5.03%* | *12.97%* | *1.55%* | *2.42%* | *1.00%* | *0.14%* | *74.50%* | *7.41%* | *18.08%* | *54.56%* | *100.00%* |
| R-8 | Sedayu | July 1st, 2008 | 14 Hours | A | Jogja | Wates | 8,432 | 2,440 | 196 | 190 | 298 | 1,202 | 115 | 160 | 49 | 10 | 10,872 | 684 | 1,536 | 4,660 | 13,092 |
| | | | | B | Wates | Jogja | 9,840 | 2,595 | 201 | 93 | 245 | 1,201 | 89 | 110 | 43 | 9 | 12,435 | 539 | 1,452 | 4,586 | 14,426 |
| | | | | | | | **18,272** | **5,035** | **397** | **283** | **543** | **2,403** | **204** | **270** | **92** | **19** | **23,307** | **1,223** | **2,988** | **9,246** | **27,518** |
| | | | | | | | *66.40%* | *18.30%* | *1.44%* | *1.03%* | *1.97%* | *8.73%* | *0.74%* | *0.98%* | *0.33%* | *0.07%* | *84.70%* | *4.44%* | *10.86%* | *33.60%* | *100.00%* |
| R-9 | Tempel | June 26th, 2008 | 14 Hours | A | Magelang | Sleman | 10,574 | 4,361 | 348 | 188 | 420 | 1,705 | 98 | 92 | 48 | 6 | 14,935 | 956 | 1,949 | 7,266 | 17,840 |
| | | | | B | Sleman | Magelang | 14,866 | 5,125 | 308 | 147 | 431 | 2,243 | 103 | 103 | 38 | 8 | 19,991 | 886 | 2,495 | 8,506 | 23,372 |
| | | | | | | | 25,440 | 9,486 | 656 | 335 | 851 | 3,948 | 201 | 195 | 86 | 14 | 34,926 | 1,842 | 4,444 | 15,772 | 41,212 |
| | | | | | | | 61.73% | 23.02% | 1.59% | 0.81% | 2.06% | 9.58% | 0.49% | 0.47% | 0.21% | 0.03% | 84.75% | 4.47% | 10.78% | 38.27% | 100.00% |
| R-10 | Prambanan | July 3rd, 2008 | 14 Hours | A | Jogja | Klaten | 20,249 | 6,781 | 159 | 48 | 534 | 1,972 | 104 | 160 | 96 | 14 | 27,030 | 741 | 2,346 | 9,868 | 30,117 |
| | | | | B | Klaten | Jogja | 20,694 | 6,516 | 177 | 69 | 486 | 2,161 | 179 | 158 | 79 | 29 | 27,210 | 732 | 2,606 | 9,854 | 30,548 |
| | | | | | | | **40,943** | **13,297** | **336** | **117** | **1,020** | **4,133** | **283** | **318** | **175** | **43** | **54,240** | **1,473** | **4,952** | **19,722** | **60,665** |
| | | | | | | | *67.49%* | *21.92%* | *0.55%* | *0.19%* | *1.68%* | *6.81%* | *0.47%* | *0.52%* | *0.29%* | *0.07%* | *89.41%* | *2.43%* | *8.16%* | *32.51%* | *100.00%* |

Source: CJRR Study Team,. Road Traffic Survey, 2008

## Table 1.2.2 Classified Hourly Traffic Count Survey Results (2/2)

| Code | Location | Date | Survey Period | Direction | | | Private Car | | Public Transport | | | Cargo Vehicle | | | | | Total | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 1-2 | 3-5 | 6-10 | 2-10 | 1-10 |
| | | | | | From | To | Motor Cycle | Sedan, Jeep, Kijang, Taksi | Small Bus | Medium Bus | Large Bus | Pick-up, Truck 2 Axle | Truck 2 Axles | Truck 3 Axles | Truck 4 Axles | Truck 5 Axles and More | Private Car | Public Transport | Cargo Vehicle | Fourwheel Vehicle | Total Vehicle |
| R-11 | Tegal Gondo | July 8th, 2008 | 14 Hours | A | Kartosuro | Klaten | 11,319 | 4,406 | 305 | 77 | 481 | 2,467 | 138 | 248 | 78 | 16 | 15,725 | 863 | 2,947 | 8,216 | 19,535 |
| | | | | B | Klaten | Kartosuro | 12,608 | 4,812 | 311 | 89 | 455 | 2,203 | 287 | 236 | 99 | 9 | 17,420 | 855 | 2,834 | 8,501 | 21,109 |
| | | | | | | | **23,927** | **9,218** | **616** | **166** | **936** | **4,670** | **425** | **484** | **177** | **25** | **33,145** | **1,718** | **5,781** | **16,717** | **40,644** |
| | | | | | | | *58.87%* | *22.68%* | *1.52%* | *0.41%* | *2.30%* | *11.49%* | *1.05%* | *1.19%* | *0.44%* | *0.06%* | *81.55%* | *4.23%* | *14.22%* | *41.13%* | *100.00%* |
| R-12 | Ampel | June 17th, 2008 | 14 Hours | A | Semarang | Solo | 5,775 | 2,326 | 146 | 178 | 307 | 2,527 | 178 | 233 | 126 | 16 | 8,101 | 631 | 3,080 | 6,037 | 11,812 |
| | | | | B | Solo | Semarang | 5,433 | 2,214 | 133 | 126 | 439 | 2,087 | 236 | 309 | 113 | 25 | 7,647 | 698 | 2,770 | 5,682 | 11,115 |
| | | | | | | | **11,208** | **4,540** | **279** | **304** | **746** | **4,614** | **414** | **542** | **239** | **41** | **15,748** | **1,329** | **5,850** | **11,719** | **22,927** |
| | | | | | | | *48.89%* | *19.80%* | *1.22%* | *1.33%* | *3.25%* | *20.12%* | *1.81%* | *2.36%* | *1.04%* | *0.18%* | *68.69%* | *5.80%* | *25.52%* | *51.11%* | *100.00%* |
| R-13 | Geyer | Julye 8th, 2008 | 14 Hours | A | Sragen | Purwodadi | 2,935 | 680 | 43 | 18 | 87 | 784 | 38 | 48 | 0 | 0 | 3,615 | 148 | 870 | 1,698 | 4,633 |
| | | | | B | Purwodadi | Sragen | 2,846 | 674 | 45 | 13 | 106 | 847 | 41 | 47 | 0 | 0 | 3,520 | 164 | 935 | 1,773 | 4,619 |
| | | | | | | | **5,781** | **1,354** | **88** | **31** | **193** | **1,631** | **79** | **95** | **0** | **0** | **7,135** | **312** | **1,805** | **3,471** | **9,252** |
| | | | | | | | *62.48%* | *14.63%* | *0.95%* | *0.34%* | *2.09%* | *17.63%* | *0.85%* | *1.03%* | *0.00%* | *0.00%* | *77.12%* | *3.37%* | *19.51%* | *37.52%* | *100.00%* |
| R-14 | Masaran | July 3rd, 2008 | 14 Hours | A | Sragen | Karanganyar | 11,732 | 4,022 | 236 | 95 | 440 | 2,218 | 192 | 312 | 106 | 17 | 15,754 | 771 | 2,845 | 7,638 | 19,370 |
| | | | | B | Karanganyar | Sragen | 9,400 | 2,720 | 199 | 81 | 410 | 1,893 | 193 | 312 | 133 | 18 | 12,120 | 690 | 2,549 | 5,959 | 15,359 |
| | | | | | | | 21,132 | 6,742 | 435 | 176 | 850 | 4,111 | 385 | 624 | 239 | 35 | 27,874 | 1,461 | 5,394 | 13,597 | 34,729 |
| | | | | | | | 60.85% | 19.41% | 1.25% | 0.51% | 2.45% | 11.84% | 1.11% | 1.80% | 0.69% | 0.10% | 80.26% | 4.21% | 15.53% | 39.15% | 100.00% |
| R-15 | Jl. Raya Bandung Rejo KM.12 | June 10th, 2008 | 14 Hours | A | Purwodadi | Semarang | 33,941 | 1,827 | 821 | 141 | 121 | 2,109 | 81 | 111 | 37 | 10 | 35,768 | 1,083 | 2,348 | 5,258 | 39,199 |
| | | | | B | Semarang | Purwodadi | 27,910 | 2,017 | 594 | 153 | 98 | 1,582 | 649 | 109 | 55 | 37 | 29,927 | 845 | 2,432 | 5,294 | 33,204 |
| | | | | | | | **61,851** | **3,844** | **1,415** | **294** | **219** | **3,691** | **730** | **220** | **92** | **47** | **65,695** | **1,928** | **4,780** | **10,552** | **72,403** |
| | | | | | | | *85.43%* | *5.31%* | *1.95%* | *0.41%* | *0.30%* | *5.10%* | *1.01%* | *0.30%* | *0.13%* | *0.06%* | *90.74%* | *2.66%* | *6.60%* | *14.57%* | *100.00%* |
| R-16 | Bangak | June 12th, 2008 | 14 Hours | A | Kartosuro | Boyolali | 12,440 | 3,367 | 347 | 270 | 499 | 2,137 | 222 | 371 | 145 | 36 | 15,807 | 1,116 | 2,911 | 7,394 | 19,834 |
| | | | | B | Boyolali | Kartosuro | 12,932 | 3,096 | 260 | 228 | 298 | 2,152 | 260 | 279 | 148 | 21 | 16,028 | 786 | 2,860 | 6,742 | 19,674 |
| | | | | | | | **25,372** | **6,463** | **607** | **498** | **797** | **4,289** | **482** | **650** | **293** | **57** | **31,835** | **1,902** | **5,771** | **14,136** | **39,508** |
| | | | | | | | *64.22%* | *16.36%* | *1.54%* | *1.26%* | *2.02%* | *10.86%* | *1.22%* | *1.65%* | *0.74%* | *0.14%* | *80.58%* | *4.81%* | *14.61%* | *35.78%* | *100.00%* |
| R-17 | Tulung | June 11th, 2008 | 14 Hours | A | Boyolali | Klaten | 4,745 | 629 | 148 | 48 | 8 | 839 | 45 | 27 | 0 | 1 | 5,374 | 204 | 912 | 1,745 | 6,490 |
| | | | | B | Klaten | Boyolali | 4,816 | 625 | 185 | 61 | 4 | 799 | 35 | 17 | 6 | 3 | 5,441 | 250 | 860 | 1,735 | 6,551 |
| | | | | | | | **9,561** | **1,254** | **333** | **109** | **12** | **1,638** | **80** | **44** | **6** | **4** | **10,815** | **454** | **1,772** | **3,480** | **13,041** |
| | | | | | | | *73.31%* | *9.62%* | *2.55%* | *0.84%* | *0.09%* | *12.56%* | *0.61%* | *0.34%* | *0.05%* | *0.03%* | *82.93%* | *3.48%* | *13.59%* | *26.69%* | *100.00%* |
| R-18 | Pathuk Wonosari | June 10th, 2008 | 14 Hours | A | Bantul | Kidul | 8,211 | 1,070 | 117 | 36 | 78 | 1,450 | 23 | 25 | 1 | 0 | 9,281 | 231 | 1,499 | 2,800 | 11,011 |
| | | | | B | Kidul | Bantul | 8,638 | 1,120 | 132 | 42 | 99 | 1,159 | 25 | 28 | 1 | 0 | 9,758 | 273 | 1,213 | 2,606 | 11,244 |
| | | | | | | | **16,849** | **2,190** | **249** | **78** | **177** | **2,609** | **48** | **53** | **2** | **0** | **19,039** | **504** | **2,712** | **5,406** | **22,255** |
| | | | | | | | *75.71%* | *9.84%* | *1.12%* | *0.35%* | *0.80%* | *11.72%* | *0.22%* | *0.24%* | *0.01%* | *0.00%* | *85.55%* | *2.26%* | *12.19%* | *24.29%* | *100.00%* |
| R-7-JT | Timbang Kulwaru | July 1st, 2008 | 14 Hours | A | Wates | Purworejo | 0 | 0 | 0 | 0 | 0 | 273 | 40 | 67 | 25 | 0 | 0 | 0 | 405 | 405 | 405 |
| | | | | B | Purworejo | Wates | 0 | 0 | 0 | 0 | 0 | 178 | 41 | 53 | 35 | 0 | 0 | 0 | 307 | 307 | 307 |
| | | | | | | | **0** | **0** | **0** | **0** | **0** | **451** | **81** | **120** | **60** | **0** | **0** | **0** | **712** | **712** | **712** |
| | | | | | | | *0.00%* | *0.00%* | *0.00%* | *0.00%* | *0.00%* | *63.34%* | *11.38%* | *16.85%* | *8.43%* | *0.00%* | *0.00%* | *0.00%* | *100.00%* | *100.00%* | *100.00%* |
| R-10-JT | Jembatan Timbang | July 3rd, 2008 | 14 Hours | A | Jogja | Klaten | 0 | 0 | 0 | 0 | 0 | 349 | 35 | 52 | 30 | 0 | 0 | 0 | 466 | 466 | 466 |
| | | | | B | Klaten | Jogja | 0 | 0 | 0 | 0 | 0 | 713 | 64 | 114 | 37 | 5 | 0 | 0 | 933 | 933 | 933 |
| | | | | | | | **0** | **0** | **0** | **0** | **0** | **1,062** | **99** | **166** | **67** | **5** | **0** | **0** | **1,399** | **1,399** | **1,399** |
| | | | | | | | *0.00%* | *0.00%* | *0.00%* | *0.00%* | *0.00%* | *75.91%* | *7.08%* | *11.87%* | *4.79%* | *0.36%* | *0.00%* | *0.00%* | *100.00%* | *100.00%* | *100.00%* |

Source: CJRR Study Team,. Road Traffic Survey, 2008

## (2) Roadside OD Interview Survey

### 1) Survey Objective

To understand the traffic flow between cities and create an OD table of automobile users for use as basic data for forecasting traffic demand.

### 2) Survey Contents

#### a. Survey Location

This Survey is carried out at 14 locations along Yogyakarta – Surakarta – Semarang corridor at trunk road locations at kabupaten/kota boundaries. The Traffic Count Survey was also be conducted at the same locations as the Roadside OD Interview Survey to obtain total volume data as well. (See Figure 1.2.5) Cargo traffic was surveyed at Weight Bridge Station (or *Jembatan timbang*) in case of Location No. 7 and No. 10.

#### b. Survey Method

Interviewer made vehicles traveling along the Survey points stop by the road side with the cooperation of a police officer to ask the drivers about trip purpose, OD, etc. The approximate number of bus passenger by bus sizes were also counted for the purpose of grasping the number of passengers who pass through kabupaten/kota boundaries.


Source: CJRR Study Team,. Road Traffic Survey, 2008

**Figure 1.2.4 Roadside OD Interview Survey Situation**

**c. Vehicle Classification**

In keeping with the standard used in Indonesia, the vehicle categories to be used are 7 classifications; motorbikes, passenger cars, pickup and small 2 axles truck, large 2 axles truck, 3 axles truck, 4 axles truck and more than 5 axles truck. Since bus passenger OD data can be obtained from Bus Passenger OD Interview Survey, bus was not a target of this survey

**d. Survey Period**

Survey period was the same as the Traffic Count Survey; 6:00 to 20:00, a total of 14 hours on Tuesday, Wednesday or Thursday. The survey was conducted from June to July, 2008.

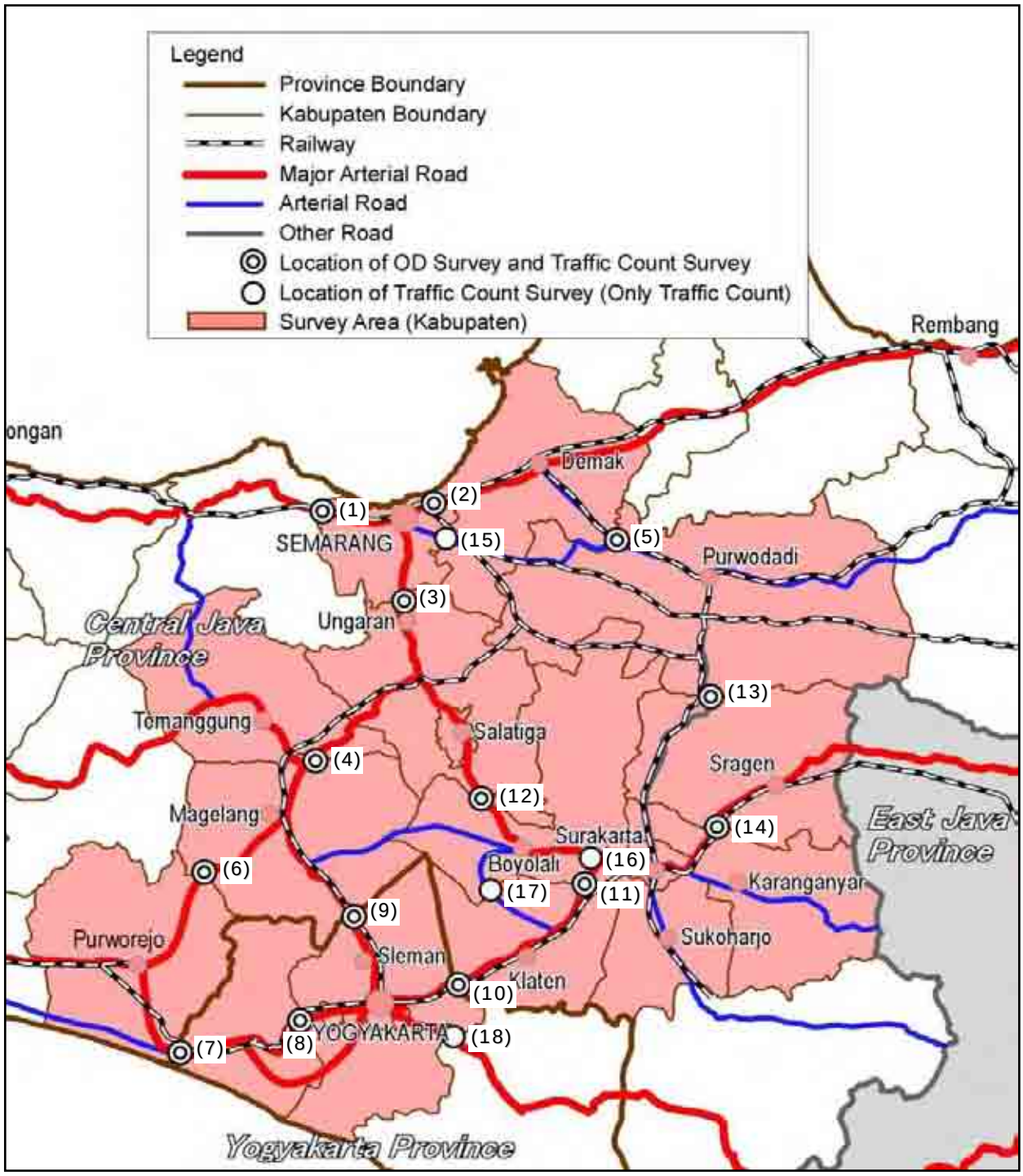



**Figure 1.2.5 Map of Road Traffic Survey Locations**

### 3) Origin Destination Table Calibration and Analyses for Passenger Transport

#### a. Sampling Ratios

Since traveling vehicles are forced to pull over and stop for the Roadside OD Interview Survey, it is necessary to minimize the impact on traffic flow. The hourly sampling is shown as follows.

**Table 1.2.3 Sampling Ratios of Road Side Interview Survey (Pax. Car and Motorcycle)**

[Unit: Number of vehicles / 14h]

| Code | Location | Direction | | Passenger Car | | | Motorcycle | | |
|---|---|---|---|---|---|---|---|---|---|
| | | From | To | RSI | TC | Sample R. | RSI | TC | Sample R. |
| R-1a | Tugu | Semarang | Kendal | 380 | 4,277 | 9% | 537 | 21,900 | 2% |
| R-1b | Tugu | Kendal | Semarang | 341 | 4,670 | 7% | 396 | 19,897 | 2% |
| R-2a | Kaligawe | Semarang | Demak | 594 | 2,978 | 20% | 707 | 18,508 | 4% |
| R-2b | Kaligawe | Demak | Semarang | 525 | 2,864 | 18% | 1,020 | 19,491 | 5% |
| R-3a | Ungaran | Semarang | Bawen | 480 | 9,011 | 5% | 788 | 17,585 | 4% |
| R-3b | Ungaran | Bawen | Semarang | 488 | 6,853 | 7% | 1,533 | 27,028 | 6% |
| R-4a | Soropadan | Semarang | Magelang | 460 | 1,819 | 25% | 626 | 2,541 | 25% |
| R-4b | Soropadan | Magelang | Semarang | 496 | 1,655 | 30% | 780 | 2,894 | 27% |
| R-5a | Godong | Semarang | Purwodadi | 314 | 1,025 | 31% | 845 | 6,220 | 14% |
| R-5b | Godong | Purwodadi | Semarang | 275 | 997 | 28% | 686 | 6,241 | 11% |
| R-6a | Kaliboto | Magelang | Purworejo | 381 | 808 | 47% | 592 | 3,199 | 19% |
| R-6b | Kaliboto | Purworejo | Magelang | 415 | 803 | 52% | 789 | 3,309 | 24% |
| R-7a | Dadirejo | Wates | Purworejo | 709 | 1,403 | 51% | 907 | 2,070 | 44% |
| R-7b | Dadirejo | Purworejo | Wates | 602 | 1,384 | 43% | 893 | 2,288 | 39% |
| R-8a | Sedayu | Jogja | Wates | 462 | 2,440 | 19% | 1,604 | 8,432 | 19% |
| R-8b | Sedayu | Wates | Jogja | 467 | 2,595 | 18% | 1,802 | 9,840 | 18% |
| R-9a | Tempel | Magelang | Sleman | 932 | 4,361 | 21% | 1,011 | 10,574 | 10% |
| R-9b | Tempel | Sleman | Magelang | 705 | 5,125 | 14% | 1,305 | 14,866 | 9% |
| R-10a | Prambanan | Jogja | Klaten | 458 | 6,781 | 7% | 1,883 | 20,249 | 9% |
| R-10b | Prambanan | Klaten | Jogja | 321 | 6,516 | 5% | 1,884 | 20,694 | 9% |
| R-11a | Tegal Gond | Kartosuro | Klaten | 979 | 4,406 | 22% | 1,335 | 11,319 | 12% |
| R-11b | Tegal Gond | Klaten | Kartosuro | 842 | 4,812 | 17% | 1,754 | 12,608 | 14% |
| R-12a | Ampel | Semarang | Solo | 383 | 2,326 | 16% | 408 | 5,775 | 7% |
| R-12b | Ampel | Solo | Semarang | 427 | 2,214 | 19% | 506 | 5,433 | 9% |
| R-13a | Geyer | Sragen | Purwodadi | 247 | 680 | 36% | 919 | 2,935 | 31% |
| R-13b | Geyer | Purwodadi | Sragen | 344 | 674 | 51% | 771 | 2,846 | 27% |
| R-14a | Masaran | Sragen | Karanganyar | 692 | 4,022 | 17% | 841 | 11,732 | 7% |
| R-14b | Masaran | Karanganyar | Sragen | 561 | 2,720 | 21% | 1,076 | 9,400 | 11% |

Note: RSI: The number of Roadside Interview Survey samples, TC: The number of vehicle counting survey result
Sample R.: Sampling Ratios

Source: CJRR Study Team,. Road Traffic Survey, 2008

**b. Methodology**

Origin and destination table of vehicles in Central Java region was calibrated by classified hourly traffic count survey and roadside OD interview survey results. Expansion factor by vehicle type for each survey location were calculated by dividing the number of vehicle by the number of OD survey respondents, and vehicle OD tables for each survey location were manipulated. Vehicle OD table was manipulated by summing up vehicle OD table of each locations avoiding duplication. Since the roadside OD interview survey was conducted during 14 hours, vehicle OD tables were expanded by multiplying a 24h/14h factor which was estimated based on the survey results conducted in "Study of Economic Partnership Projects in Developing Countries in FY2006". 24h/14h factors by vehicle type are shown below.

**Table 1.2.4 24 Hours / 14 Hours Expansion Ratio by Vehicle Type**

| Motorcycle | Passenger Car | Small Bus | Medium Bus | Large Bus |
|---|---|---|---|---|
| 1.15 | 1.22 | 1.17 | 1.17 | 1.34 |

| Pick Up | 2 Axles Truck | 3 Axles Truck | 4 Axles Truck | 5+ Axles Truck |
|---|---|---|---|---|
| 1.22 | 1.39 | 1.51 | 1.58 | 2.19 |

Source: CJRR estimation based on road traffic survey of "Study of Economic Partnership Projects in Developing Countries in FY2006" (JETRO)

Finally vehicle OD tables were converted by multiplying average passengers. According to the roadside interview survey, average passengers of motorcycle is 1.39 per vehicle and 3.24 for passenger cars.

### c. Origin and Destination Table by Analysis Zone

The OD tables of passenger car and motorcycle are shown below.

**Table 1.2.5 Passenger OD Table of Passenger Car in the Central Java Region by Analysis Zone**

[Unit: passengers per day]

| | Bo | De | Es | Kl | Ku | Ma | Pu | Sa | Sm | Sr | Su | Ws | Yo | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bo | | 79 | 263 | 677 | 19 | 121 | 164 | 1,540 | 1,160 | 115 | 89 | 395 | 748 | 5,370 |
| De | | | 93 | 18 | | 22 | 181 | 343 | 3,413 | 28 | 137 | 750 | 311 | 5,296 |
| Es | 241 | 31 | | 778 | 173 | 653 | 102 | 646 | 4,825 | 194 | 4,118 | 4,842 | 5,377 | 21,981 |
| Kl | 679 | 29 | 850 | | 283 | 613 | 33 | 286 | 996 | 311 | 6,449 | 1,471 | 9,565 | 21,564 |
| Ku | 117 | 22 | 272 | 198 | | 86 | 13 | 0 | 155 | 22 | 117 | 522 | 5,237 | 6,761 |
| Ma | 71 | 33 | 702 | 525 | 64 | | 37 | 713 | 2,005 | 64 | 647 | 2,317 | 9,867 | 17,045 |
| Pu | 93 | 244 | 136 | 77 | | 98 | | 186 | 1,177 | 163 | 418 | 237 | 402 | 3,231 |
| Sa | 1,780 | 334 | 879 | 457 | 8 | 673 | 297 | | 7,062 | 32 | 1,371 | 1,187 | 1,447 | 15,526 |
| Sm | 1,078 | 3,057 | 5,074 | 903 | 119 | 2,606 | 1,099 | 8,474 | | 396 | 3,857 | 9,550 | 4,145 | 40,358 |
| Sr | 161 | 65 | 207 | 248 | 23 | 52 | 142 | 23 | 179 | | 6,674 | 464 | 578 | 8,816 |
| Su | 86 | 162 | 2,630 | 4,651 | 131 | 1,102 | 502 | 1,560 | 3,288 | 4,896 | | 2,546 | 6,963 | 28,517 |
| Ws | 505 | 368 | 5,551 | 1,378 | 616 | 2,587 | 301 | 1,942 | 9,731 | 261 | 3,381 | | 7,886 | 34,508 |
| Yo | 879 | 189 | 3,691 | 9,321 | 4,099 | 10,472 | 293 | 996 | 3,653 | 428 | 8,020 | 7,473 | | 49,514 |
| Total | 5,689 | 4,612 | 20,348 | 19,232 | 5,534 | 19,086 | 3,163 | 16,710 | 37,644 | 6,910 | 35,278 | 31,753 | 52,527 | 258,486 |

Analysis Zone: Bo = Kab. Boyolali, De = Kab. Demak, Es = Eastern Area of the Semarang-Solo-Yogyakarta Corridor (external zone), Kl = Kab. Klaten, Ku = Kab. Kulon Progo, Ma = Kab. Magelang and Kota Magelang, Pu = Kab. Grobogan, Sa = Kab. Salatiga and Kota Salatiga, Sm = Kota Semarang, Sr = Sragen, Su = Kota Solo (Sulakarta) and Kab. Kranganyar, Ws = Western Area of the Semarang-Solo-Yogyakarta Corridor (external zone), Yo = Kab. Sleman, Kab. Bantul and Kota Yogyakarta
Source: CJRR Study Team,. Road Traffic Survey, 2008

**Table 1.2.6 Passenger OD Table of Motorcycle in the Central Java Region by Analysis Zone**

[Unit: passengers per day]

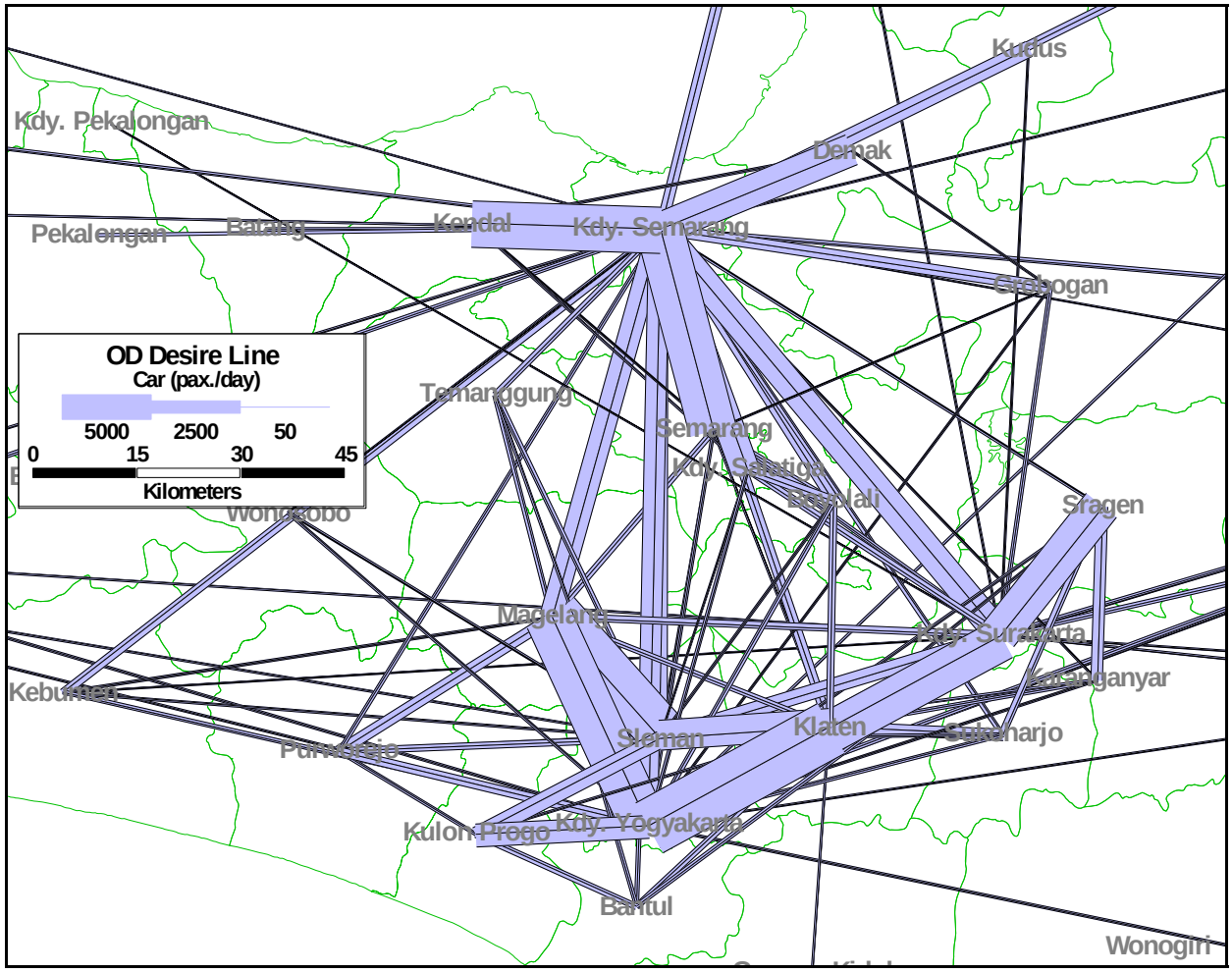
| | Bo | De | Es | Kl | Ku | Ma | Pu | Sa | Sm | Sr | Su | Ws | Yo | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bo | | 79 | 128 | 1,923 | 14 | 79 | 283 | 3,447 | 1,521 | 153 | 168 | 279 | 742 | 8,817 |
| De | 57 | | 147 | 29 | | 42 | 1,152 | 209 | 15,261 | 35 | 134 | 630 | 119 | 17,815 |
| Es | 41 | 155 | | 490 | 149 | 267 | 224 | 350 | 3,553 | 235 | 1,498 | 887 | 1,405 | 9,257 |
| Kl | 2,193 | 26 | 515 | | 228 | 448 | 89 | 309 | 713 | 299 | 10,264 | 460 | 23,755 | 39,299 |
| Ku | 17 | | 154 | 129 | | 169 | | 18 | 92 | 28 | 78 | 771 | 11,679 | 13,134 |
| Ma | 97 | 52 | 233 | 280 | 102 | | 29 | 788 | 1,289 | 11 | 177 | 3,375 | 10,070 | 16,504 |
| Pu | 188 | 1,337 | 277 | 58 | | 13 | | 187 | 1,569 | 643 | 707 | 90 | 169 | 5,237 |
| Sa | 3,685 | 740 | 544 | 407 | 17 | 635 | 546 | | 14,249 | 12 | 1,040 | 1,073 | 519 | 23,466 |
| Sm | 624 | 16,600 | 4,691 | 467 | 32 | 914 | 1,540 | 7,236 | | 212 | 1,110 | 11,177 | 1,194 | 45,797 |
| Sr | 201 | 46 | 228 | 407 | | 22 | 480 | 62 | 514 | | 13,887 | 42 | 580 | 16,466 |
| Su | 274 | 111 | 1,452 | 8,410 | 193 | 252 | 607 | 823 | 1,313 | 10,150 | | 629 | 4,027 | 28,242 |
| Ws | 146 | 564 | 871 | 383 | 946 | 3,478 | 153 | 1,070 | 12,207 | 91 | 440 | | 4,810 | 25,159 |
| Yo | 671 | 93 | 1,254 | 17,279 | 10,260 | 14,165 | 119 | 543 | 1,133 | 567 | 4,077 | 4,439 | | 54,600 |
| Total | 8,193 | 19,802 | 10,494 | 30,263 | 11,941 | 20,485 | 5,223 | 15,041 | 53,415 | 12,437 | 33,580 | 23,851 | 59,068 | 303,792 |

Analysis Zone: Bo = Kab. Boyolali, De = Kab. Demak, Es = Eastern Area of the Semarang-Solo-Yogyakarta Corridor (external zone), Kl = Kab. Klaten, Ku = Kab. Kulon Progo, Ma = Kab. Magelang and Kota Magelang, Pu = Kab. Grobogan, Sa = Kab. Salatiga and Kota Salatiga, Sm = Kota Semarang, Sr = Sragen, Su = Kota Solo (Sulakarta) and Kab. Kranganyar, Ws = Western Area of the Semarang-Solo-Yogyakarta Corridor (external zone), Yo = Kab. Sleman, Kab. Bantul and Kota Yogyakarta
Source: CJRR Study Team,. Road Traffic Survey, 2008

### d. Desire Line by Kabupaten

Based on the road traffic survey conducted by the study team in 2008, desire line of car passengers in Semarang – Solo – Yogyakarta corridor is depicted in Source: CJRR Study Team, Road Traffic Survey, 2008

Figure 1.2.6. There is a number of car passenger trips such as Kota Yogyakarta – Klaten, Sleman – Magelang, Kota Surakarta – Kota Yogyakarta, Kota Yogyakarta – Magelang, Kota Semarang – Kendal, Kota Semarang – Kabupaten Semarang. Middle distance trips, trips with zonal distance is approximately 50 – 100 km, such as Kota Semarang – Kota Surakarta, Kota Semarang – Kota Yogyakarta, Kota Semarang – Magelang are major traffic flow along the corridor.

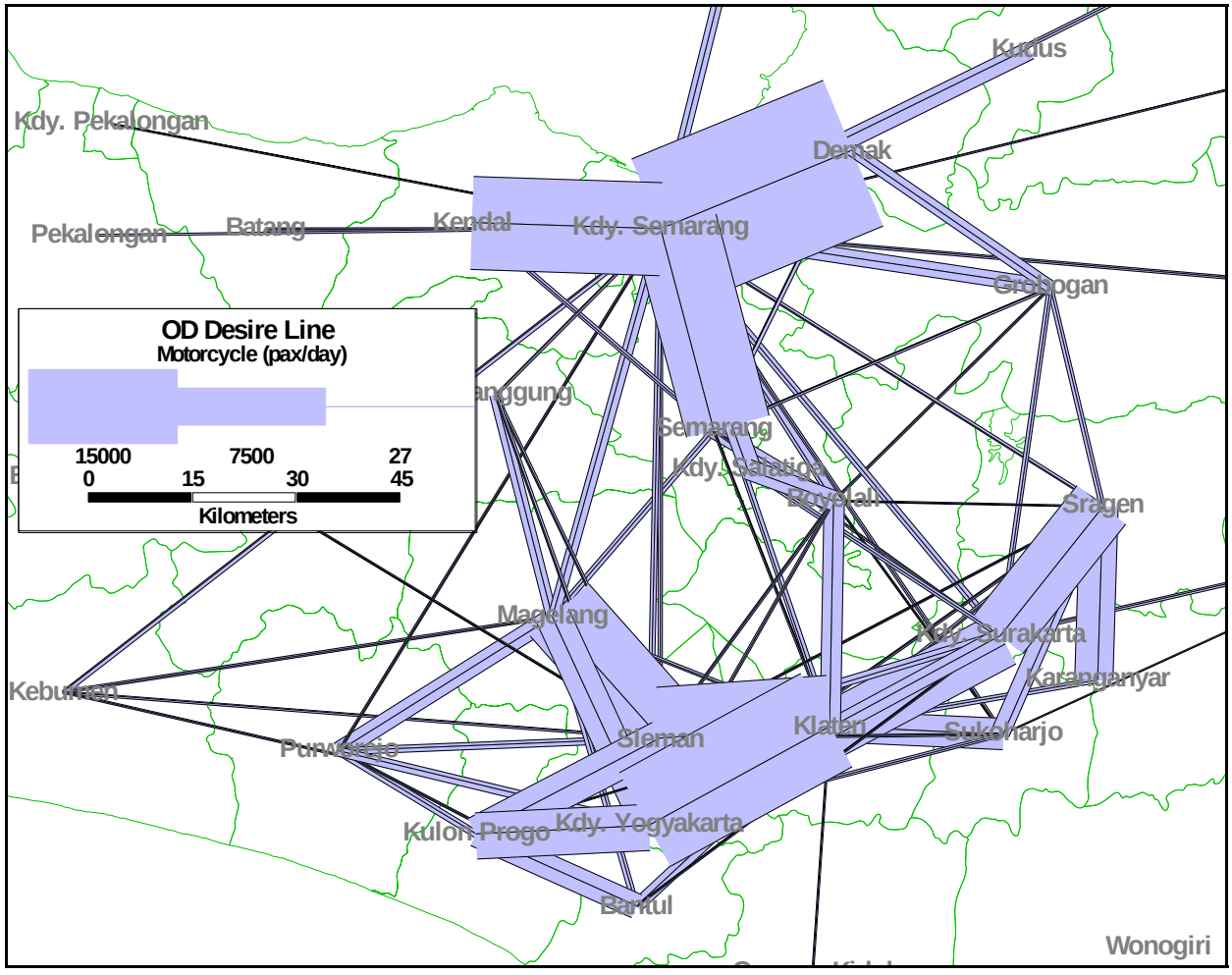



Note: Desire lines which have less than 200 passenger /day for one direction are excluded.
Source: CJRR Study Team, Road Traffic Survey, 2008

**Figure 1.2.6 Desire Line of Car Passengers in Semarang – Solo – Yogyakarta Corridor**

Based on the road traffic survey conducted by the study team in 2008, desire line of motorcycle passengers in Semarang – Solo – Yogyakarta corridor is depicted in Figure 1.2.7. In contrast with car passengers, The number of the middle distance travel is relatively limited while trips to adjacent kabupaten/kota such as Kota Semaran – Demak, Kota Semarang – Kendal, Kota Semarang – Kabupaten Semaran, Kota Yogyakarta – Klaten, Sleman – Magelang, Kota Surakarta – Sragen is approximately twice or triple of car passengers.

It is not negligible that some passengers choose motor cycle as transportation mode for the middle distance travel. For instance, the number of trips between Kota Semarang – Kota Surakarta, Kota Semarang – Kota Yogyakarta, Kota Semarang – Magelang are more than 1,000 passengers per day while the number of passengers are smaller than cars.




Note: Desire lines which have less than 500 passenger /day for one direction are excluded.
Source: CJRR Study Team, Road Traffic Survey, 2008

**Figure 1.2.7 Desire Line of Motorcycle Passengers in Semarang – Solo – Yogyakarta Corridor**

### 4) Origin Destination Table Calibration and Analyses for Freight Transport

#### a. Sampling Ratios

Since traveling vehicles are forced to pull over and stop for the Roadside OD Interview Survey, it is necessary to minimize the impact on traffic flow. The hourly sampling is shown as follows.

**Table 1.2.7 Sampling Ratios of Road Side Interview Survey (Trucks)**

[Unit: Number of vehicles / 14h]

| Code | Location | Direction | | 2 Axles Truck | | | 3 Axles Truck | | | Truck with More than 4 Axles | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | From | To | RSI | TC | Sample R. | RSI | TC | Sample R. | RSI | TC | Sample R. |
| R-1a | Tugu | Semarang | Kendal | 568 | 4,117 | 14% | 152 | 949 | 16% | 52 | 537 | 10% |
| R-1b | Tugu | Kendal | Semarang | 639 | 4,778 | 13% | 75 | 982 | 8% | 57 | 695 | 8% |
| R-2a | Kaligawe | Semarang | Demak | 827 | 3,030 | 27% | 113 | 791 | 14% | 127 | 659 | 19% |
| R-2b | Kaligawe | Demak | Semarang | 657 | 3,046 | 22% | 137 | 792 | 17% | 73 | 676 | 11% |
| R-3a | Ungaran | Semarang | Bawen | 677 | 3,777 | 18% | 76 | 488 | 16% | 32 | 232 | 14% |
| R-3b | Ungaran | Bawen | Semarang | 474 | 5,334 | 9% | 34 | 418 | 8% | 22 | 275 | 8% |
| R-4a | Soropadan | Semarang | Magelang | 598 | 1,427 | 42% | 96 | 183 | 52% | 23 | 49 | 47% |
| R-4b | Soropadan | Magelang | Semarang | 551 | 1,424 | 39% | 43 | 154 | 28% | 41 | 51 | 80% |
| R-5a | Godong | Semarang | Purwodadi | 682 | 1,378 | 49% | 56 | 119 | 47% | - | 4 | 0% |
| R-5b | Godong | Purwodadi | Semarang | 471 | 1,267 | 37% | 30 | 82 | 37% | 1 | 11 | 9% |
| R-6a | Kaliboto | Magelang | Purworejo | 428 | 715 | 60% | 66 | 100 | 66% | 13 | 14 | 93% |
| R-6b | Kaliboto | Purworejo | Magelang | 408 | 800 | 51% | 14 | 44 | 32% | 3 | 19 | 16% |
| R-7a | Dadirejo | Wates | Purworejo | - | 722 | - | - | 135 | - | - | 52 | - |
| R-7b | Dadirejo | Purworejo | Wates | - | 671 | - | - | 97 | - | - | 57 | - |
| R-8a | Sedayu | Jogja | Wates | 404 | 1,317 | 31% | 37 | 160 | 23% | 11 | 59 | 19% |
| R-8b | Sedayu | Wates | Jogja | 343 | 1,290 | 27% | 29 | 110 | 26% | 17 | 52 | 33% |
| R-9a | Tempel | Magelang | Sleman | 559 | 1,803 | 31% | 51 | 92 | 55% | 17 | 54 | 31% |
| R-9b | Tempel | Sleman | Magelang | 654 | 2,346 | 28% | 23 | 103 | 22% | 14 | 46 | 30% |
| R-10a | Prambanan | Jogja | Klaten | - | 2,076 | - | - | 160 | - | - | 110 | - |
| R-10b | Prambanan | Klaten | Jogja | - | 2,340 | - | - | 158 | - | - | 108 | - |
| R-11a | Tegal Gondo | Kartosuro | Klaten | 816 | 2,605 | 31% | 59 | 248 | 24% | 37 | 94 | 39% |
| R-11b | Tegal Gondo | Klaten | Kartosuro | 517 | 2,490 | 21% | 70 | 236 | 30% | 18 | 108 | 17% |
| R-12a | Ampel | Semarang | Solo | 595 | 2,705 | 22% | 37 | 233 | 16% | 36 | 142 | 25% |
| R-12b | Ampel | Solo | Semarang | 557 | 2,323 | 24% | 67 | 309 | 22% | 18 | 138 | 13% |
| R-13a | Geyer | Sragen | Purwodadi | 343 | 822 | 42% | 15 | 48 | 31% | - | - | - |
| R-13b | Geyer | Purwodadi | Sragen | 526 | 888 | 59% | 14 | 47 | 30% | - | - | - |
| R-14a | Masaran | Sragen | Karanganyar | 783 | 2,410 | 32% | 96 | 312 | 31% | 78 | 123 | 63% |
| R-14b | Masaran | Karanganyar | Sragen | 616 | 2,086 | 30% | 106 | 312 | 34% | 56 | 151 | 37% |
| R-7-JTa | Kulon Progo | Wates | Purworejo | 140 | 313 | 45% | 38 | 67 | 57% | 13 | 25 | 52% |
| R-7-JTb | Kulon Progo | Purworejo | Wates | 111 | 219 | 51% | 37 | 53 | 70% | 24 | 35 | 69% |
| R-10-JTa | Depok | Jogja | Klaten | 260 | 384 | 68% | 28 | 52 | 54% | 16 | 30 | 53% |
| R-10-JTb | Depok | Klaten | Jogja | 331 | 777 | 43% | 48 | 114 | 42% | 25 | 42 | 60% |

Note: RSI: The number of Roadside Interview Survey samples, TC: The number of vehicle counting survey result, Sample R.: Sampling Ratios
Source: CJRR Study Team, Road Traffic Survey, 2008

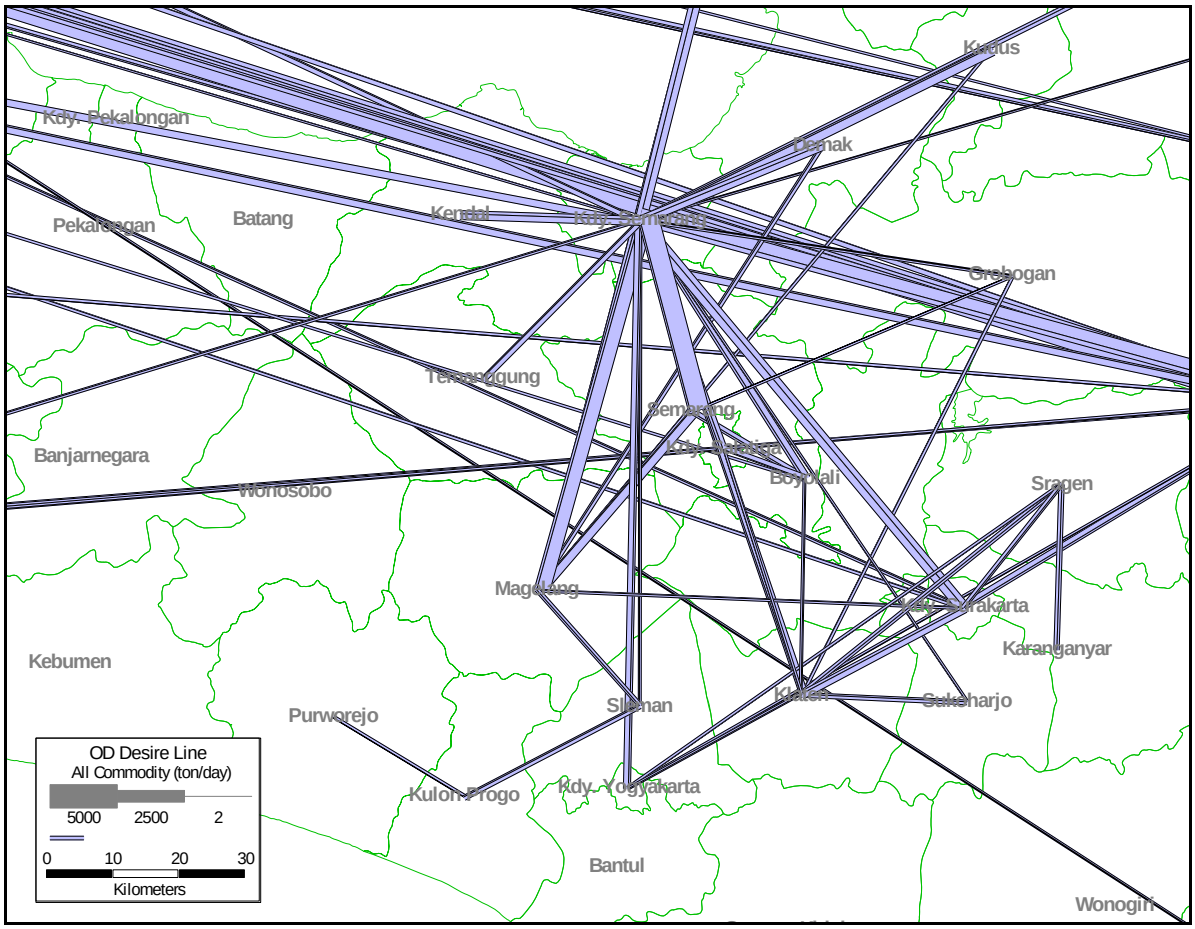
#### b. Methodology

Methodology is almost as same as passenger vehicles (a car and a motorcycle) except the point that final output for freight transportation is cargo weight OD tables instead of passenger OD tables. Cargo weight of each truck was used to manipulate cargo weight OD table by commodity types.

#### c. Weight Origin Destination Table and Desire Line by Analysis Zone

The following figure depicts the desire lines of commodity flow along Semarang – Solo – Yogyakarta corridor. East-West commodity flow, which connects west and east Java through North Java Corridor (or *Pantura*), is the major traffic corridor within the region. Radial commodity flows from / to Kota Semarang are also massive such as Kabupaten Semarang, Magelang and Surakarta. Since the flow pattern varies by commodity type, the flow patterns

by commodity type are discussed individually in the following subsection.




Source: CJRR Study Team, Road Traffic Survey, 2008

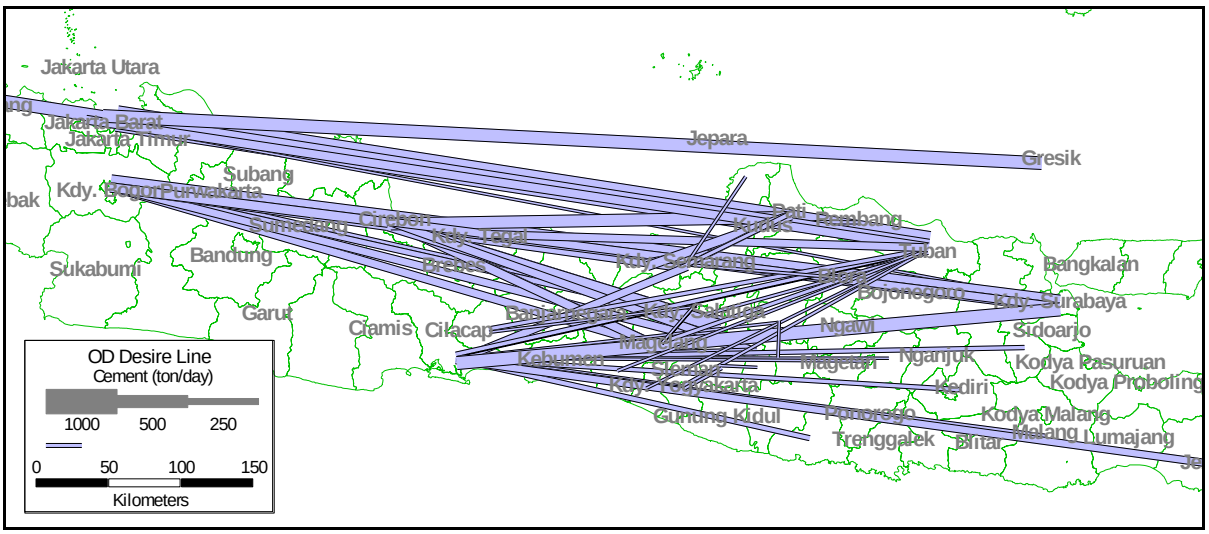
**Figure 1.2.8 Desire Lines of Freight Transport in Semarang – Solo – Yogyakarta Corridor**

### d. Freight Traffic Weight Desire Line by Commodity Type

#### Cement

Based on the Road Traffic Survey conducted during the Study in 2008, daily flow of cement which departs, arrives and passes through Semarang – Solo – Yogyakarta corridor is depicted in the following figure. Cement flows originate in cities such as Gresik, Tuban and Cirebon where major cement plants are located, and are destined for major cities such as Jakarta, Surabaya, Semarang and Solo.

While cement is a bulky cargo, it is transported by truck for long distances which exceed 500 km. Examples include Gresik – Jakarta, Tuban – Jakarta, Jakarta – Surabaya and Cilacap - Surabaya.

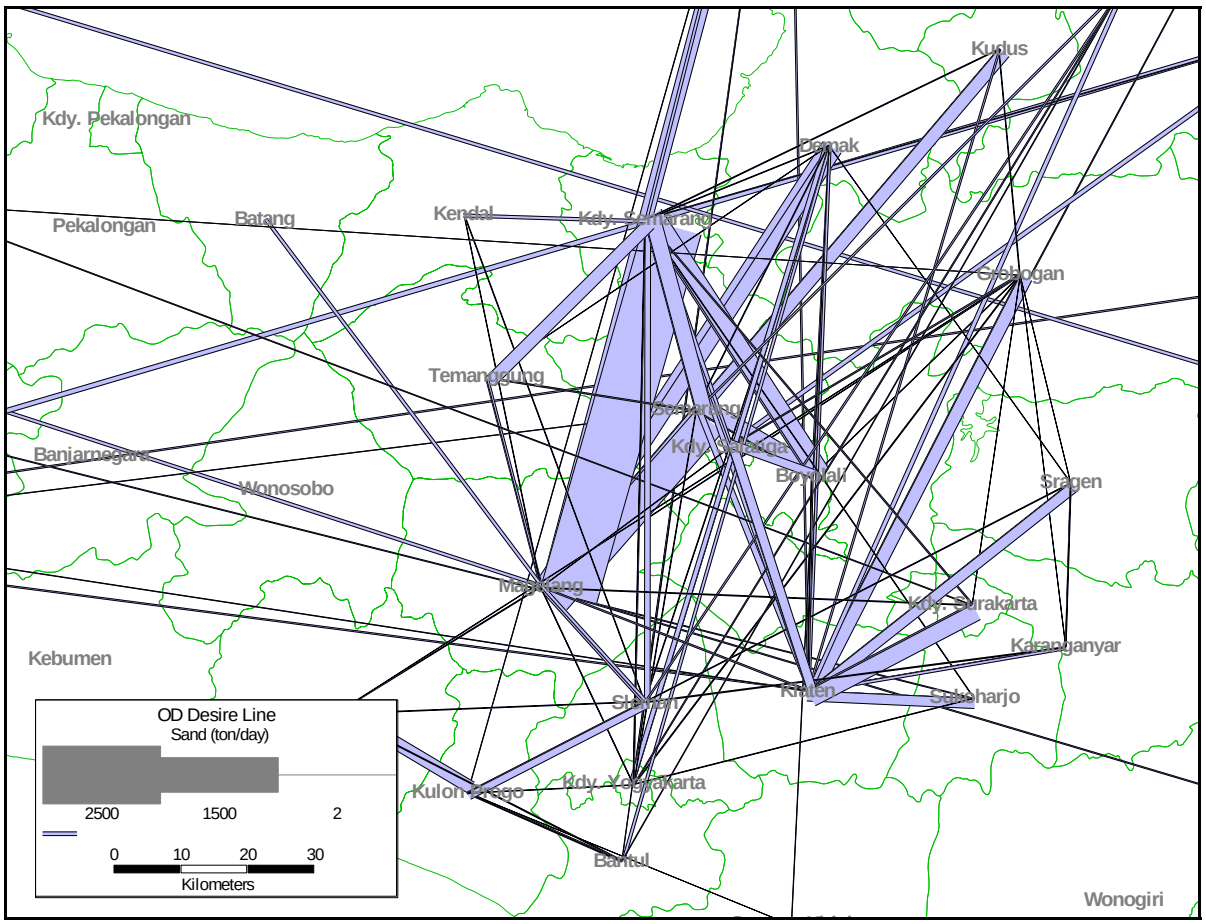



Note: Only trips departing, arriving and passing through Semarang – Solo – Yogyakarta corridor was surveyed.
Source: CJRR Study Team, Road Traffic Survey, 2008

**Figure 1.2.9 Desire Lines of Cement in Semarang – Solo – Yogyakarta Corridor**

**Quartz Sand (Silica)**

Since sand, important raw material for cement, is mined in the Central Java region, its transport flow is within the region. The following figure depicts the flow of sand in Semarang – Solo – Yogyakarta corridor. In contrast with steel and cement, vertical flow is massive such as Magelang – Kota Semarang, Magelang – Kabupaten Semarang, Boyolali – Kota Semarang, Klaten – Kota Surakarta. Transported sand from Magelang to Kabupaten Semarang exceeds more than 2,000 tons / day.

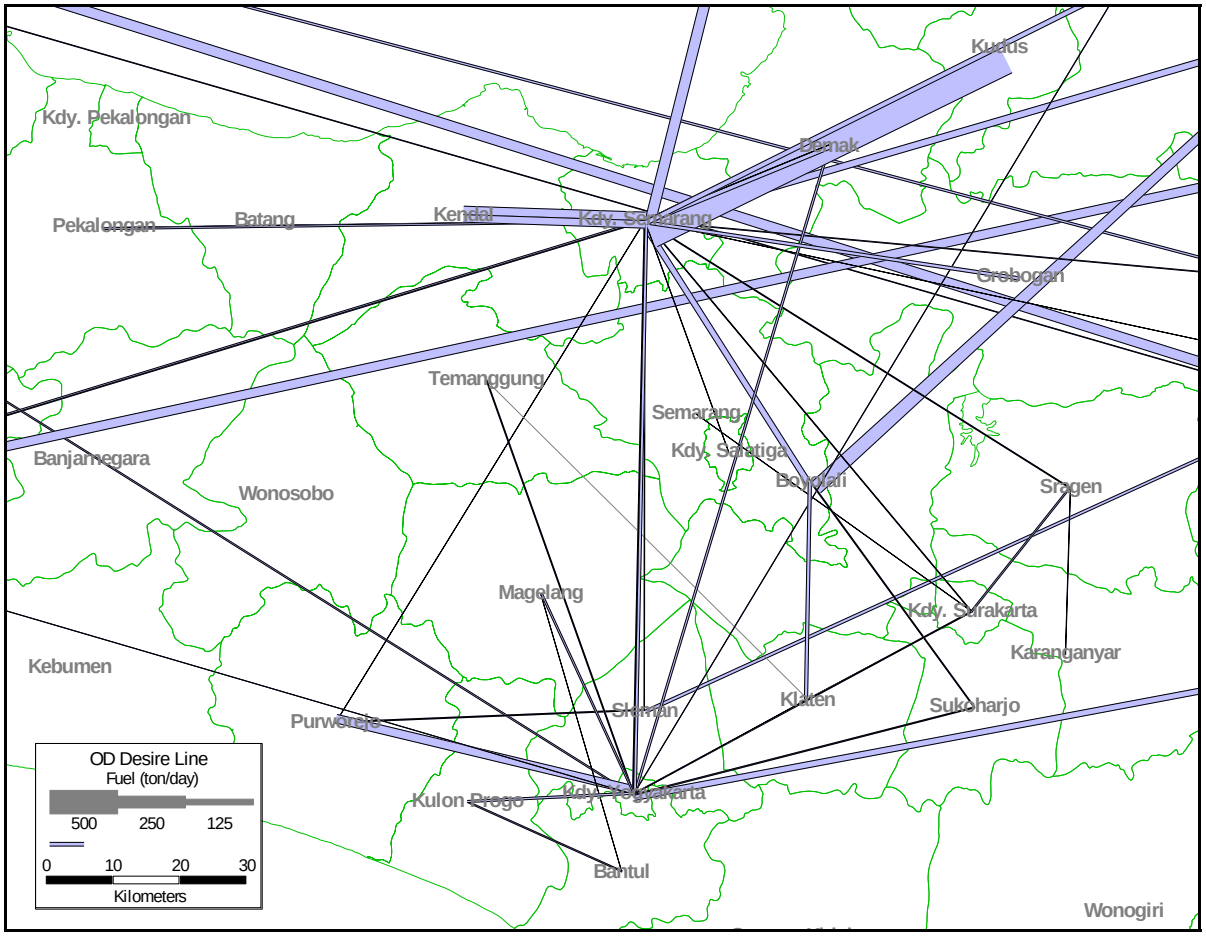



Source: CJRR, Road Traffic Survey, 2008

**Figure 1.2.10 Desire Lines of Sand in Semarang – Solo – Yogyakarta Corridor**

**Fuel**

While major traffic flow of fuel originates in Yogyakarta, Semarang and Boyolali where fuel depot / terminal of PT. Pertamina is located to adjacent Kabupaten, interregional flow was also observed during road traffic survey including Tangelang – Surabaya and Cilacap – Tuban.




Source: CJRR Study Team, Road Traffic Survey, 2008

**Figure 1.2.11 Desire Lines of Fuel in Semarang – Solo – Yogyakarta Corridor**

## (3) Bus Passenger OD Interview Survey

### 1) Survey Objective

To understand the traffic flow between cities and create an OD table of bus passenger for use as basic data for forecasting traffic demand.

### 2) Survey Contents

#### a. Survey Location

Survey was conducted at 15 intercity bus terminals within the Case Study region of Yogyakarta - Solo - Semarang and it's surroundings. (See Figure 1.2.12 and Table 1.2.8)

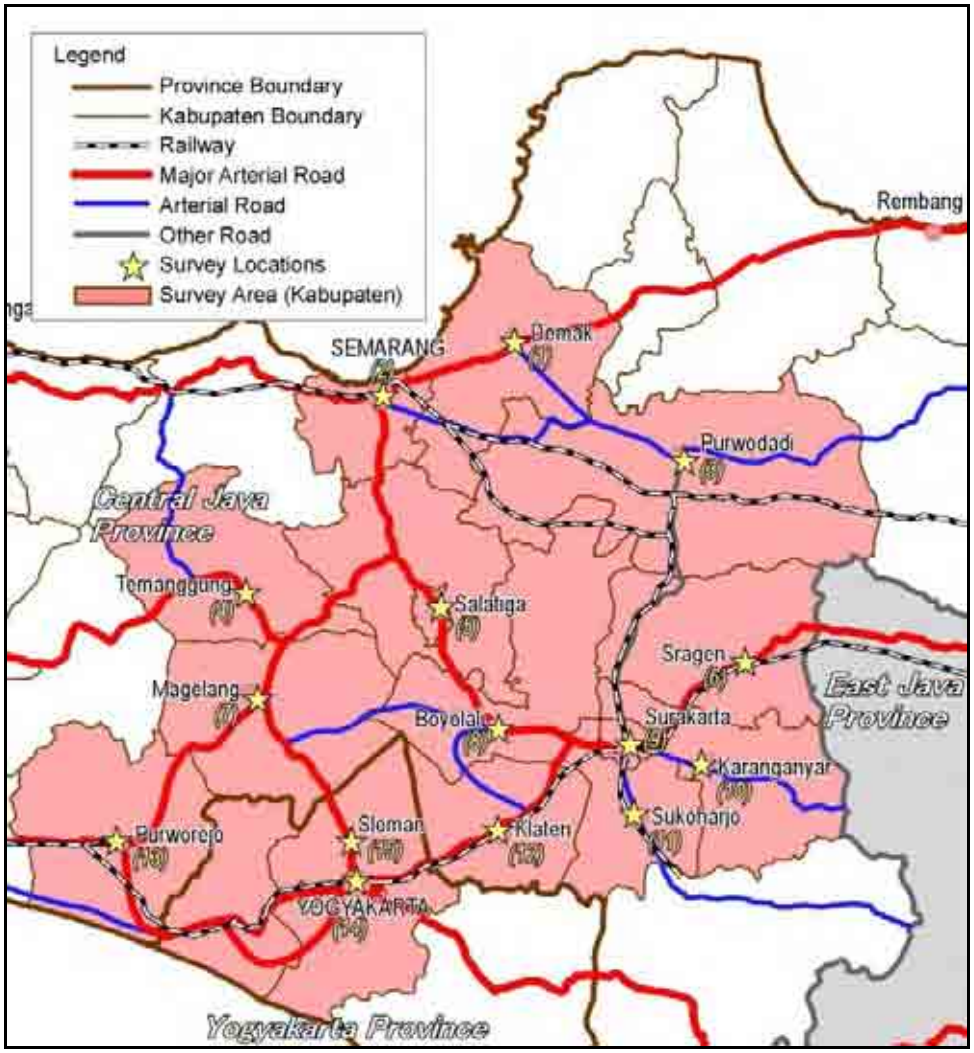



**Figure 1.2.12 Bus Passenger OD Interview Survey Locations**

**Table 1.2.8 List of Bus Passenger OD Interview Survey Locations**

| No. | Bus Terminal Name | Kabupaten / Kota | City | Survey Hour |
|---|---|---|---|---|
| 1 | Bintoro | Kab. Demak | Demak | 14 hours |
| 2 | Terboyo | Kota Semarang | Semarang | 24 hours |
| 3 | Purwodadi | Kab. Grobogan | Purwodadi | 11 hours |
| 4 | Madureso | Kab. Temanggung | Temanggung | 12 hours |
| 5 | Tingkir | Kota Salatiga | Salatiga | 14 hours |
| 6 | Pilangsari | Kab. Sragen | Sragen | 9 hours |
| 7 | Tidar | Kota Magelang | Maglang | 12 hours |
| 8 | Boyolali | Kab. Boyolali | Boyolali | 14 hours |
| 9 | Tirtonadi | Kota Surakarta | Surakarta | 24 hours |
| 10 | Jongke | Kab. Karanganyar | Karanganyar | 12 hours |
| 11 | Sukoharjo | Kab. Sukoharjo | Sukoharjo | 10 hours |
| 12 | Jonggrangan | Kab. Klaten | Klaten | 12 hours |
| 13 | Purworejo | Kab. Purworejo | Purworejo | 14 hours |
| 14 | Giwangan | Kota Yogyakarta | Yogyakarta | 24 hours |
| 15 | Jombor | Kab. Sleman | Yogyakarta | 11 hours |

**b. Survey Method**

Interviewer asked intercity bus passengers boarding at the bus terminals about trip purpose, OD, etc while the passengers are waiting to their buses. In addition, the approximate number of boarding, arriving, and passing passengers of every departing and arriving bus was surveyed by counting and interviewing to conductor at entrance of bus terminal.

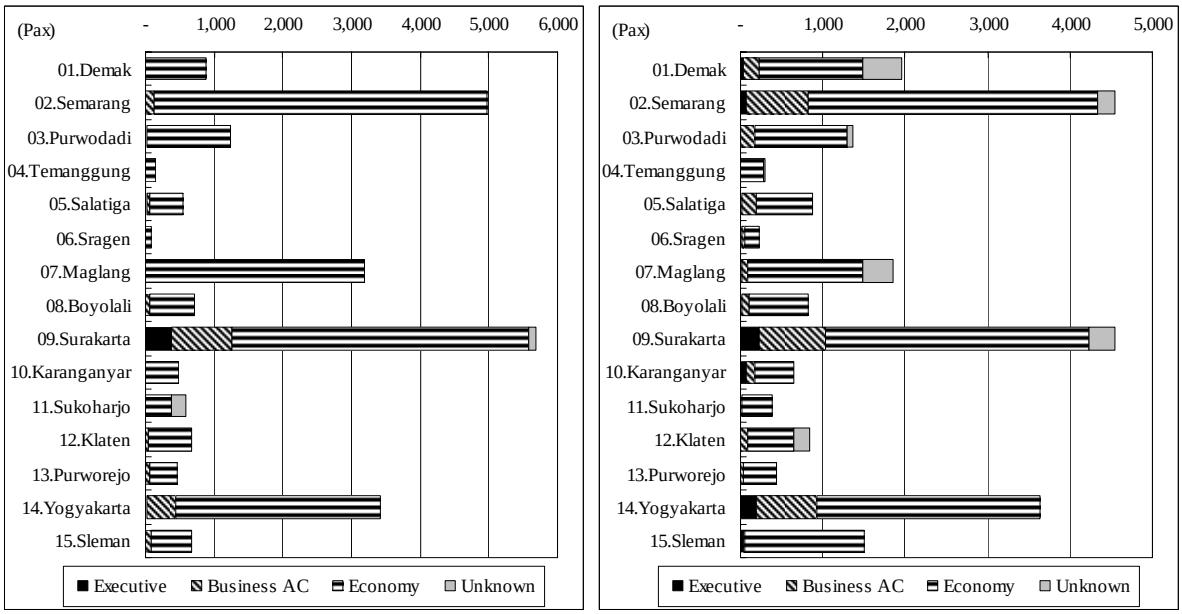
**c. Survey Period**

In keeping with the working hours in regional cities, it was basically from 6:00 to 20:00, a total of 14 hours on Tuesday, Wednesday or Thursday. However, survey period was extended to 24 hours for large bus terminals which is operated 24 hours. On the other hand, some bus terminals were closed before 20:00. The surveys were continued until closing time for these bus terminals. (See Table 1.2.8). The survey was conducted from June to July, 2008.

**3) Survey Results of Passenger Count Survey**

**a. Alighting and Boarding Bus Passenger Volume by Class by Terminal**

Alighting and boarding passenger volume by terminal is shown as follows. Semarang, Surakarta and Yogyakarta terminal exceeds more than 3,000 passengers per day for both alighting and boarding. Executive and Business AC class passengers ratio of Surakarta and Yogyakarta terminals are comparatively higher than that of Semarang.



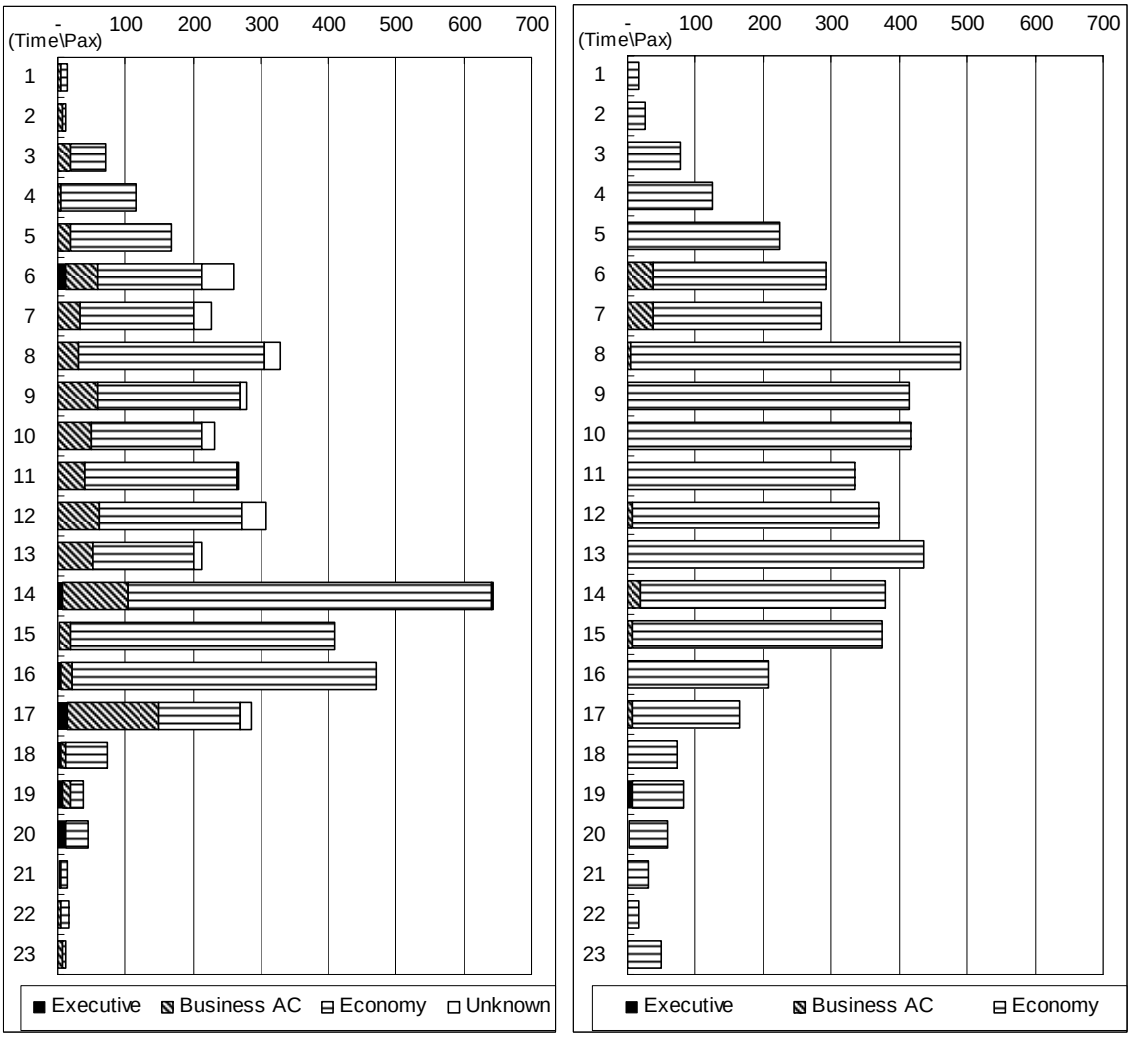

Source: CJRR Study Team, Road Traffic Survey, 2008

**Figure 1.2.13 Bus Passenger Volume by Class by Terminal**

**(Right: Departure, Left: Arrival)**

### b. Hourly Bus Passenger Volume by Class by Terminal

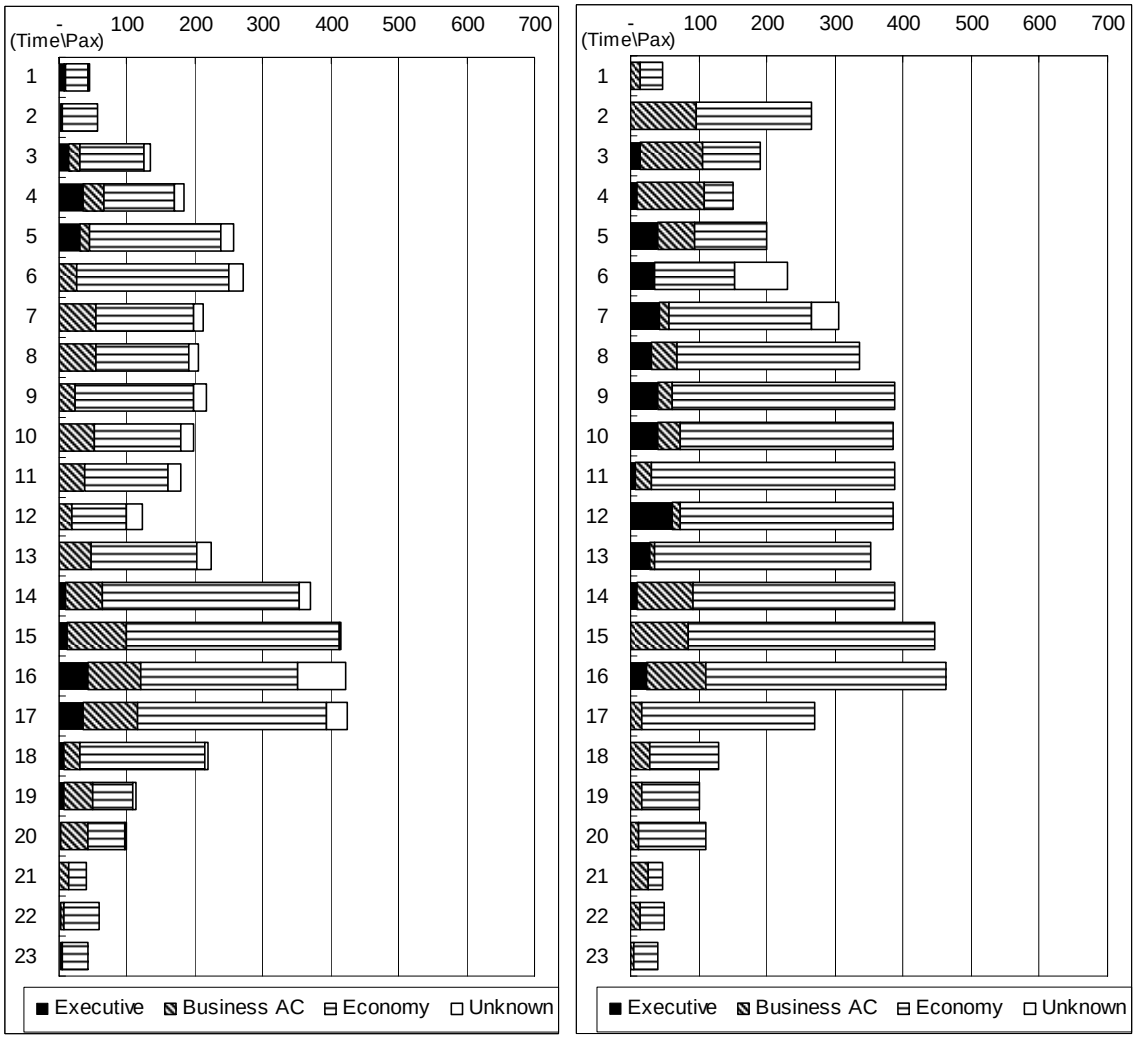
Departure passenger volume is large from 2 PM to 4 PM while arrival passenger volume shows moderate peak from 8 AM to 3 PM at Semarang bus terminal. Hourly passenger volume Surakarta bus terminal shows similar pattern. On the other hand, Yogyakarta bus terminal shows moderate peak from 8 AM to 16 PM for both departing and arriving passengers.




Source: CJRR Study Team, Road Traffic Survey, 2008

**Figure 1.2.14 Hourly Bus Passenger Volume by Class at Terboyo (Semarang) Bus Terminal**

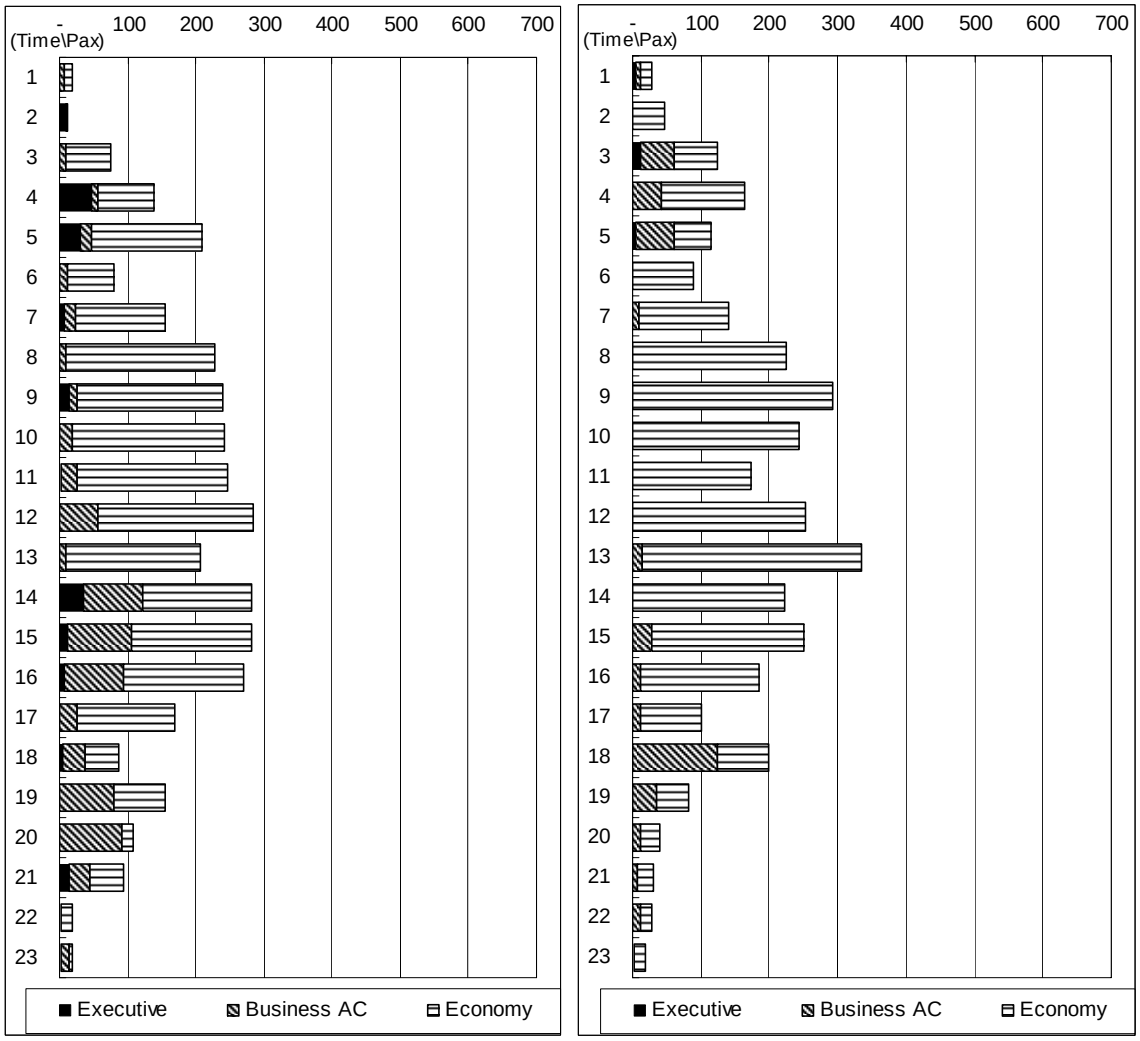
**(Right: Departure, Left: Arrival)**




Source: CJRR Study Team, Road Traffic Survey, 2008

**Figure 1.2.15 Hourly Bus Passenger Volume by Class at Tirtonadi (Solo) Bus Terminal**

**(Right: Departure, Left: Arrival)**




Source: CJRR Study Team, Road Traffic Survey, 2008

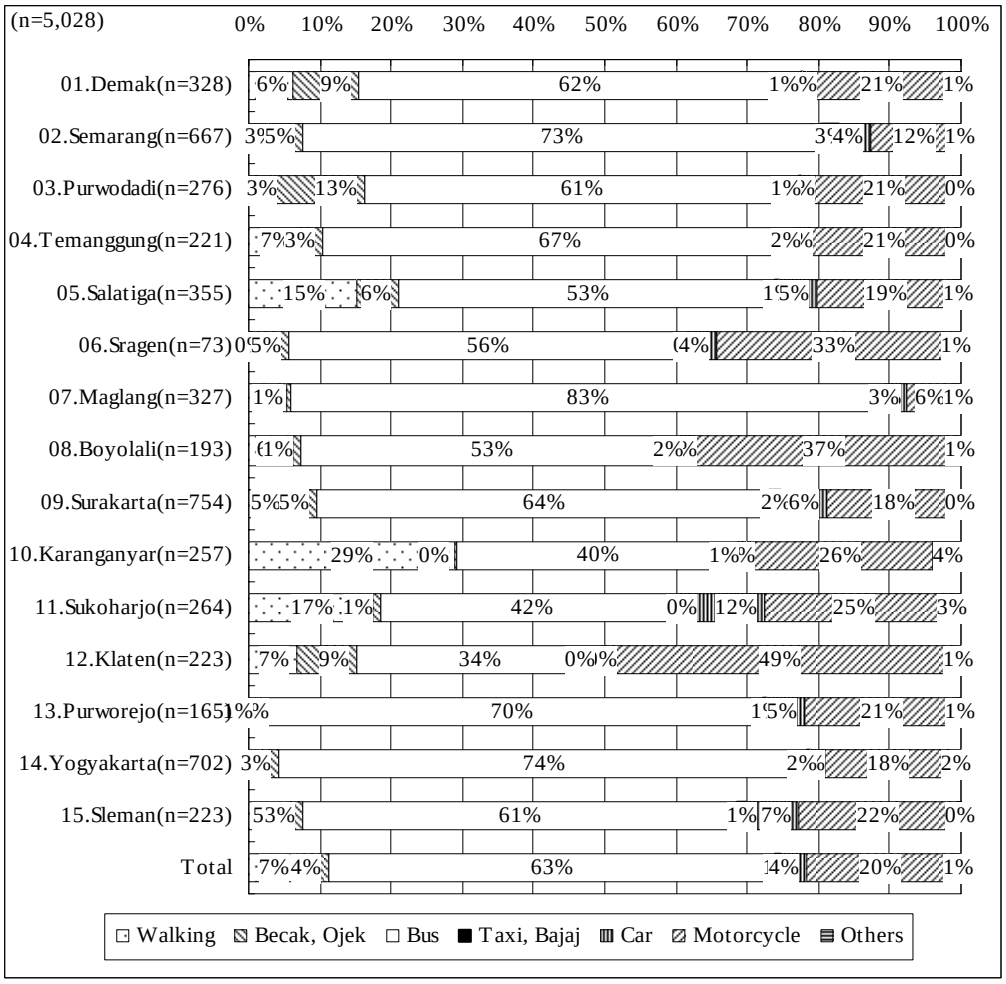
**Figure 1.2.16 Hourly Bus Passenger Volume by Class at Giwangan (Yogyakarta) Bus Terminal**

**Right: Departure, Left: Arrival**

### 4) Descriptive Survey Results of Interview Survey

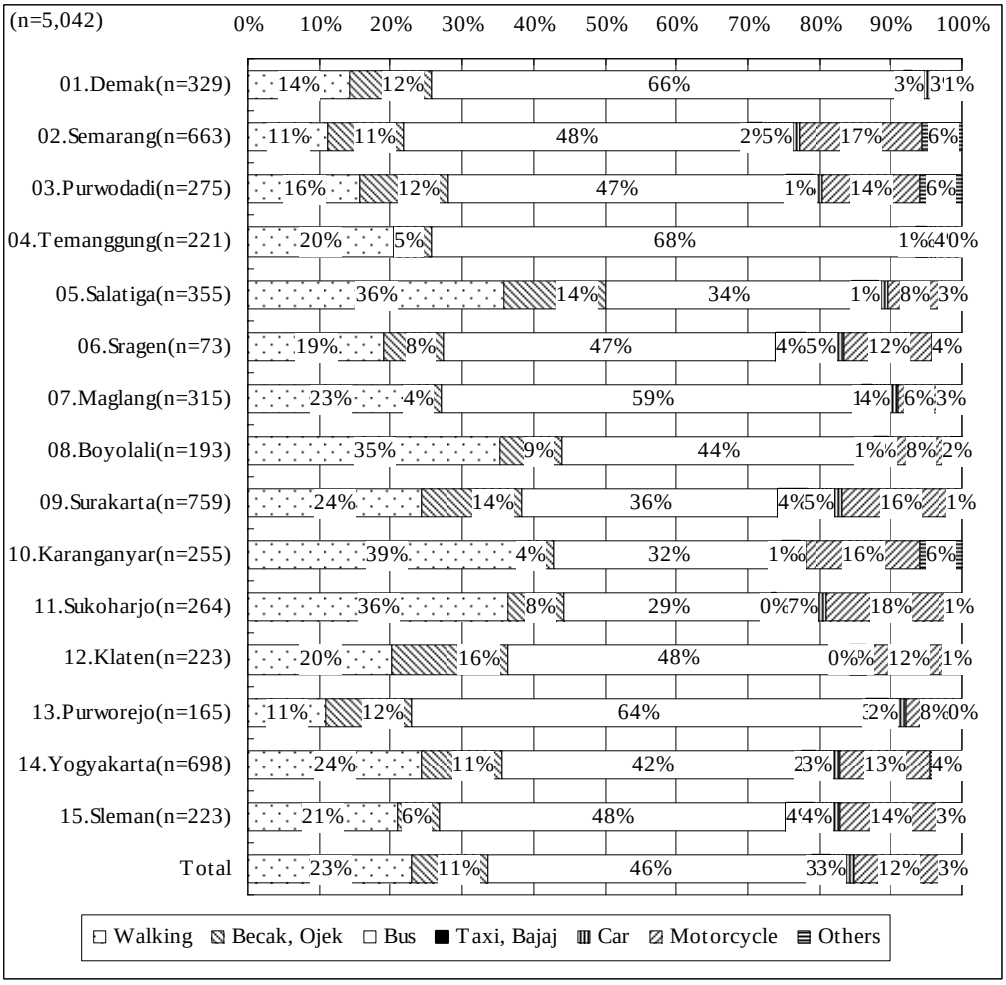
#### a. Access and Egress Transportation Mode by Bus Terminal

Access and egress transportation mode by bus terminals are shown below. Bus was the largest share and motorcycle is the second largest share is motorcycle for most bus terminals.




Source: CJRR Study Team, Road Traffic Survey, 2008

**Figure 1.2.17 Access Mode to Bus Terminals**

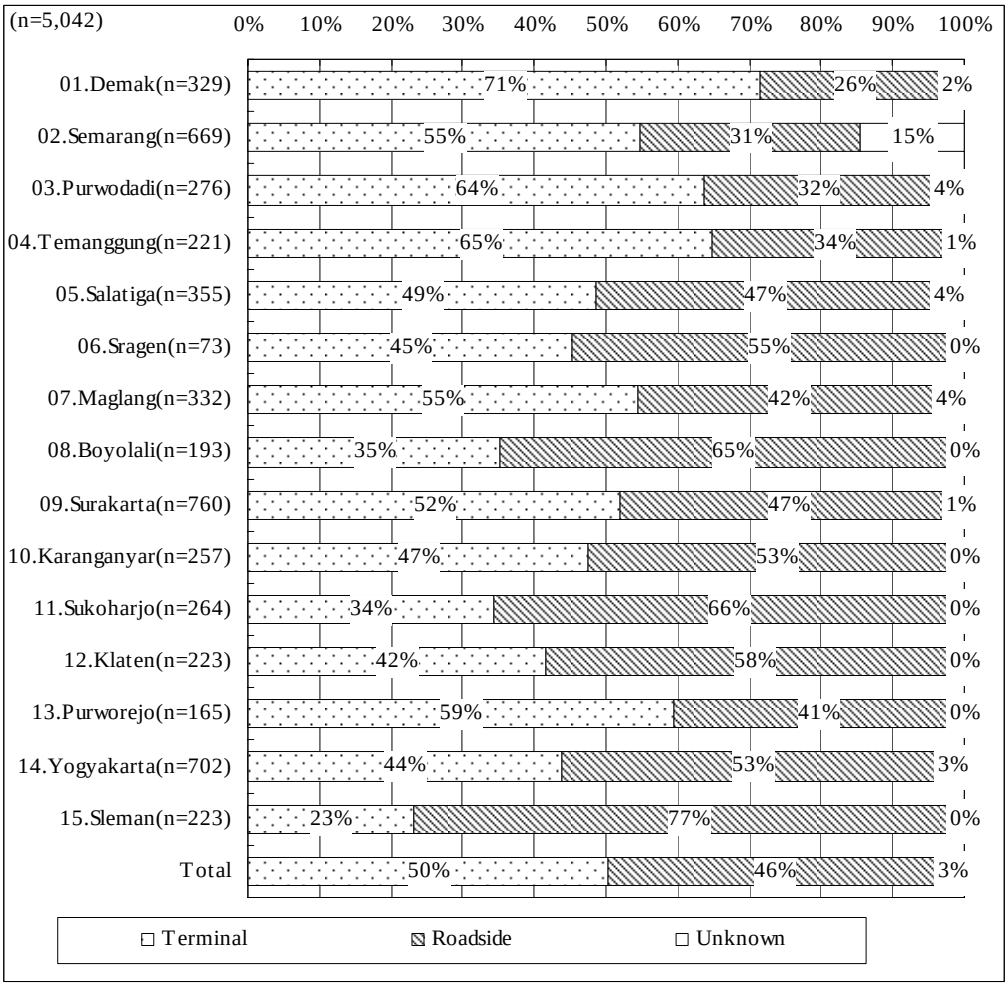



Source: CJRR Study Team, Road Traffic Survey, 2008

**Figure 1.2.18 Egress Mode from Bus Terminals**

**b. Bus Alighting Location**

It is observed that some bus passenger boarding/alighting at roadside while all intercity bus passengers are obliged to board/alight at bus terminals. Types of alighting locations by bus terminals were shown below. Approximately half of bus passengers board from bus terminals do not alight at bus terminals.

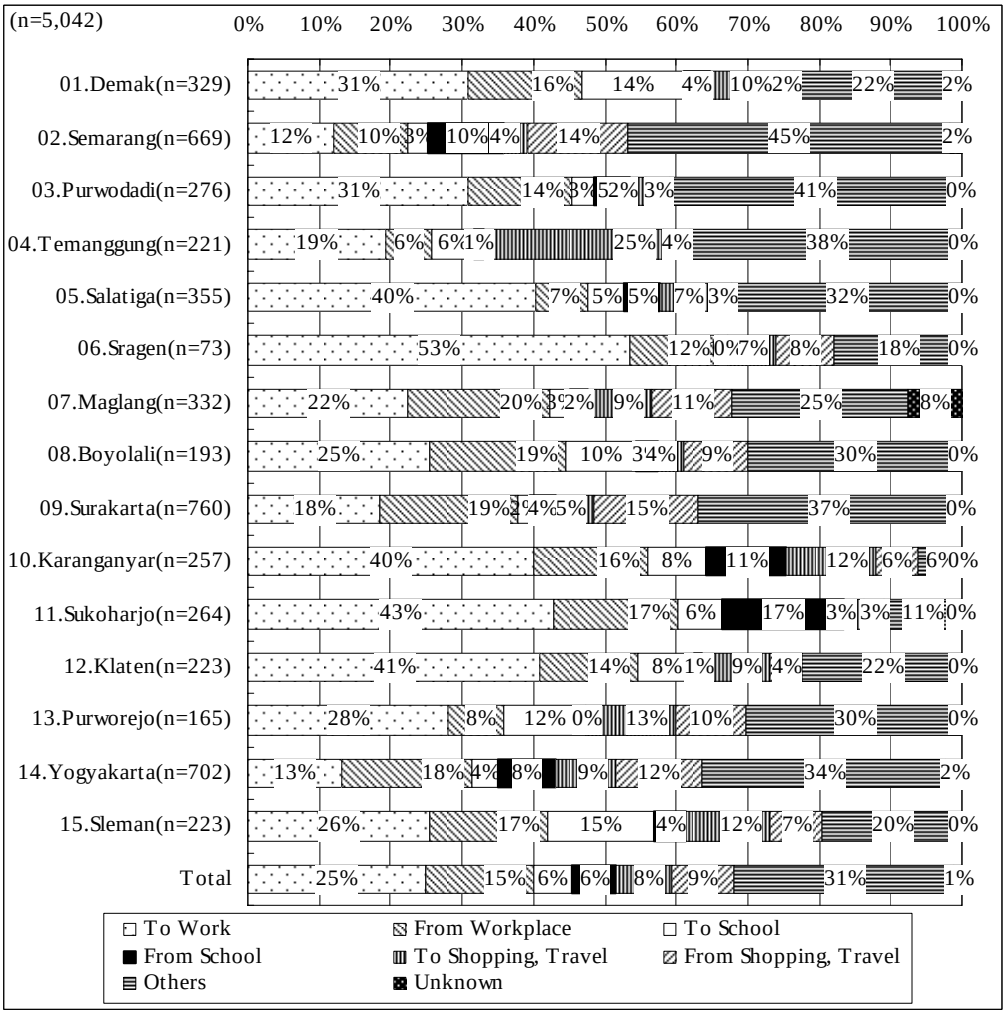



Source: CJRR Study Team, Bus Passenger OD Interview Survey

**Figure 1.2.19 Egress Mode from Bus Terminals**

### c. Trip Purpose by Bus Terminal

Trip purpose by bus terminals are shown below. Trip purpose by bus terminals are shown below. The share of "To work" is larger than other purposes.

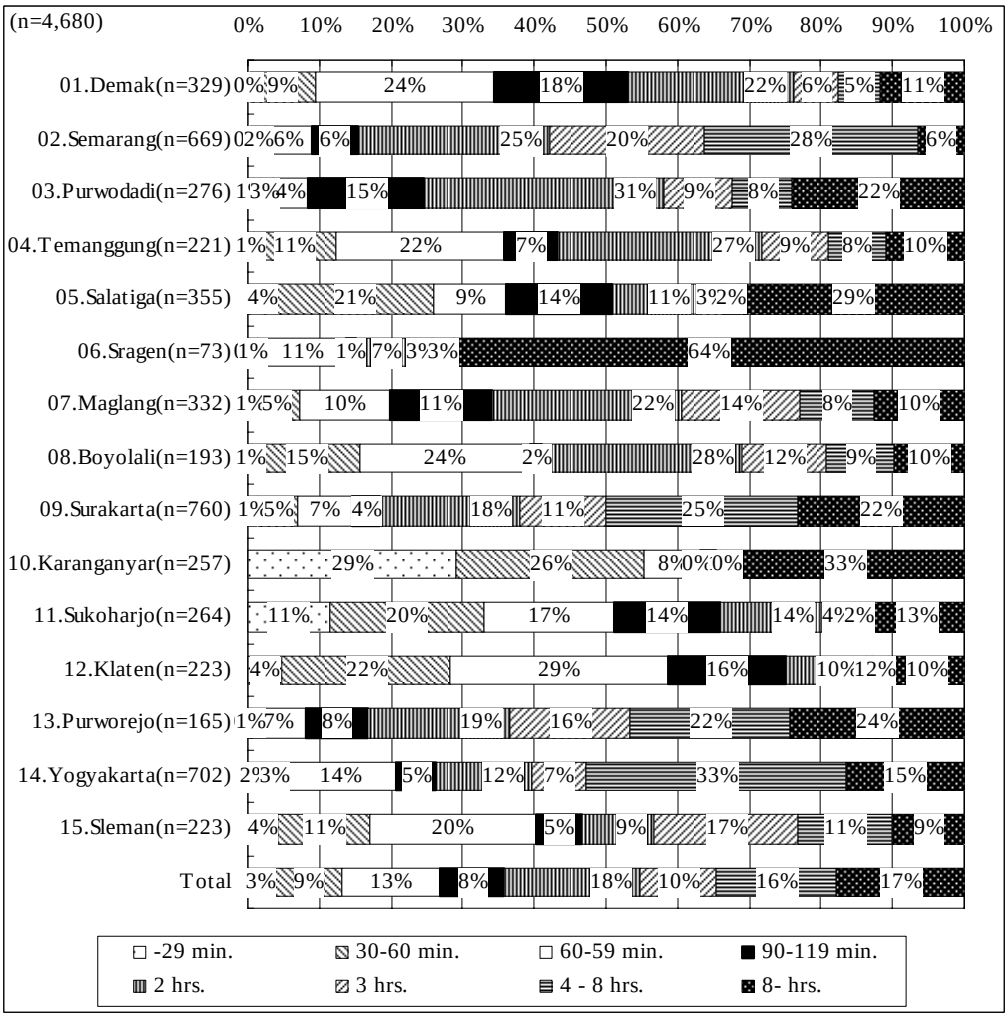



Source: CJRR Study Team, Road Traffic Survey, 2008

**Figure 1.2.20 Trip Purpose by Bus Terminals**

### d. Travel Time

Travel time by bus terminals are shown below. Since bus terminals serve for intercity and inter-regency transport, approximately 80 % of passengers travel more than 1 hour.

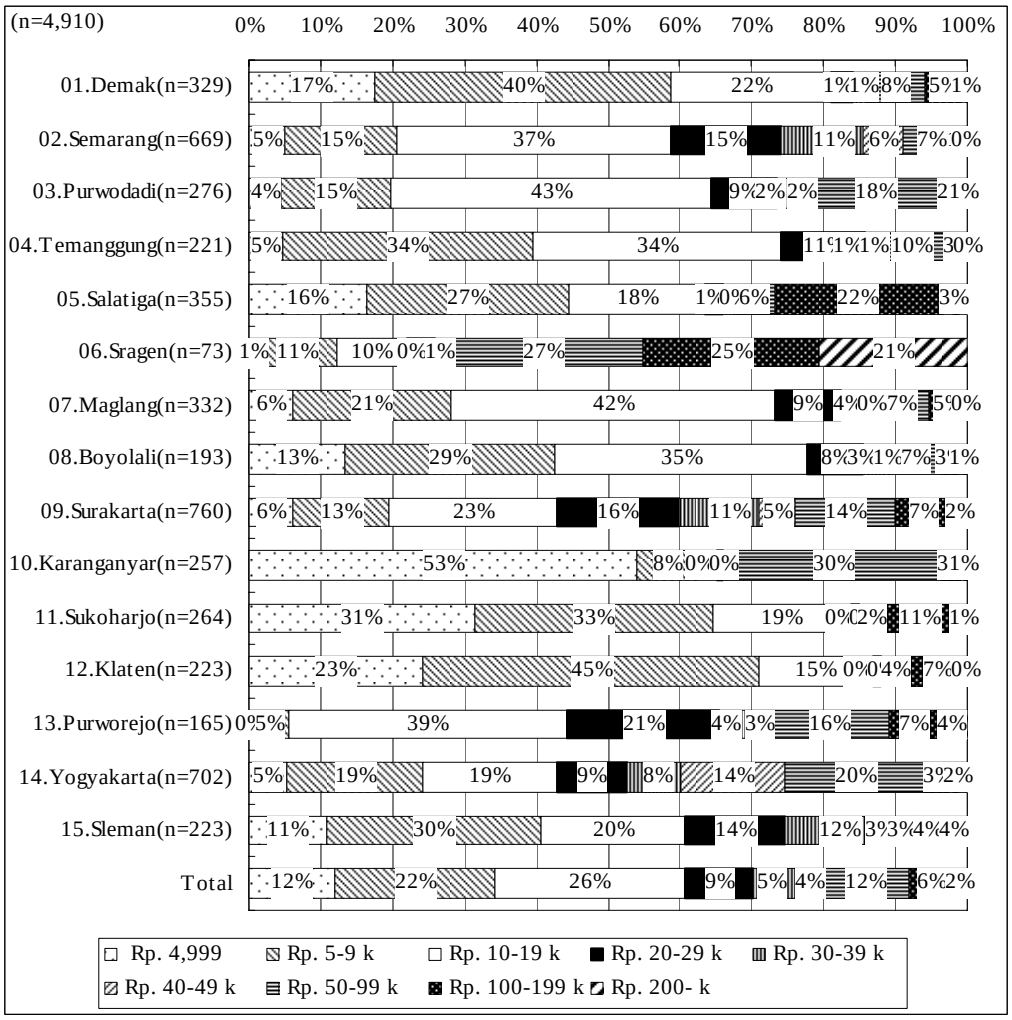



Source: CJRR Study Team, Road Traffic Survey, 2008

**Figure 1.2.21 Travel Time by Bus Terminals**

### e. Transportation Cost

Travel cost by bus terminals are shown below. Since bus terminals serve for intercity and inter-regency transport, approximately 64 % of passengers' travel cost exceeds Rp. 100,000.

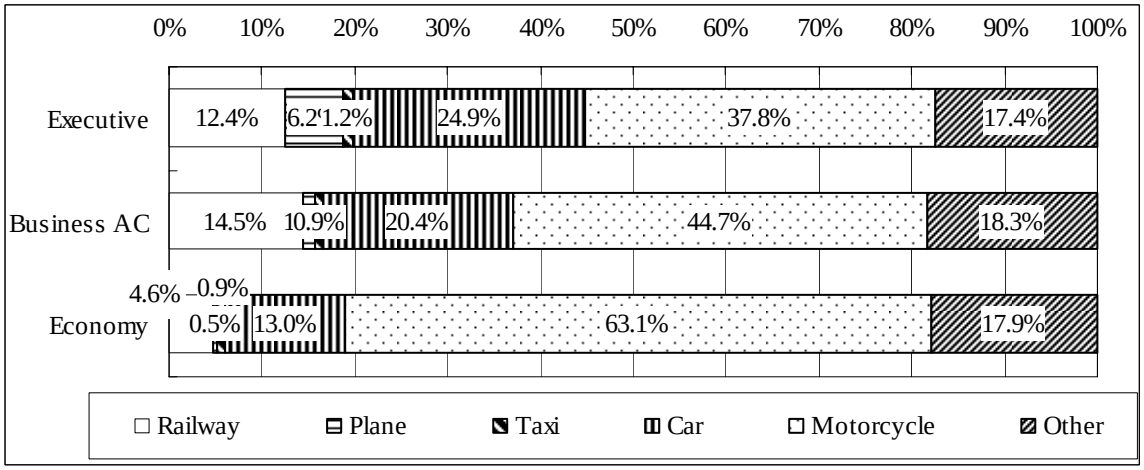



Source: CJRR Study Team, Road Traffic Survey, 2008

**Figure 1.2.22 Travel Cost by Bus Terminals**

### f. Alternative Transport Mode

Alternative transportation mode of bus by class is shown below. For executive class, the share of Plane and is comparatively larger than economy and business class.

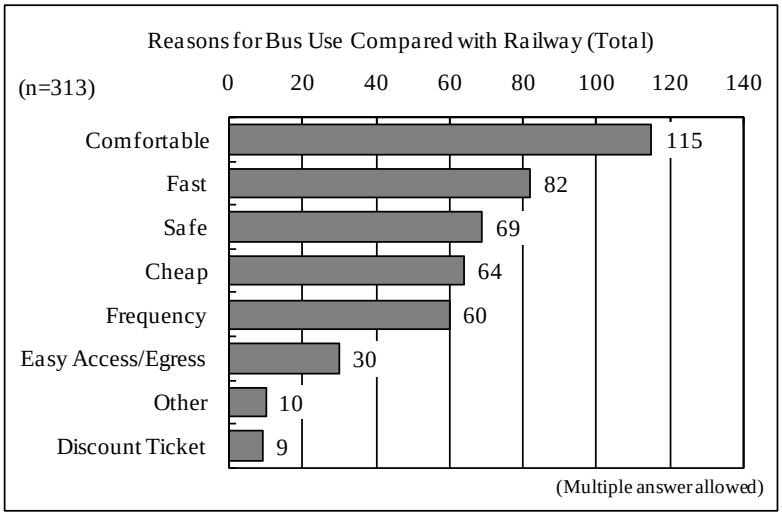



Source: CJRR Study Team, Road Traffic Survey, 2008

**Figure 1.2.23 Alternative Transportation Mode by Class**

### g. Reason for Bus Use

313 respondents answered their alternative transport mode is railway. Figure 1.2.24 shows their reasons for bus use. Regardless of class, most respondents answered that comfort is the reason for bus use instead of railway. Other major reasons were speed, safety, price and frequency, in that order. These passengers could potentially be railway users with improvement of these factors.




Source: CJRR Study Team, Road Traffic Survey, 2008

**Figure 1.2.24 Reasons for Bus Use**

### 5) Origin Destination Table Calibration and Analyses

#### a. Sampling Ratios

Sampling ratios by bus terminal by direction is shown below. 9,142 valid interview samples were surveyed and average sampling ration was 19.1%.

**Table 1.2.9 Sampling Ratios by Bus Terminals**

| City | Terminal | Direction | Number of Departure Passengers | No. of Valid Samples | Sampling Ratios |
|---|---|---|---|---|---|
| 01.Demak | Bintoro | West | 895 | 197 | 22.0% |
| 01.Demak | Bintoro | East | 977 | 85 | 8.7% |
| 01.Demak | Bintoro | Unknown | 82 | 8 | |
| 01.Demak | Bintoro | Total | 1,954 | 290 | 14.8% |
| 02.Semarang | Terboyo | West | 426 | 77 | 18.1% |
| 02.Semarang | Terboyo | South | 1,385 | 177 | 12.8% |
| 02.Semarang | Terboyo | East | 2,708 | 290 | 10.7% |
| 02.Semarang | Terboyo | Unknown | 18 | 97 | |
| 02.Semarang | Terboyo | Total | 4,537 | 641 | 14.1% |
| 03.Purwodadi | Purwodadi | West | 821 | 62 | 7.6% |
| 03.Purwodadi | Purwodadi | East | 282 | 125 | 44.3% |
| 03.Purwodadi | Purwodadi | South | 246 | 48 | 19.5% |
| 03.Purwodadi | Purwodadi | Unknown | 18 | 12 | |
| 03.Purwodadi | Purwodadi | Total | 1,367 | 247 | 18.1% |
| 04.Temanggung | Madureso | North | 91 | 47 | 51.6% |
| 04.Temanggung | Madureso | Southeast | 203 | 163 | 80.3% |
| 04.Temanggung | Madureso | Unknown | - | 1 | |
| 04.Temanggung | Madureso | Total | 294 | 211 | 71.8% |
| 05.Salatiga | Tingkir | North | 868 | 304 | 35.0% |
| 05.Salatiga | Tingkir | Unknown | 1 | | |
| 05.Salatiga | Tingkir | Total | 869 | 304 | 35.0% |
| 06.Sragen | Pilangsari | West | 216 | 63 | 29.2% |
| 06.Sragen | Pilangsari | East | 11 | 4 | 36.4% |
| 06.Sragen | Pilangsari | Unknown | - | 3 | |
| 06.Sragen | Pilangsari | Total | 227 | 70 | 30.8% |
| 07.Maglang | Tidar | South | 881 | 148 | 16.8% |
| 07.Maglang | Tidar | North | 975 | 116 | 11.9% |
| 07.Maglang | Tidar | Unknown | 4 | 16 | |
| 07.Maglang | Tidar | Total | 1,860 | 280 | 15.1% |
| 08.Boyolali | Boyolali | Southeast | 410 | 85 | 20.7% |
| 08.Boyolali | Boyolali | North | 420 | 93 | 22.1% |
| 08.Boyolali | Boyolali | Unknown | - | 13 | |
| 08.Boyolali | Boyolali | Total | 830 | 191 | 23.0% |
| 09.Surakarta | Tirtonadi | North | 181 | 48 | 26.5% |
| 09.Surakarta | Tirtonadi | West | 1,441 | 247 | 17.1% |
| 09.Surakarta | Tirtonadi | South | 391 | 59 | 15.1% |
| 09.Surakarta | Tirtonadi | East | 1,004 | 222 | 22.1% |
| 09.Surakarta | Tirtonadi | Southwest | 1,106 | 90 | 8.1% |
| 09.Surakarta | Tirtonadi | Unknown | 424 | 54 | |
| 09.Surakarta | Tirtonadi | Total | 4,547 | 720 | 15.8% |
| 10.Karanganyar | Jongke | West | 640 | 168 | 26.3% |
| 10.Karanganyar | Jongke | Unknown | - | | |
| 10.Karanganyar | Jongke | Total | 640 | 168 | 26.3% |
| 11.Sukoharjo | Sukoharjo | South | 258 | 142 | 55.0% |
| 11.Sukoharjo | Sukoharjo | North | 114 | 58 | 50.9% |
| 11.Sukoharjo | Sukoharjo | Unknown | 6 | 18 | |
| 11.Sukoharjo | Sukoharjo | Total | 378 | 218 | 57.7% |
| 12.Klaten | Jongrangan | West | 454 | 89 | 19.6% |

| | | | | | |
|---|---|---|---|---|---|
| 12.Klaten | Jongrangan | East | 370 | 117 | 31.6% |
| 12.Klaten | Jongrangan | Unknown | 7 | 1 | |
| 12.Klaten | Jongrangan | Total | 831 | 207 | 24.9% |
| 13.Purworejo | Purworejo | West | 192 | 59 | 30.7% |
| 13.Purworejo | Purworejo | East | 239 | 92 | 38.5% |
| 13.Purworejo | Purworejo | Unknown | - | 7 | |
| 13.Purworejo | Purworejo | Total | 431 | 158 | 36.7% |
| 14.Yogyakarta | Giwangan | West | 654 | 171 | 26.1% |
| 14.Yogyakarta | Giwangan | South | 469 | 104 | 22.2% |
| 14.Yogyakarta | Giwangan | East | 1,472 | 176 | 12.0% |
| 14.Yogyakarta | Giwangan | North | 1,038 | 182 | 17.5% |
| 14.Yogyakarta | Giwangan | Unknown | 7 | 25 | |
| 14.Yogyakarta | Giwangan | Total | 3,640 | 658 | 18.1% |
| 15.Sleman | Jombor | South | 287 | 102 | 35.5% |
| 15.Sleman | Jombor | North | 1,222 | 91 | 7.4% |
| 15.Sleman | Jombor | Unknown | 1 | 14 | |
| 15.Sleman | Jombor | Total | 1,510 | 207 | 13.7% |
| Total | | | 47,830 | 9.140 | 19.1% |

Source: CJRR Study Team, Road Traffic Survey, 2008

**b. Methodology**

Origin and destination table of bus users in the Central Java region was calibrated by bus passenger count survey and bus OD interview survey results. Expansion factor by train by survey station were calculated by dividing boarding passengers of the bus by the number of OD survey respondents. Since the passengers who will alight at non-surveyed terminals can represent boarding passengers at non-surveyed terminals, these samples with opposite OD were added for OD table. The number of passenger of survey locations which surveyed less than 24 hours, expansion factors for 24 hours are multiplied.

**Table 1.2.10 Expansion Factors for 24 Hours**

| Survey Hours | Expansion Factors |
|---|---|
| 9 | 1.892 |
| 10 | 1.625 |
| 11 | 1.415 |
| 12 | 1.289 |
| 13 | 1.241 |
| 14 | 1.205 |
| 24 | 1.000 |

Source: CJRR Study Team, Estimates based on Road Traffic Survey, 2008

### c. Origin Destination Table by Large Zone

The estimated daily OD table of bus passengers is shown below.

**Table 1.2.11 Bus Passenger OD Table in the Central Java Region by Analysis Zone**

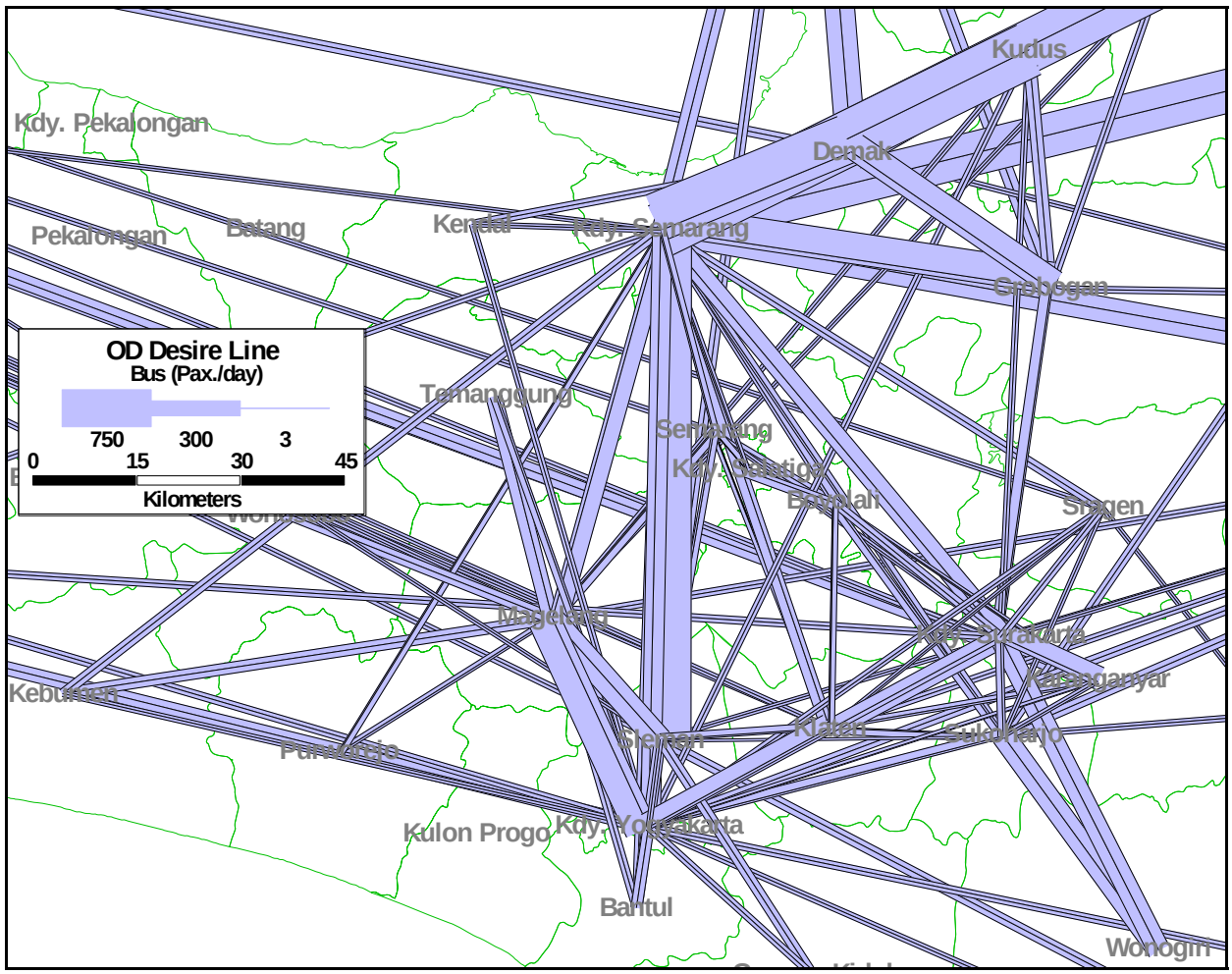
[Unit: passengers per day]

| | Bo | De | Es | Kl | Ku | Ma | Pu | Sa | Sm | Sr | Su | Ws | Yo | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bo | 21 | 7 | 103 | 23 | 6 | 24 | 7 | 168 | 166 | 17 | 228 | 148 | 48 | 966 |
| De | 8 | 341 | 740 | 8 | | 35 | 146 | 62 | 771 | 15 | 28 | 382 | 41 | 2,575 |
| Es | 63 | 70 | 303 | 149 | 40 | 148 | 52 | 128 | 274 | 30 | 138 | 571 | 389 | 2,357 |
| Kl | 98 | 38 | 123 | 83 | 16 | 19 | 12 | 26 | 91 | 13 | 397 | 262 | 420 | 1,598 |
| Ku | | | 54 | | | | 8 | | 37 | 4 | 10 | | 27 | 141 |
| Ma | 19 | 19 | 218 | 15 | 15 | 237 | 25 | 160 | 311 | 17 | 48 | 724 | 802 | 2,609 |
| Pu | 20 | 404 | 411 | 14 | | | 139 | 30 | 544 | 22 | 224 | 339 | 60 | 2,207 |
| Sa | 224 | 14 | 254 | 115 | | 49 | 26 | 218 | 163 | 7 | 97 | 415 | 92 | 1,676 |
| Sm | 58 | 219 | 1,958 | 171 | 6 | 69 | 92 | 58 | 74 | 30 | 204 | 451 | 269 | 3,658 |
| Sr | 30 | | 44 | 37 | | 6 | 3 | 41 | 68 | 17 | 57 | 378 | 80 | 761 |
| Su | 191 | 35 | 1,317 | 183 | | 47 | 46 | 157 | 404 | 100 | 1,139 | 992 | 437 | 5,047 |
| Ws | 28 | 38 | 644 | 81 | 6 | 272 | 33 | 124 | 232 | 11 | 216 | 510 | 475 | 2,670 |
| Yo | 77 | 7 | 981 | 123 | 50 | 458 | 70 | 198 | 924 | 12 | 300 | 1,226 | 455 | 4,879 |
| Total | 837 | 1,192 | 7,150 | 1,001 | 139 | 1,363 | 660 | 1,370 | 4,058 | 295 | 3,086 | 6,397 | 3,597 | 31,145 |

Analysis Zone: Bo = Kab. Boyolali, De = Kab. Demak, Es = Eastern Area of the Semarang-Solo-Yogyakarta Corridor (external zone), Kl = Kab. Klaten, Ku = Kab. Kulon Progo, Ma = Kab. Magelang and Kota Magelang, Pu = Kab. Grobogan, Sa = Kab. Salatiga and Kota Salatiga, Sm = Kota Semarang, Sr = Sragen, Su = Kota Solo (Sulakarta) and Kab. Kranganyar, Ws = Western Area of the Semarang-Solo-Yogyakarta Corridor (external zone), Yo = Kab. Sleman, Kab. Bantul and Kota Yogyakarta
Source: CJRR Study Team, Road Traffic Survey, 2008

### d. Desire Line of Bus Passengers

Figure 1.2.25 depicts the desire line of bus passenger in the Central Java region. While the number of passenger between Semarang and northeast kabupaten such as Demak and Kudus are comparatively larger than other hinterland of Semarang city such as Kendal and Kabupaten Semarang. It is presumed that survey results were affected by location of bus terminal. Since Terboyo (Semarang) bus terminal is located in the north east of Semarang City, passengers from center of Semarang city to northwest direction cities use Terboyo bus terminal. On the other hand, passengers from center of Semarang city to other direction, they usually board at roadside in CBD of Semarang city.




Note: Desire lines which have less than ??? passenger /day for one direction are excluded.
Source: CJRR Study Team, Road Traffic Survey, 2008

**Figure 1.2.25 Desire Line of Bus Passengers in Semarang – Solo – Yogyakarta Corridor**

## 1.3 Travel Speed Survey

### 1) Survey Objective

In order to compare the travel time for automobiles and buses with that of trains, the variation in automobile travel time is analyzed to obtain its competitiveness in relation to trains. Furthermore, congestion bottlenecks and its causes were also investigated.

### 2) Survey Contents

#### a. Survey Routes

Survey the 7 main trunk road routes in the Yogyakarta - Solo - Semarang sector that are believed to be in competition with the railways. (See Figure 1.3.1) Each route was divided into sections by city, intersection of arterial road, border of kabupaten/kota, large river and other geographical features.

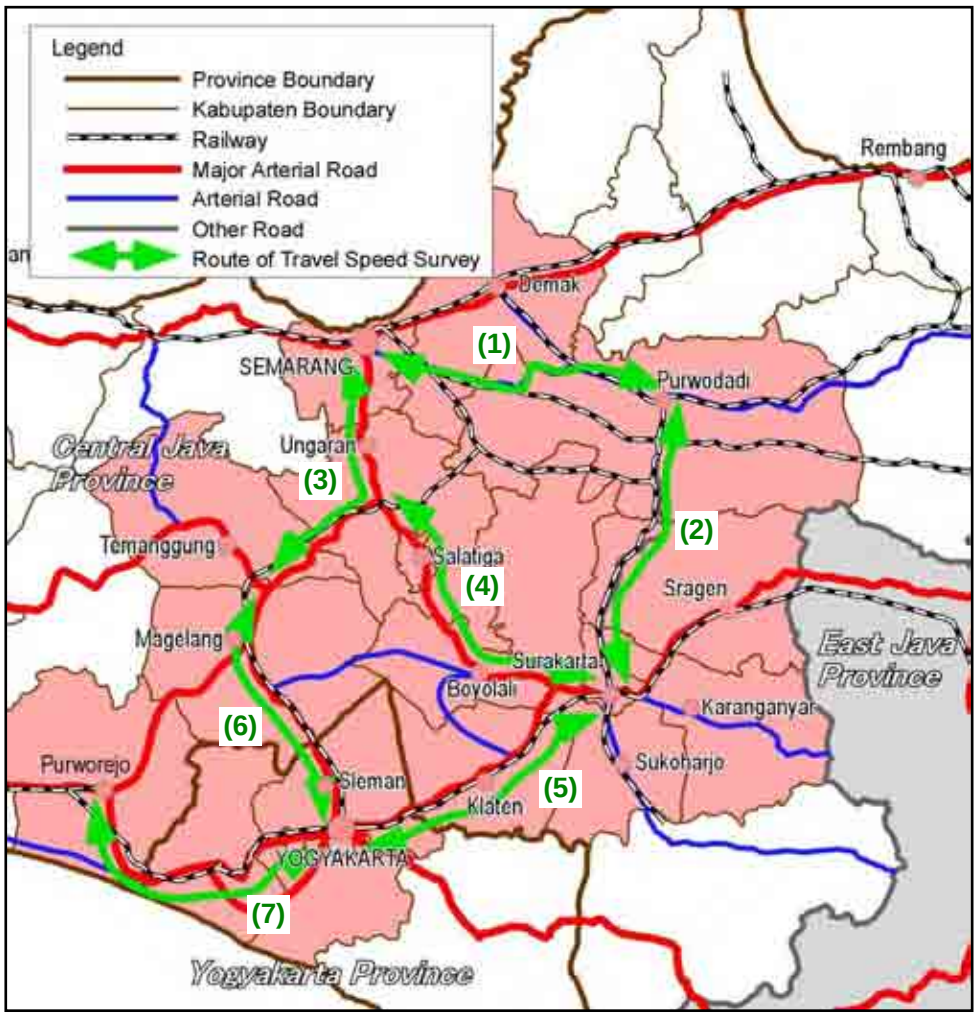



**Figure 1.3.1 Route covered by Travel Speed Survey**

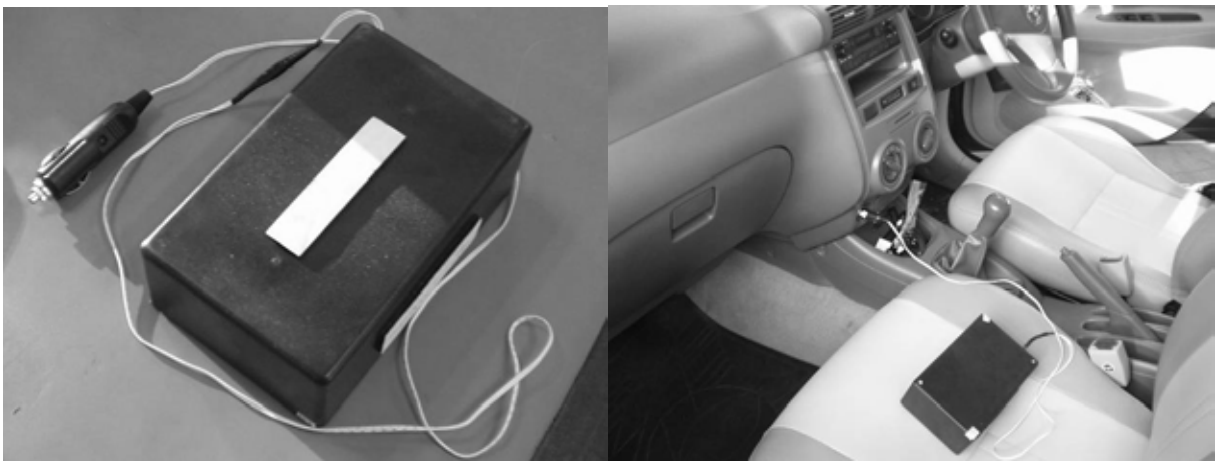
### b. Survey Method

A survey vehicle equipped with a GPS (Global Positioning System) device, which could transmit positional data at every 30 seconds via GPRS (General Packet Radio Service) were utilized and travel speed were calculated. A set of devices were installed on the survey vehicle (See Source: CJRR Study Team, Travel Speed Survey, 2008

Figure 1.3.2).

### c. Survey Period and Duration

Travel speed data of two directions 3 times a day (morning, lunch, evening) at each route were surveyed. The survey was conducted on weekday of Tuesday, Wednesday and Thursday, 3rd - 5th and 18th in June.



Source: CJRR Study Team, Travel Speed Survey, 2008

**Figure 1.3.2 GPS device for Travel Speed Survey**

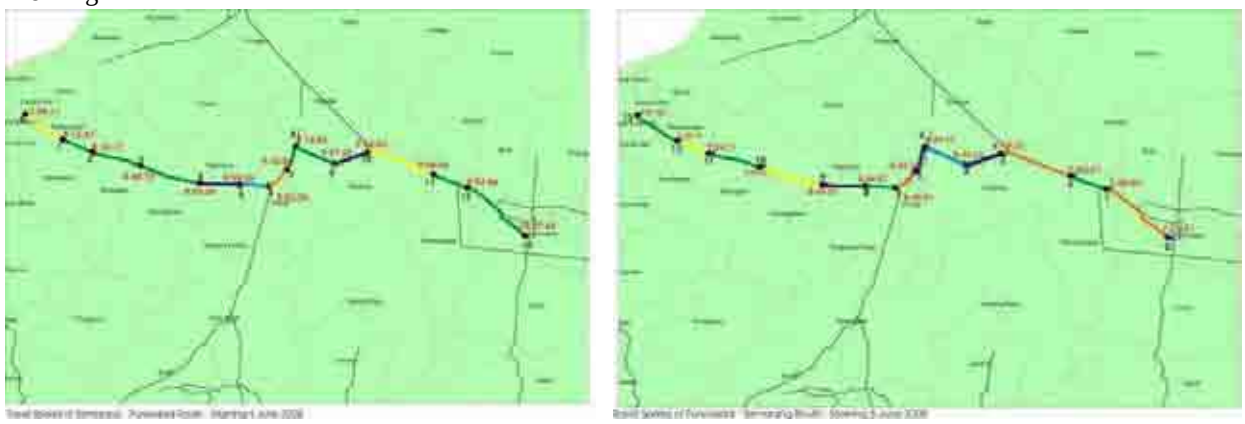
**3) Survey Results**

Travel Speed Survey results are shown below. Each route is divided by several sections and colored by travel speed categories.

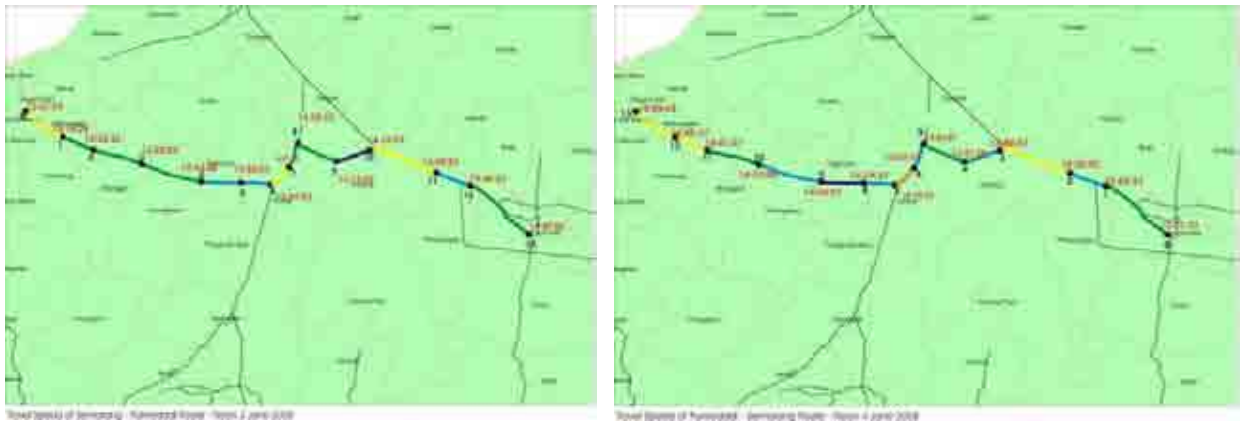
### a. Semarang - Purwodadi

Semarang - Purwodadi | Purwodadi - Semarang

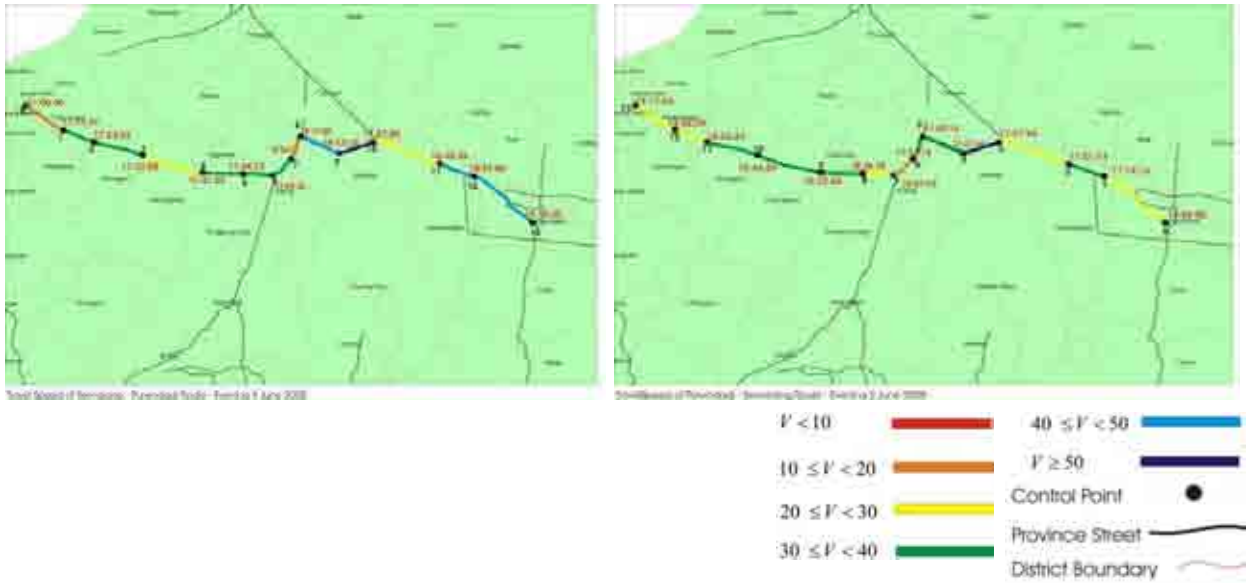
Morning



Noon



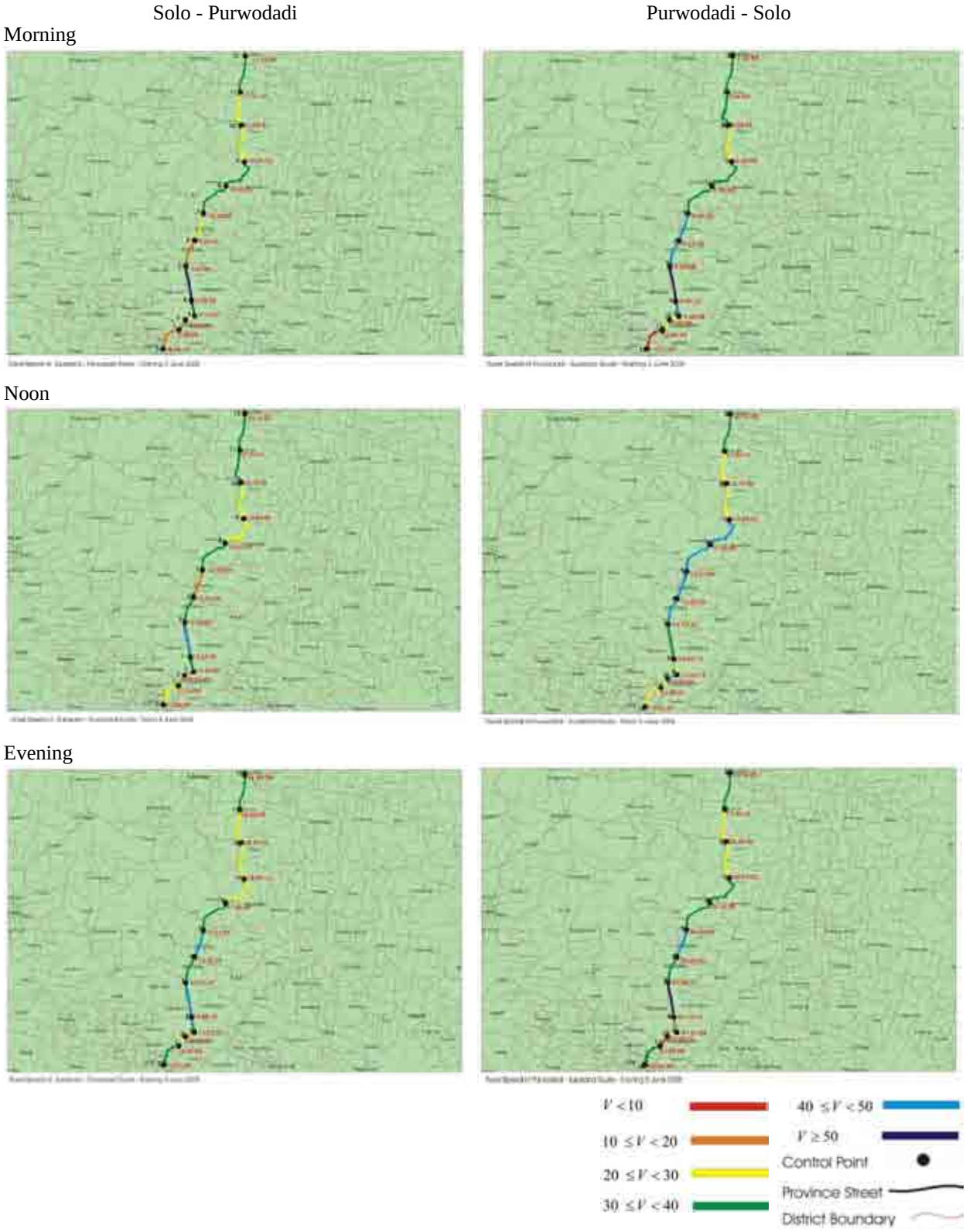
Evening




Source: CJRR Study Team, Travel Speed Survey, 2008

**Figure 1.3.3 Travel Speed of Semarang – Purwodadi Route**

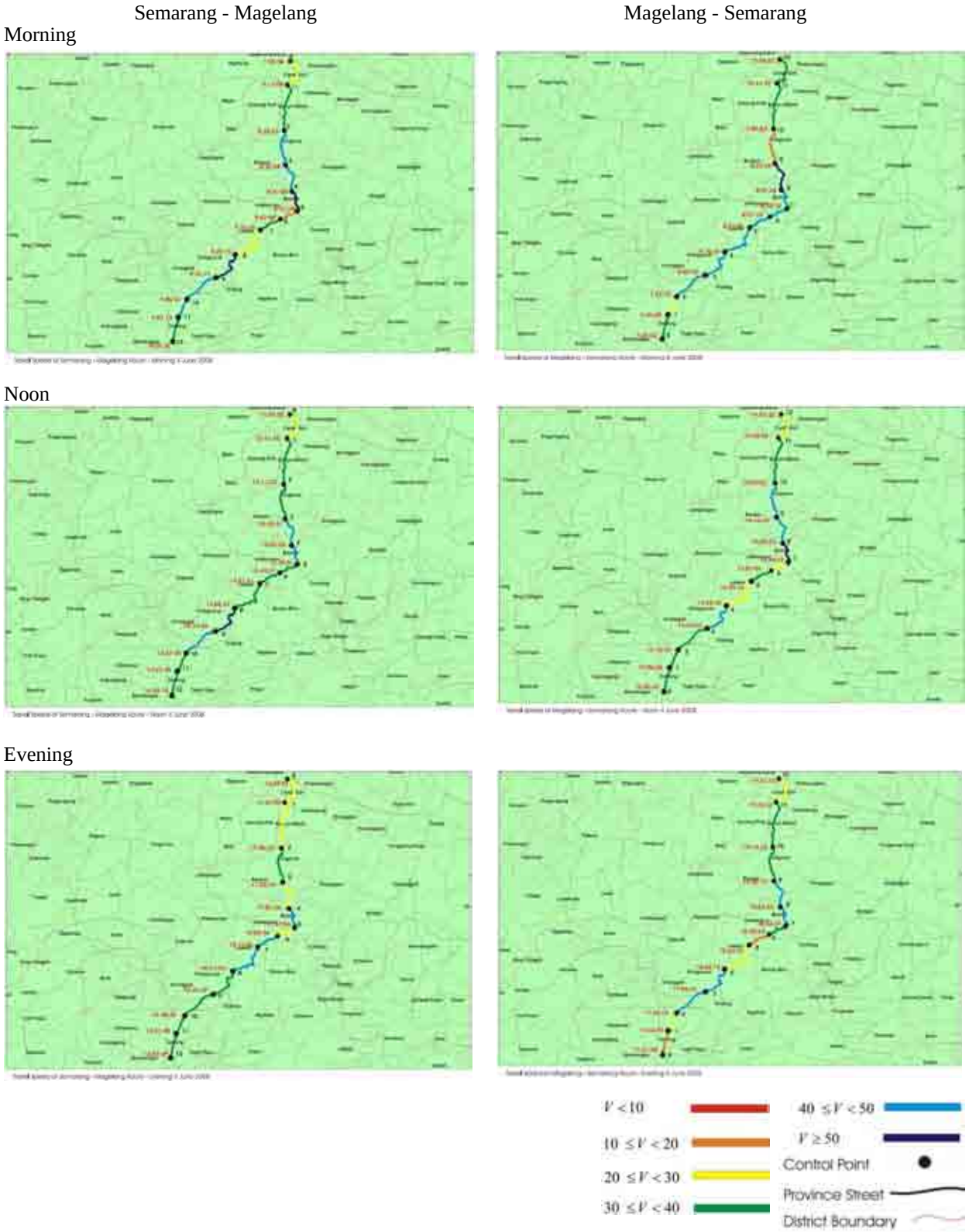
**b. Solo – Purwodadi**




Source: CJRR Study Team, Travel Speed Survey, 2008

**Figure 1.3.4 Travel Speed of Semarang – Purwodadi Route**

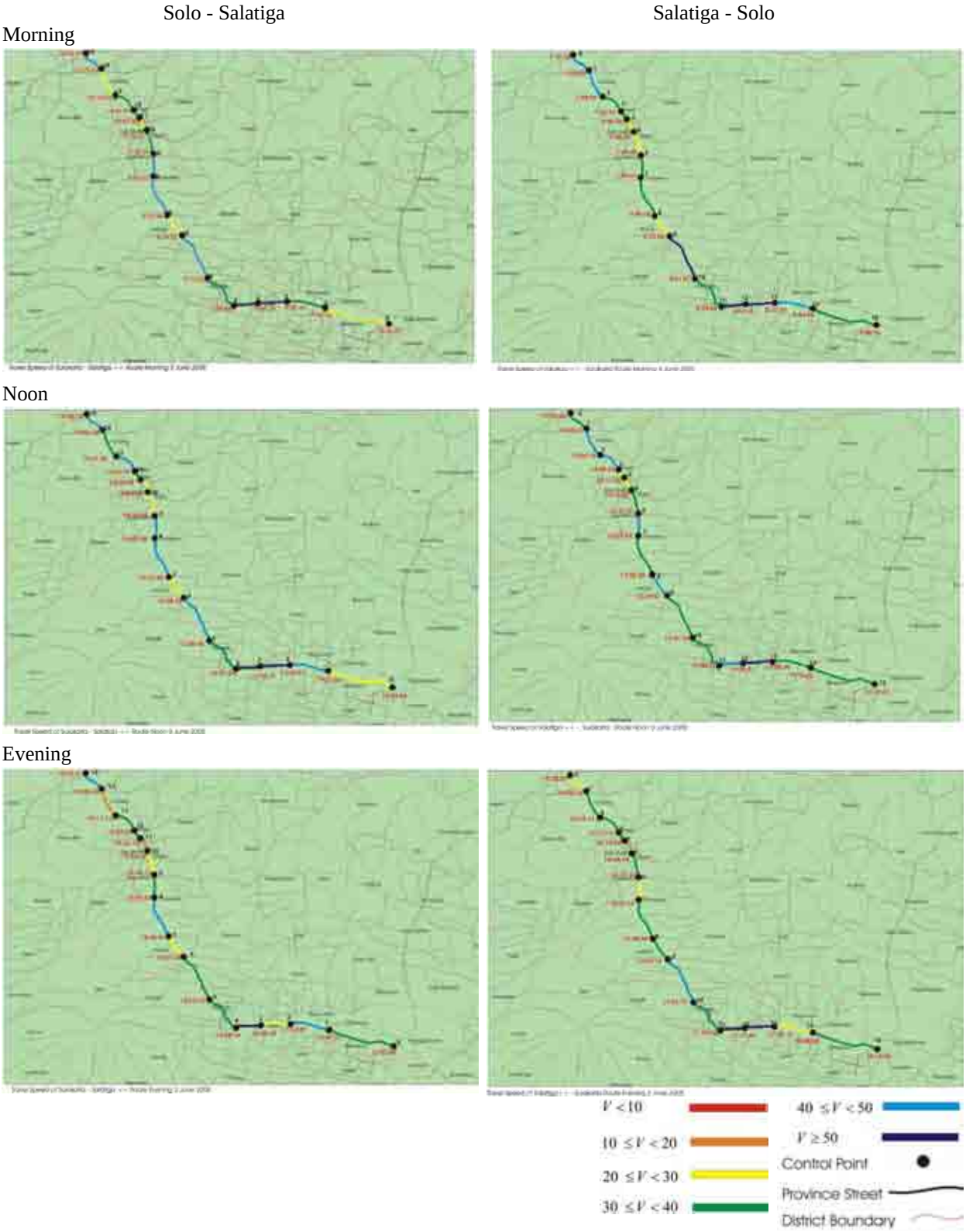
### c. Semarang - Magelang




Source: CJRR Study Team, Travel Speed Survey, 2008

**Figure 1.3.5 Travel Speed of Semarang – Magelang Route**

**d. Solo - Salatiga**




Source: CJRR Study Team, Travel Speed Survey, 2008

**Figure 1.3.6 Travel Speed of Solo – Salatiga Route**

### e. Yogyakarta – Solo

Yogyakarta - Solo | Solo - Yogyakarta

Morning

Noon

Evening


Source: CJRR Study Team, Travel Speed Survey, 2008

**Figure 1.3.7 Travel Speed of Yogyakarta – Solo Route**

### f. Yogyakarta - Magelang

Yogyakarta - Magelang | Magelang - Yogyakarta

Morning

Noon

Evening


Source: CJRR Study Team, Travel Speed Survey, 2008

**Figure 1.3.8 Travel Speed of Yogyakarta – Magelang Route**

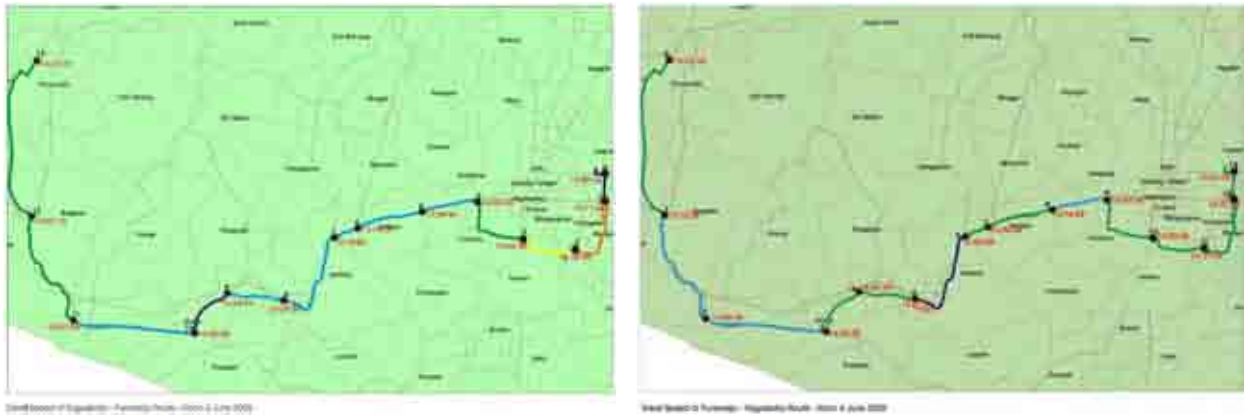
### g. Yogyakarta Purworejo

Yogyakarta - Purworejo

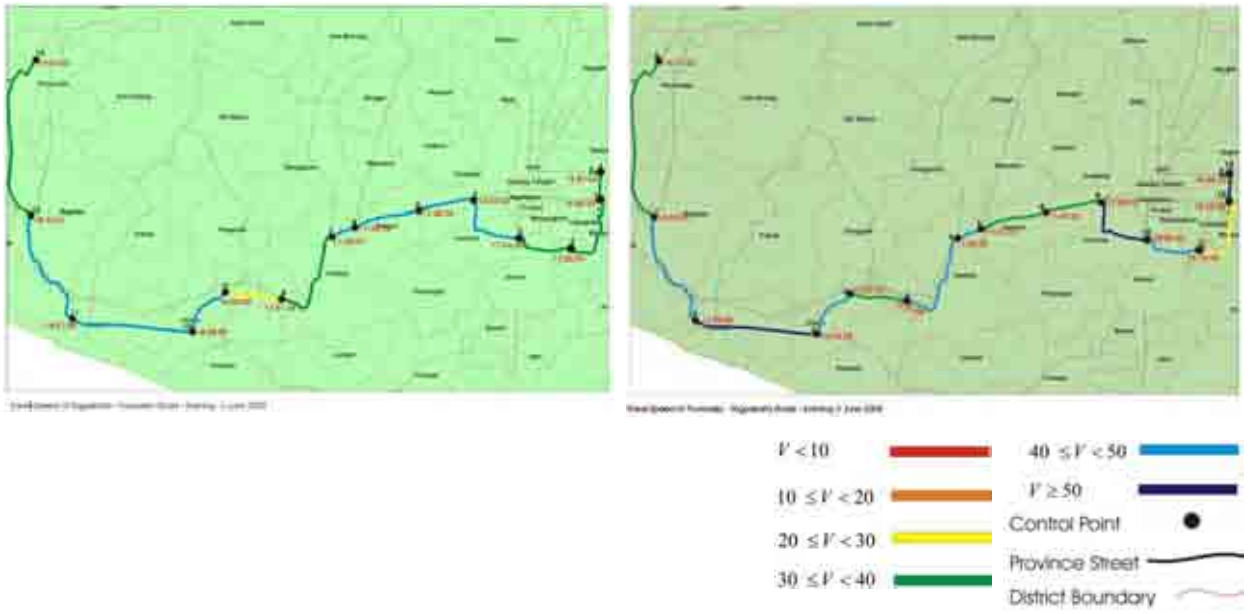
Purworejo - Yogyakarta

Morning

Noon



Evening




Source: CJRR Study Team, Travel Speed Survey, 2008

**Figure 1.3.9 Travel Speed of Yogyakarta – Purworejo Route**

## 1.4 Stated Preference Survey

### 1) Survey Objective

This survey was aimed at investigating the characteristics of travel taken by the community within the scope of commuter train service plan. The travel characteristics include travel origin and destination, transportation mode being used, departure time, travel time, and travel frequency. In addition, the survey was aimed at investigating the responses of the community regarding the plan of commuter train passing through their living area and looking at their desire to use the transportation service. From the survey, it is expected that the enthusiasm of the community to use commuter train can be investigated and the ability of the community to use the commuter train can be assessed.

### 2) Survey Method

In the survey, surveyor interviewed communities living in the scope of the commuter train area. Surveyor came to the residents' houses, door to door, located in plan area of commuter train. In order to get reliable data, surveyor prioritized residents living near the station.

Firstly, the surveyor asked personal and family data of the respondent. During this interview, the surveyor recorded the travel characteristics of the respondent. Subsequently, surveyor explained the plan of commuter train, including the concept and service plan. After the information the surveyor gave was seemed sufficient, the surveyor asked for respondent's response to the presence of commuter train.

### 3) Survey Location and Samples

The survey was conducted in Central Java region, which had high potential of travel demand for commuter train. In Central Java, furthermore, there are three cities of business centers and play as the center of economical activity and study. The cities are Semarang, Surakarta and Yogyakarta. The scope of this commuter train investigated in this survey included the three regions and their buffer areas, including Wates, Yogyakarta, Klaten, Solo, Sragen, Semarang, Purwodadi, Demak, and Kendal. Furthermore, the survey area was divided into several zones, i.e. Wates – Yogyakarta segment, Yogyakarta – Klaten segment, Adi Sucipto Yogyakarta Airport, Klaten – Solo segment, Solo-Sragen segment, Semarang – Brumbung segment, Semarang – Kendal segment and Semarang – Demak segment. The sample of the survey included citizens living around the corridors potential to use train. The detail of survey location and number of sample is presented in the following table.

**Table 1.4.1 Survey Location and Number of Sample**

| No | Survey Location | Number of Sample |
|---|---|---|
| 1. | Wates – Yogyakarta Segment | 300 |
| 2. | Yogyakarta – Klaten Segment | 300 |
| 3. | Adi Sucipto Yogyakarta Airport | 200 |
| 4. | Klaten – Solo Segment | 300 |
| 5. | Solo – Sragen Segment | 301 |
| 6. | Semarang – Brumbung Segment | 300 |
| 7. | Semarang – Kendal Segment | 302 |
| 8. | Semarang – Demak Segment | 293 |
| | Total | 2,296 |

### 4) Survey Time Period

This survey was conducted in 25 August 2008 – 2 September 2008.

### 5) Summary of Questions

The following is the list of survey questions.

**Table 1.4.2 List of Survey Questions**

| ID Group | Group of Question | Detail Information | |
|---|---|---|---|
| A | Information of Household | 1 | Vehicle ownership |
| | | 2 | Income (Rupiahs) |
| | | 3 | Number of Family Member |
| | | 4 | Number of Adult Family Member |
| | | 5 | Number of Adult & Working Family Member |
| | | 6 | Time needed to go to train station by walk |
| B | Information of Personal Data | 1 | Gender |
| | | 2 | Social Status |
| | | 3 | Driving License |
| | | 4 | Car Availability |
| | | 5 | Motorcycle Availability |
| C | Travel Detail | 1 | Trip Purpose |
| | | 2 | Departure time |
| | | 3 | Total Travel Time |
| | | 4 | Transportation Mode |
| | | 5 | Travel Type |
| | | 6 | Weekly Travel Intensity |
| | | 7 | Monthly Travel Intensity |
| | | 8 | Public Transport Cost |
| | | 9 | Taxi Cost |
| | | 10 | Car Operation Cost (Monthly) |
| | | 11 | Motorcycle Operation Cost (Monthly) |
| D | Willingness & Ability to pay | 1 | Tariff of Rp 2,500 |
| | | 2 | Tariff of Rp 5,000 |
| | | 3 | Tariff of Rp 7,500 |
| | | 4 | Tariff of Rp 10,000 |
| | | 5 | Reason of Not Using Train Service |

Source: CJRR Study Team, Stated Preference Survey, 2008

### 6) Result of Survey

In the implementation of the survey, there are several problems encountered. The largest problem is on the process of data input. The followings are problems found in the preparation

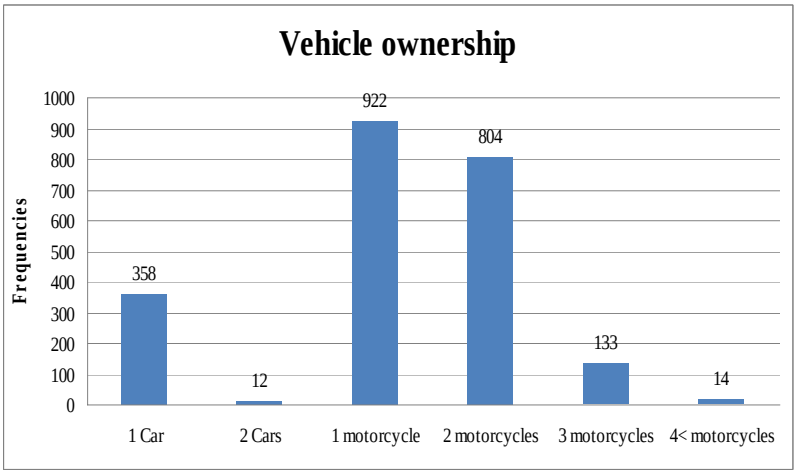
and implementation of the survey.

- The first problem is related to bureaucracy. It takes too long time to issue the license to enter the passenger waiting room in Adisutjipto airport (until one week), while it takes only three days to complete the survey.
- The second problem is the difficulty to meet respondents, particularly for those living in elite settlement area, because most of them have no time to be interviewed. Consequently, the survey was conducted at night in order to increase the possibility to meet the appropriate respondents.
- The greatest problem is found during the data inputting process, in which most respondents have no sufficient information regarding names of village or sub-district of their travel destination. Information which can be acquired includes names of street or landmark of the areas. Therefore, the data input person needs to trace the location in accordance to additional information from the complete regional map. It surely takes much time.

## A. Household Information

### A.1) Vehicle ownership

In accordance to the data on motor vehicle ownership, majority of respondents owned motorcycle, consisted of 804, 922 and 147 respondents owning 2 motorcycles, 1 motorcycle and more than 2 motorcycles, respectively. Furthermore, respondents who owned car amount for 370 respondents, consisted of 358 respondents owning one car and 12 respondents owning two cars for each respondent. The detail of number of respondents by vehicle ownership is presented in figure 1.

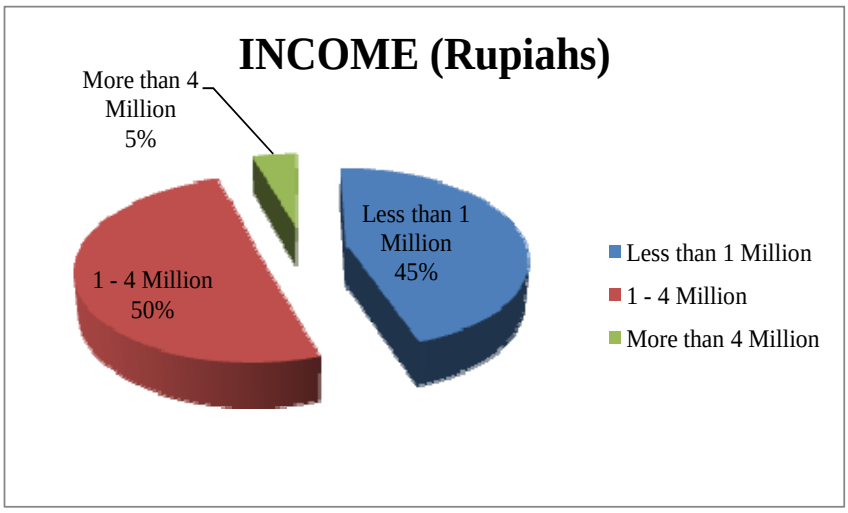



Source: CJRR Study Team, Stated Preference Survey, 2008

**Figure 1.4.1 Number of Respondents by Vehicle Ownership**

A.2)Income

The result of the survey data shows that 50% respondents have income rate between 1 and 4 million rupiah per month. Respondents who have income rate less than 1 million per month amount for 46% of all respondents. Furthermore, respondents who have income rate more than 4 million per month amount for 4%. The detail of number of respondents by income is presented in figure 2.

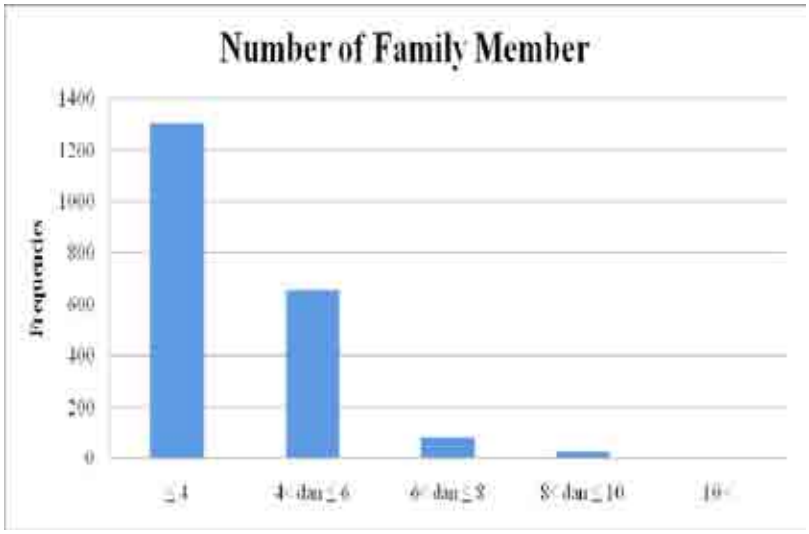



Source: CJRR Study Team, Stated Preference Survey, 2008

**Figure 1.4.2 Number of Respondents by Income**

A.3)Number of Family Member

The result of the survey showed that 1304 respondents have family member of less than 4 persons while 661 respondents have family member between 4 and 6 persons. Furthermore, respondents who have family member between 6 and 8 persons and more than 8 persons amount for 88 and 29 respondents, respectively. The detail of number of respondents by number of family member is presented in figure 3.

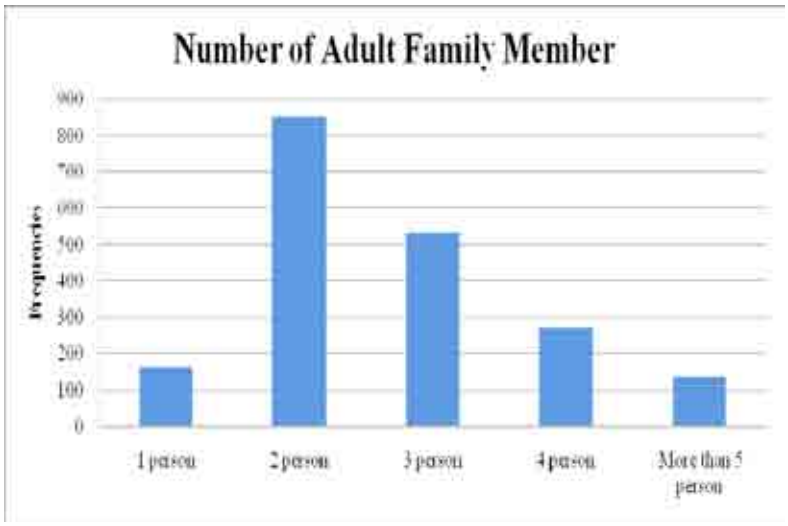



Source: CJRR Study Team, Stated Preference Survey, 2008

**Figure 1.4.3 Number of Respondents by Number of Family Member**

A.4)Number of Adult Family member

Number of adult family number within most of respondents' family is two persons (852 respondents). Furthermore, respondents who have adult family member of 3 persons and more than 3 persons are 533 and 410 respondents, respectively. The detail of number of respondents by the number of adult family member is presented in figure 4.



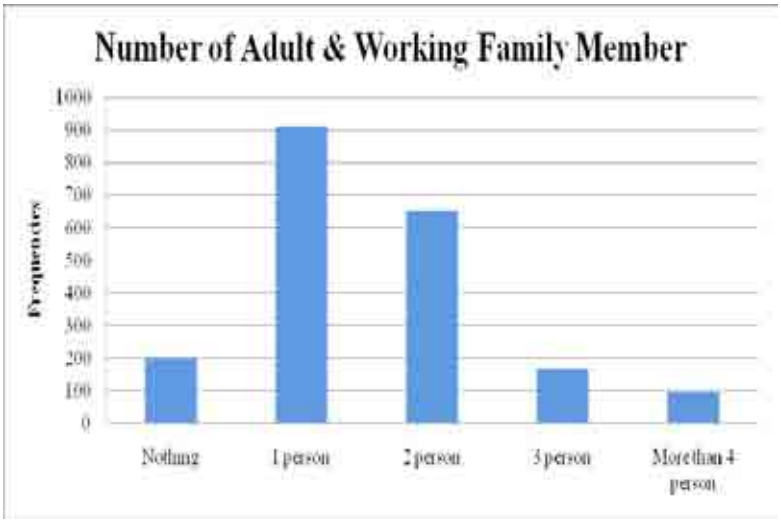

Source: CJRR Study Team, Stated Preference Survey, 2008

**Figure 1.4.4 Number of Respondents by The Number of Adult Family Member**

A.5)Number of adult and working family member

Most respondents stated that they had one adult, working family member, usually the family head. This surely has significant impact on the frequency of travel of the family. Respondents who had one adult, working family member amount for 913 respondents while those who had 2,

3 or more and no adult, working family member amount for 654, 259 and 196 respondents. The more the number of working family number is, the greater the number of travel demand. The detail of number of respondents by the number of adult, working family member is presented in figure 5.

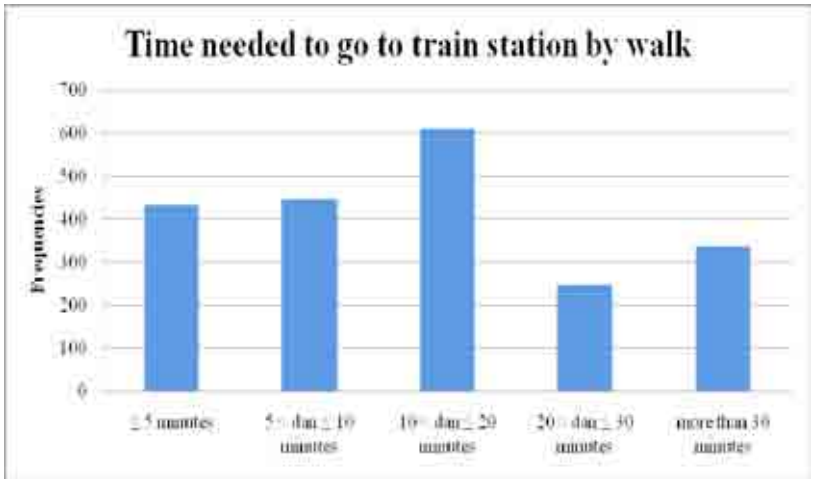



Source: CJRR Study Team, Stated Preference Survey, 2008

**Figure 1.4.5 Number of Respondents by The Number of Adult, Working Family Member**

A.6)Time needed to go to train station by walk

Most of respondents, 612 respondents, stated that they needed 10 to 20 minutes to arrive at the station by foot. Furthermore, respondents who needed less than 5 minutes, 5 to 10 minutes and more than 20 minutes to arrive at the station by foot amounted for 433, 488 and 585 respondents. The detail of number of respondents by time need to go to train station by walk is presented in figure 6.



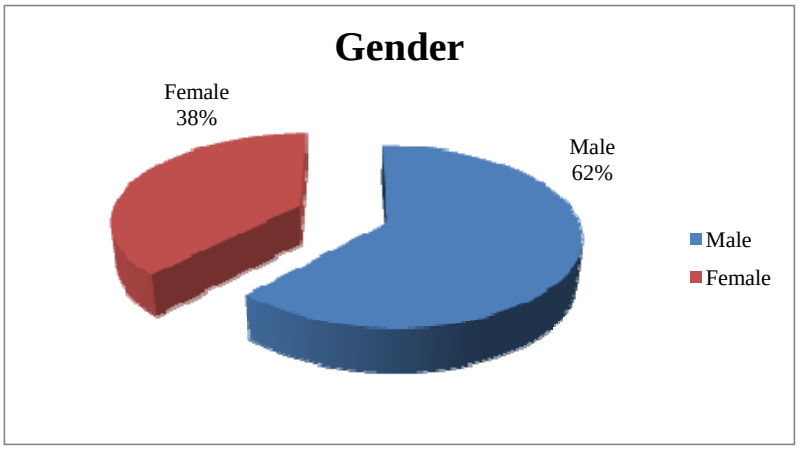

Source: CJRR Study Team, Stated Preference Survey, 2008

**Figure 1.4.6 Number of Respondents by Time Need to Go to Train Station by Walk**

## B. Personal Information

### B.1) Gender

The sample of this survey consisted of 1286 males (62%) and 791 females (38%).

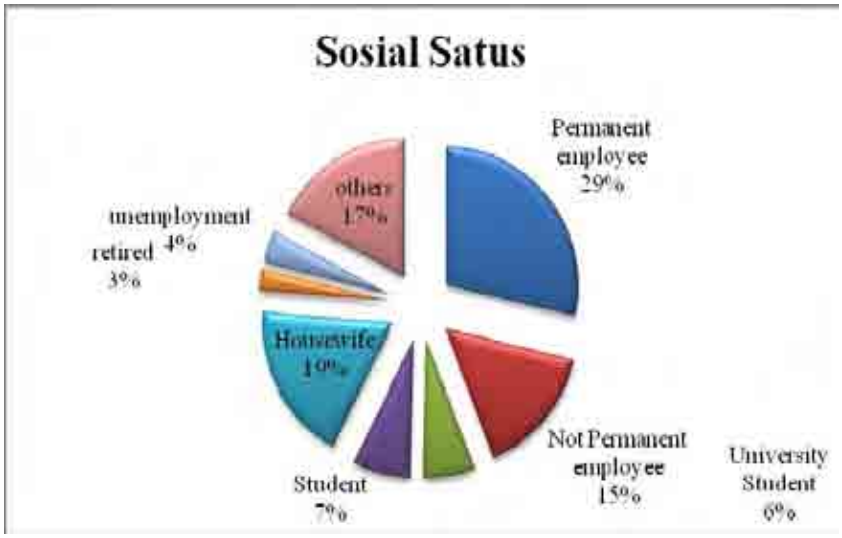



Source: CJRR Study Team, Stated Preference Survey, 2008

**Figure 1.4.7 Percentage Of Respondents By Gender**

### B.2) Social status

Regarding the social status, respondents of the survey were permanent employee, non permanent employee, housewife, students, unemployment, retired and others. The percentage of respondents by social status is presented in the following figure.




Source: CJRR Study Team, Stated Preference Survey, 2008

**Figure 1.4.8 Percentage Of Respondents By Social Status**

B.3) Driving Licenses

As for driver's license, about 2% of respondents only hold car license, about 58% of respondents only hold motorcycle license, 10% of respondents hold both licenses, and 30% of respondents do not have a driver's license. The detail of number of respondents by possession of driving license is presented in figure 9.


Source: CJRR Study Team, Stated Preference Survey, 2008

**Figure 1.4.9 Number Of Respondents By Possession Of Driving License**

B.4) Car Availability

In terms of car availability, 77% respondents said that they had no car available. Only did 13% respondents say that they had car available and 10% respondents say that they sometimes had car available.


Source: CJRR Study Team, Stated Preference Survey, 2008

**Figure 1.4.10 Percentage Of Respondents Which Have Car Availability**

B.5) Motorcycle Availability

For motorcycle availability, 57% respondents said that they had motorcycle available. Furthermore, 27% respondents said that they sometimes had motorcycle available and 15% respondents said that they had no motorcycle available.

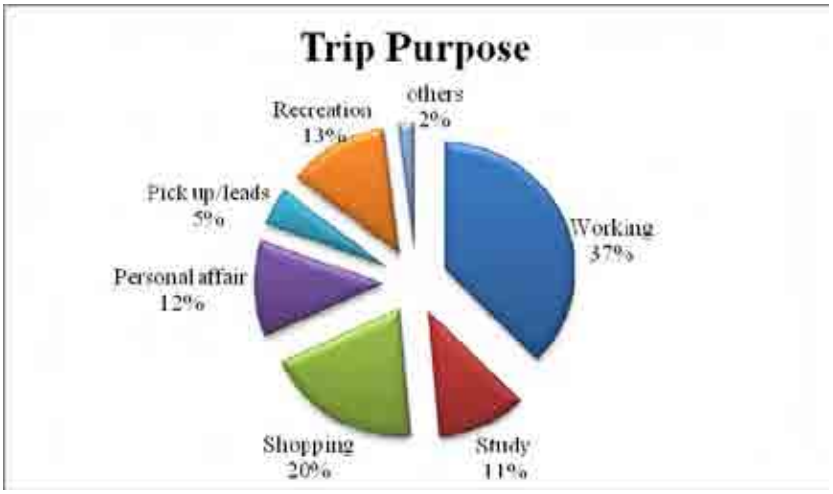

Source: CJRR Study Team, Stated Preference Survey, 2008

**Figure 1.4.11 Percentage Of Respondents Which Have Motorcycle Availability**

## C. Detail of Respondents' Trip

C.1) Trip Purpose

Most respondents stated that they traveled for work (761 respondents or 37%). Other trip purposes included study, shopping, personal affair, pick up/leads and recreation. The detailed number of respondents by trip purposes is presented in figure 12.



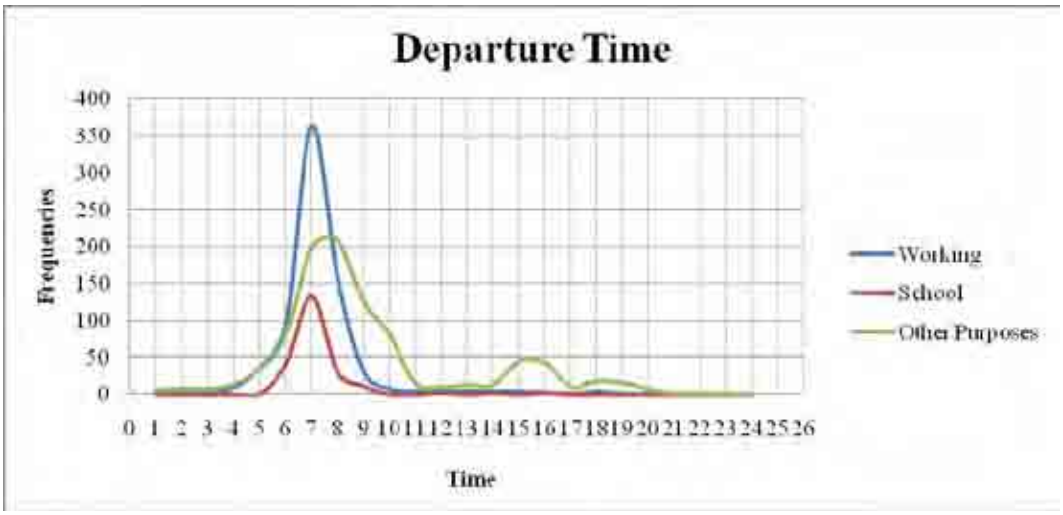

Source: CJRR Study Team, Stated Preference Survey, 2008

**Figure 1.4.12 Percentage Of Respondents By Trip Purpose**

C.2) Departure time

Most respondents who traveled for work and school usually leave between 6.00 and 7.00 am. Furthermore, the numbers of respondents who traveled for work and school on the time span were 364 and 133 respondents, respectively.

Respondents who traveled for purpose other than work and school tended to have various departure time characteristics. Respondents traveling between 7.00 and 8.00 am amounted for 209 respondents and those traveling between 6.00 and 7.00 amounted for 199 respondents. Other favorable departure time was between 2.00 and 3.00 pm (45 respondents). The detail of number of respondents by departure time is presented in figure 13.

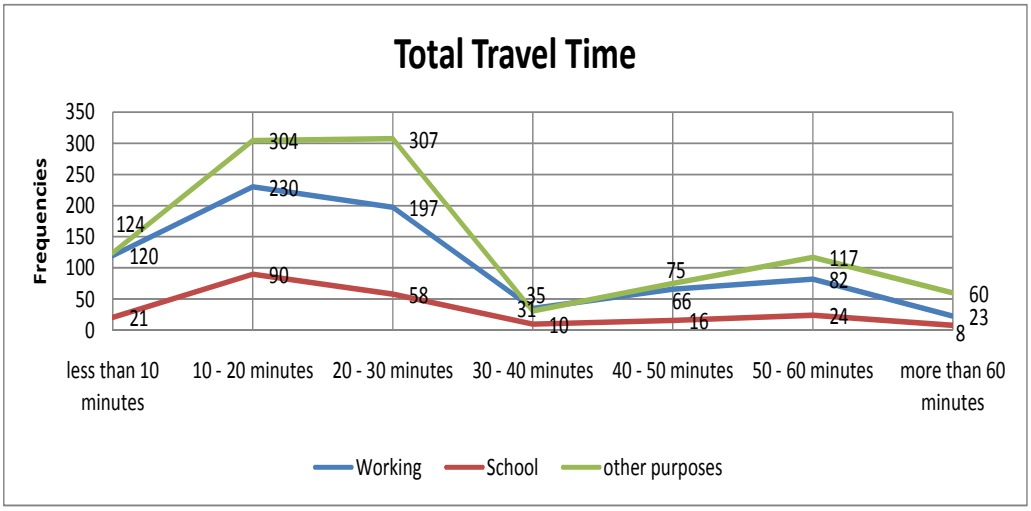



Source: CJRR Study Team, Stated Preference Survey, 2008

**Figure 1.4.13 Number Of Respondents By Departure Time**

C.3) Total Travel Time

For respondents traveling for work, most of them (230 respondents) usually need 10 to 20 minutes to arrive at their workplace. For those traveling for school (90 respondents), it usually takes 10 to 20 minutes to arrive at school or university. For other trip purposes, it usually takes 10 to 30 minutes from the origin to the destination which can be further categorized into two time spans, i.e. 10 to 20 minutes (304 respondents) and 20 to 30 minutes (307 respondents). The detail of number of respondents by total travel time is presented in figure 14.

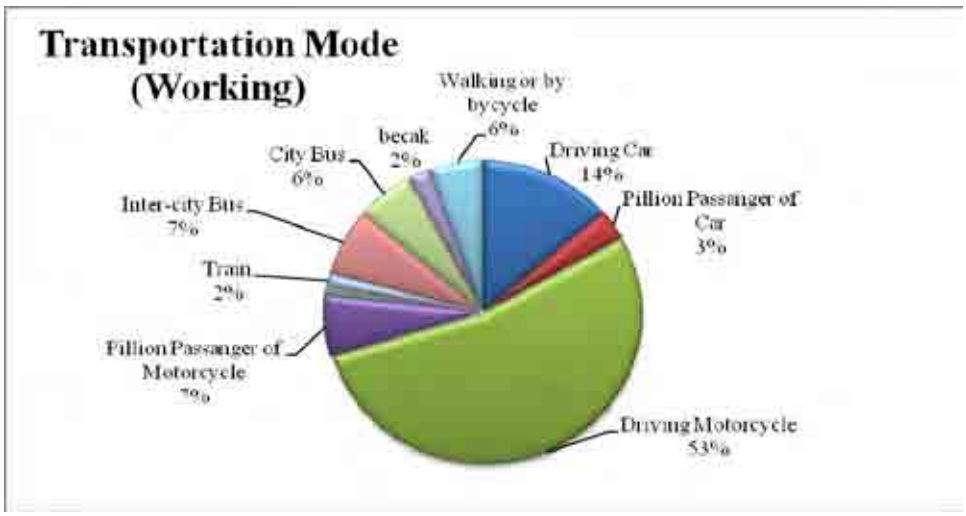



Source: CJRR Study Team, Stated Preference Survey, 2008

**Figure 1.4.14 Number Of Respondents By Total Travel Time**

## C.4) Transportation Mode

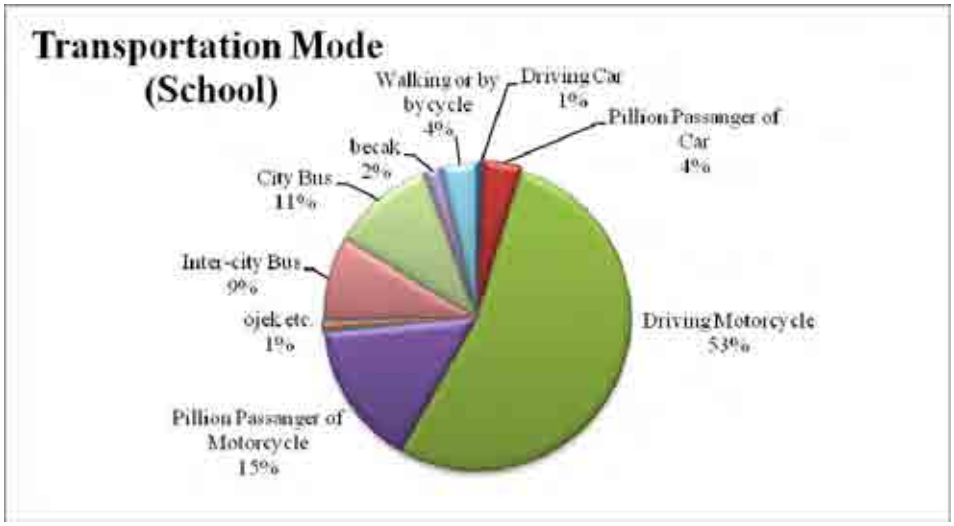
In conducting travel, respondents traveling for work used several transportation modes. Most of them used motorcycle (53%) and other respondents got a ride on motorcycle (7%). Other respondents used private car (14%), got ride on car (3%), inter-city bus (7%), city bus (6%) and trains (2%). The detail of number of respondents (traveling for work) by transportation mode is presented in figure 15.




Source: CJRR Study Team, Stated Preference Survey, 2008

**Figure 1.4.15 Number Of Respondents (Traveling For Work) By Transportation Mode**

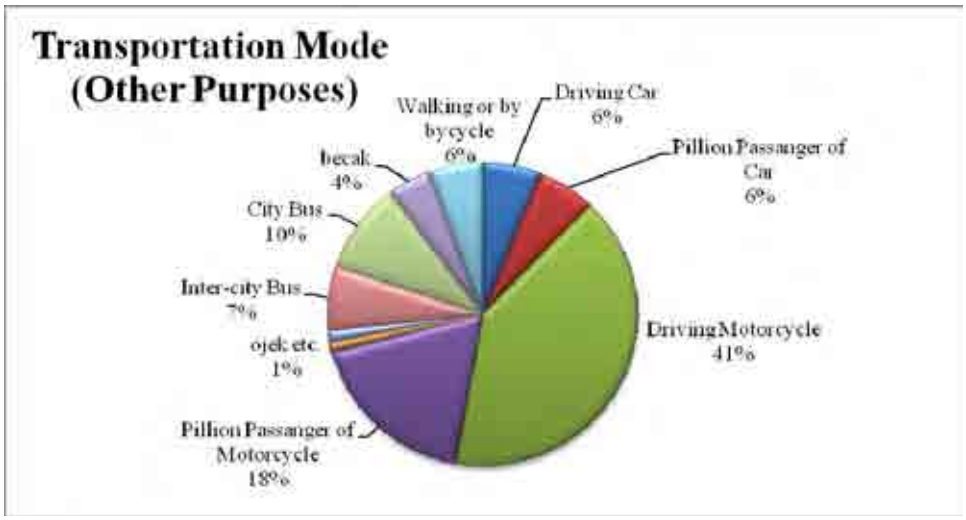
For respondents traveling for school, most respondents (53%) rode motorcycle and 15% respondents got ride. For public transportation mode, inter-city bus and city bus are the most common transportation mode. The detail of number of respondent traveling for school by transportation mode is presented in figure 16.




Source: CJRR Study Team, Stated Preference Survey, 2008

**Figure 1.4.16 Number Of Respondent Traveling For School By Transportation Mode**

For respondents traveling for purpose other than work and school, most of them used motorcycle, amounting for 41%, and 18% respondents got a ride. For public transportation mode, respondents using inter-city bus and city bus amounted for 7% and 10%, respectively. The detail of number of respondents traveling for purpose other than work and school by transportation mode is presented in figure 17.



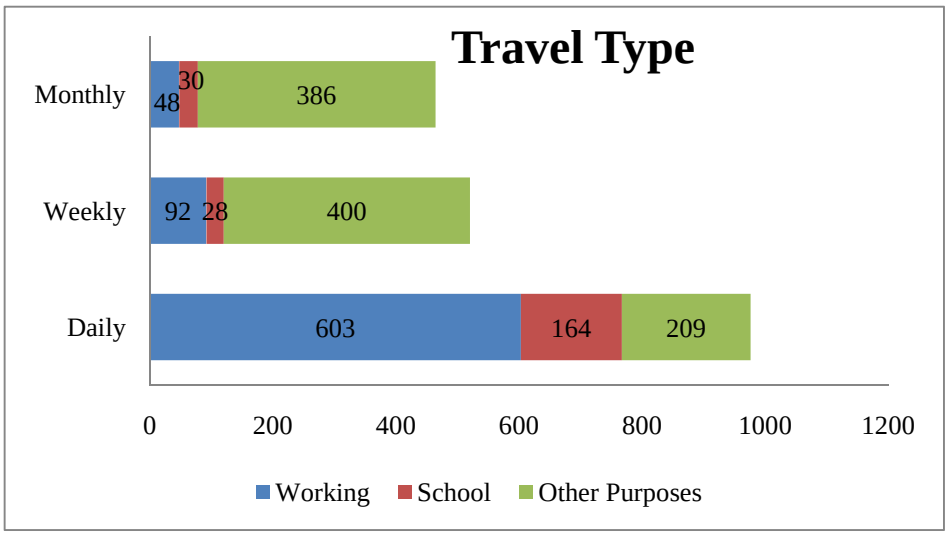

Source: CJRR Study Team, Stated Preference Survey, 2008

**Figure 1.4.17 Number Of Respondents Traveling For Purpose Other Than Work And School By Transportation Mode**

C.5) Travel Type

Most respondents stated that they conducted daily travel. Respondents conducting daily travel for work purpose amounted for 603 respondents. In addition, respondents conducting travel for

school commonly preferred daily travel, amounting for 164 respondents. Meanwhile, respondents traveling for purposes other than work and school commonly preferred weekly travel, amounting for 400 respondents. The detail of number of respondents by travel type is presented in the following figure.



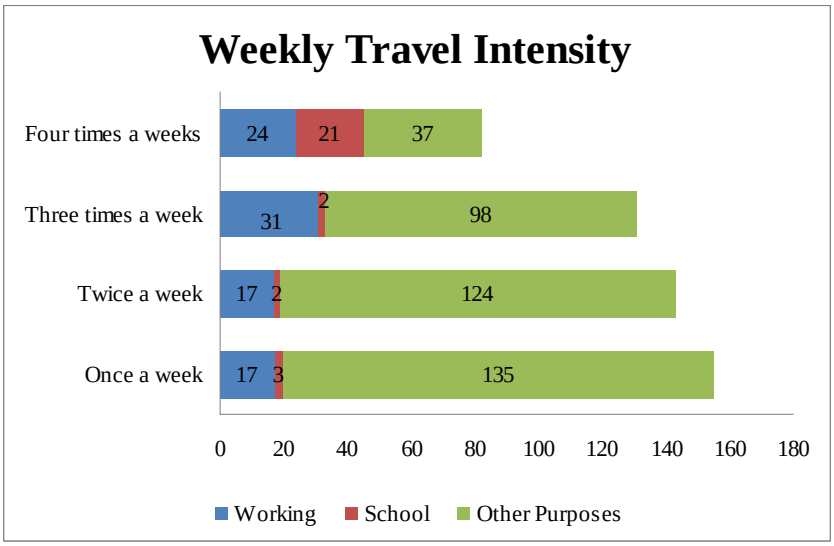

Source: CJRR Study Team, Stated Preference Survey, 2008

**Figure 1.4.18 Number Of Respondents By Travel Type**

C.6) Weekly Travel Intensity

Respondents who frequently conduct weekly travel are those traveling for purposes other than work and school. As an comparison, for respondents traveling once a week, those traveling for school and work amount for 3 and 17 respondents, respectively, while those traveling for purpose other than school and work amount for 124 respondents. Another comparison, for respondents traveling twice a week, those traveling for school and work amount for 2 and 17 respondents, respectively, while those traveling for purpose other than school and work amount for 124 respondents.

For three-time-a-week travel intensity, there are 31, 2 and 98 respondents stating that they travel for work, school and other purpose, respectively. Furthermore, for four-time-a-week travel intensity, there are 24, 21 and 37 respondent stating that they travel for work, school and other purposes, respectively. The detail of number of respondents by weekly travel intensity is presented in figure 19.

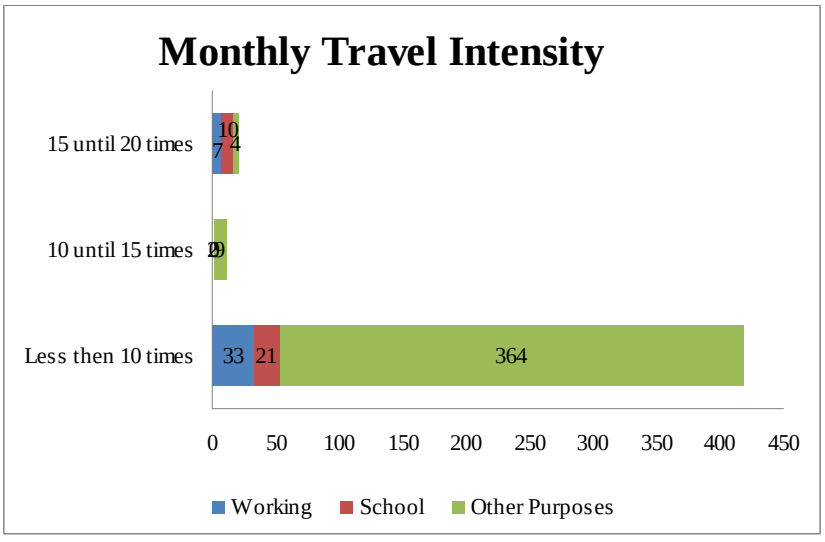



Source: CJRR Study Team, Stated Preference Survey, 2008

**Figure 1.4.19 Number Of Respondents By Weekly Travel Intensity**

C.7) Monthly Travel Intensity

In terms of monthly travel intensity, most respondents conducting this type of travel are those traveling for purposes other than work and school. Most respondents traveling less than 10 times a month, consisted of 33 respondents traveling for work, 21 respondents traveling for school and 364 respondents traveling for purposes other than work and school. The detail of number of respondents by monthly travel intensity is presented in the following figure.

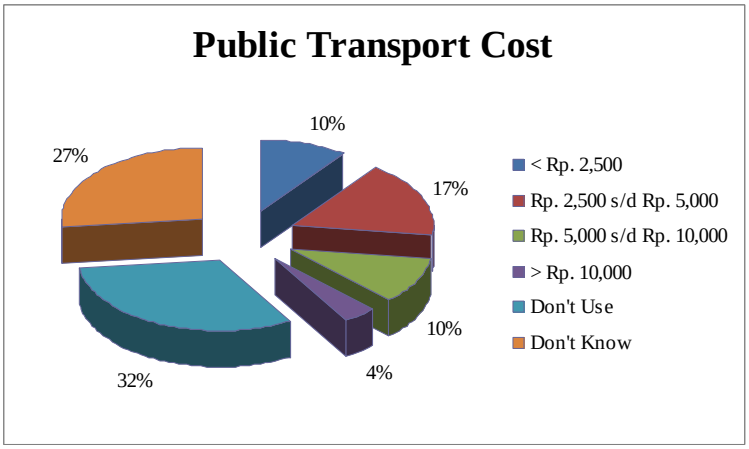



Source: CJRR Study Team, Stated Preference Survey, 2008

**Figure 1.4.20 Number Of Respondents By Monthly Travel Intensity**

## C.8) Public Transport Cost

In terms of public transportation cost, seventeen percents or 342 respondents said that they spent Rp 2,500 to Rp 5,000 for the public transportation cost while 10% respondents said that they spent less than Rp 2,500 for the public transportation cost. Fifteen percents of respondents spent more than Rp 5,000 for the public transportation cost while 31% respondents did not use public transportation and 27% respondents did not know the amount the spent for public transportation cost. The detail of number of respondents by amount spent for public transportation cost is presented in figure 21.

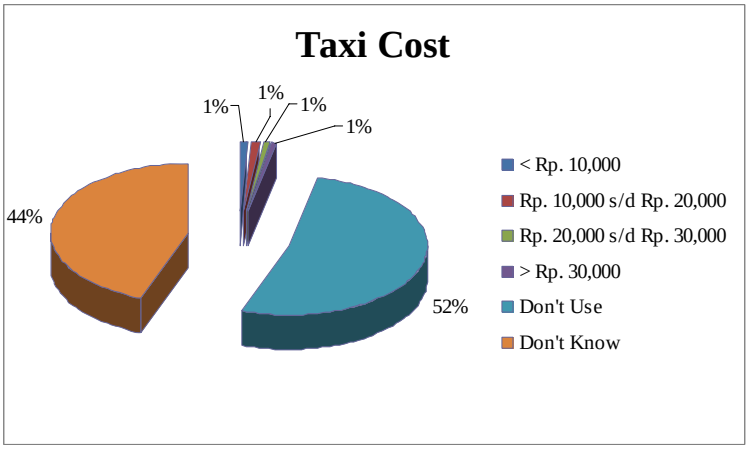



Source: CJRR Study Team, Stated Preference Survey, 2008

**Figure 1.4.21 Number Of Respondents By Amount Spent For Public Transportation Cost**

## C.9) Taxi Cost

Most respondents rarely used taxi. Only did 4% respondents spend cost for traveling using taxi. The detail of number of respondents by the amount spent for taxi cost is presented in the following figure.

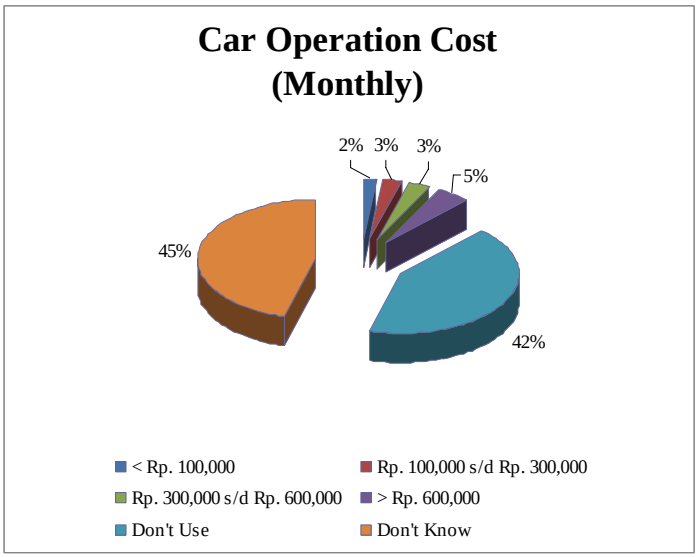



Source: CJRR Study Team, Stated Preference Survey, 2008

**Figure 1.4.22 Number Of Respondents By The Amount Spent For Taxi Cost**

C.10) Car Operation Cost (monthly)

In terms of car operation cost, most respondents did know the amount since they did not use private car. However, 2%, 3%, 3% and 4% respondents said that they spent less than Rp 100,000; Rp 100,000 – Rp 300,000; Rp 300,000 – Rp 600,000 and more than Rp 600,000 for the private car operation cost. The detail of number of respondents by the amount of monthly car operation cost is presented in figure 23.

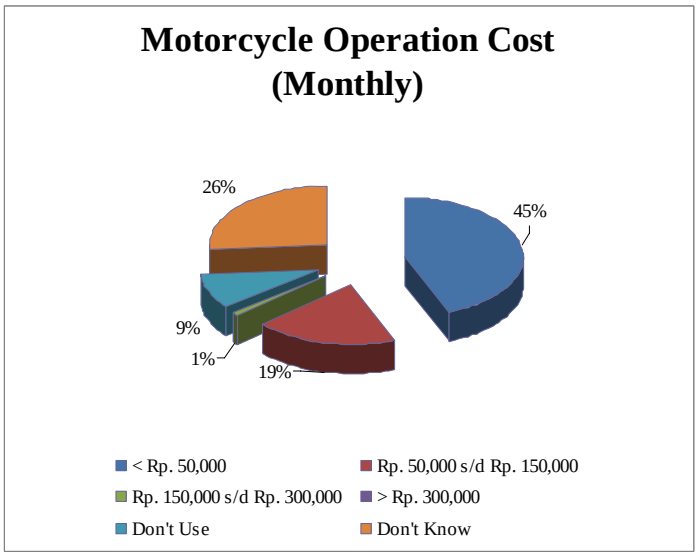



Source: CJRR Study Team, Stated Preference Survey, 2008

**Figure 1.4.23 Number Of Respondents By The Amount Of Monthly Car Operation Cost**

C.11) Motorcycle Operation Cost ( monthly )

Most respondents (894 or 44%) said that they spent Rp 50,000 per month for motorcycle operation cost. Furthermore, 396 (20%) respondents said that they spent Rp 50,000 – Rp 150,000 per month for the motorcycle operation cost while 24 (1%) respondents said that they spent Rp 150,000 – Rp 300,000 per month for the cost. The rest of respondents did know the amount of motorcycle operation cost and did not use motorcycle. The detail of number of respondents by the amount of monthly motorcycle operation cost is presented in figure 24.



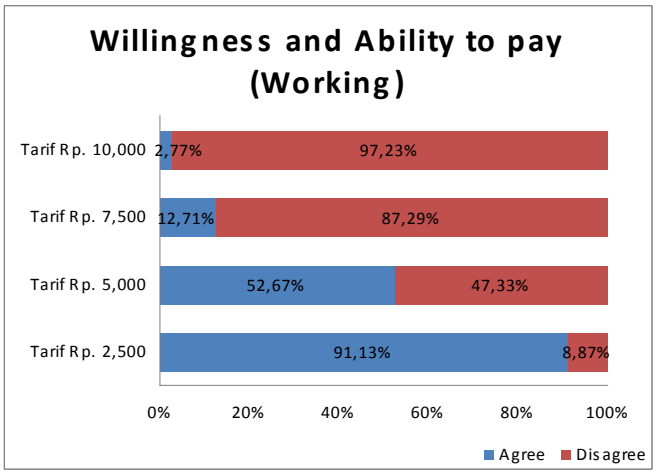

Source: CJRR Study Team, Stated Preference Survey, 2008

**Figure 1.4.24 Number Of Respondents By The Amount Of Monthly Motorcycle Operation Cost**

## D. Willingness and ability to pay

### D.1)Working Purpose

Respondents with working purpose have the capability and ability in paying more than respondents with other purposes. 91.13% respondents with working purposes agree if the established tariff is Rp 2,500.00. Respondents with working purposes who agree if the tariff is Rp 5,000.00 are 52.67% and the rest 47.33% did not agree. For the tariff of Rp 7,500.00 and Rp 10,000.00 the respondents who agree are 12.72% and 2.77%, respectively. The detail of number of respondents traveling for work by willingness and ability to pay is presented in figure 25 below.

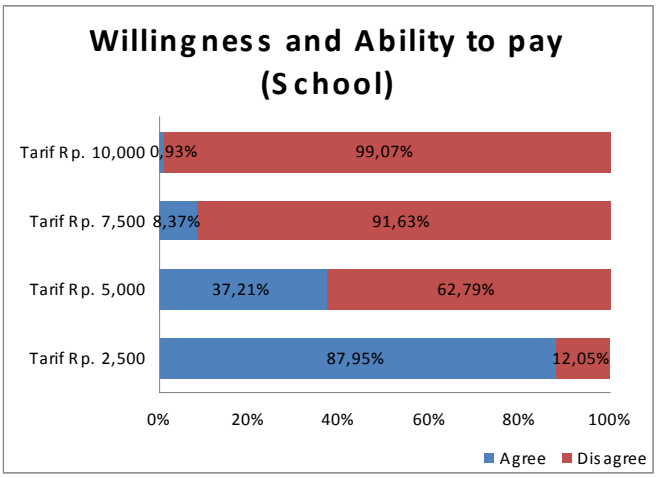



Source: CJRR Study Team, Stated Preference Survey, 2008

**Figure 1.4.25 Number Of Respondents Traveling For Work By Willingness And Ability To Pay**

D.2)School Purpose

Respondents traveling for school purpose have the capability and ability in paying in the least price than respondents with other purposes. 87.95% respondents with school purpose agree if the tariff is Rp 2,500.00. For the tariff of Rp 5,000.00 respondents with school purpose who agree with the tariff are 37.21% respondents and the rest 62.79% respondents did not agree with the tariff. For tariff of Rp 7,500.00 and Rp 10,000.00 respondents who agree are 8.37% respondents and 0.93% respondents, respectively. The detail of number of respondents traveling for school purpose by willingness and ability to pay is presented in figure 26 below.

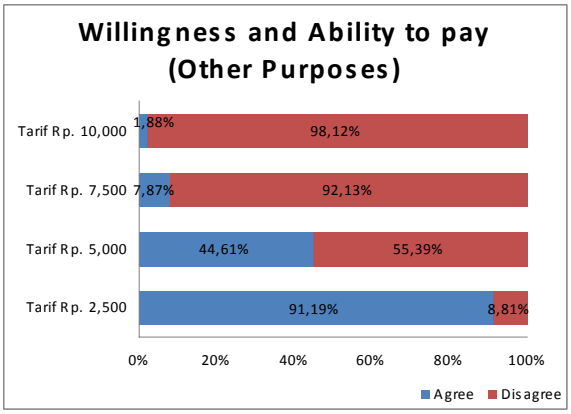



Source: CJRR Study Team, Stated Preference Survey, 2008

**Figure 1.4.26 Number Of Respondents Traveling For School Purpose By Willingness And Ability To Pay**

D.3)Other Purposes

Respondents with purposes other than school and work have the average capability and ability in paying compared to respondents with school and working purposes. 91.19% respondents with purposes other than school and working agree with the tariff of Rp 2,500.00. It can be said that almost most of them agree with the tariff of 2,500.00. For the tariff of Rp,5 000.00, 44.61% respondents with working purpose agree with the tariff and the rest 55.39% respondents did not agree. For the tariff of Rp 7,500.00 and Rp 10,000.00, respondents who agree with the tariff are 7.87% and 1.88% respondents, respectively. The detail of number of respondent traveling for purpose other than school and work is presented in figure 27.

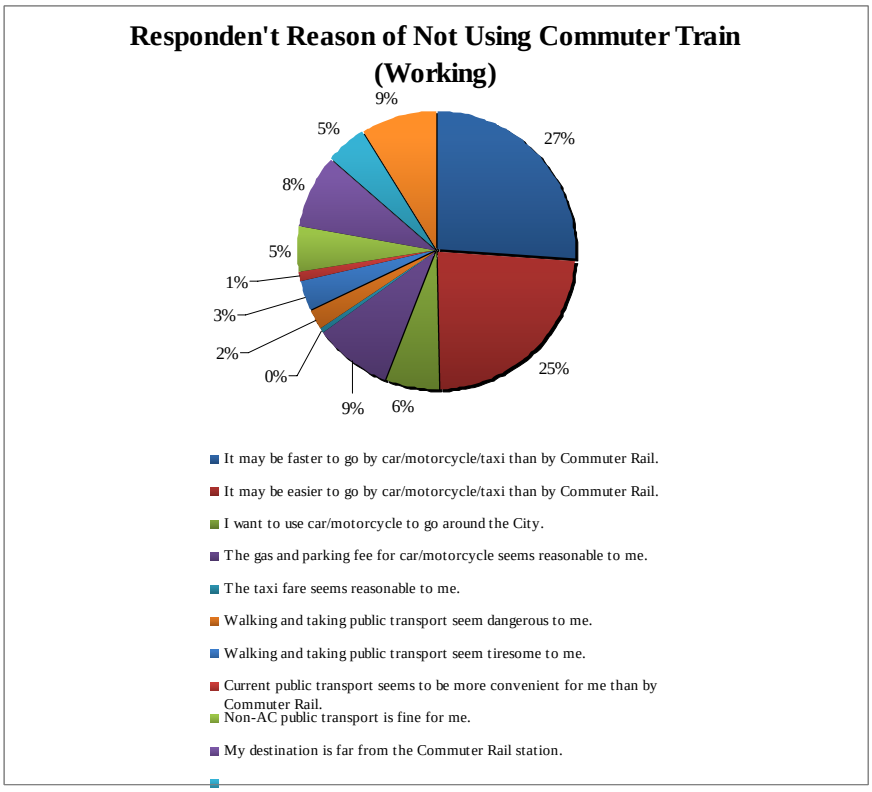



Source: CJRR Study Team, Stated Preference Survey, 2008

**Figure 1.4.27 Number Of Respondent Traveling For Purpose Other Than School And Work**

D.4)Respondent's reason of not using commuter train

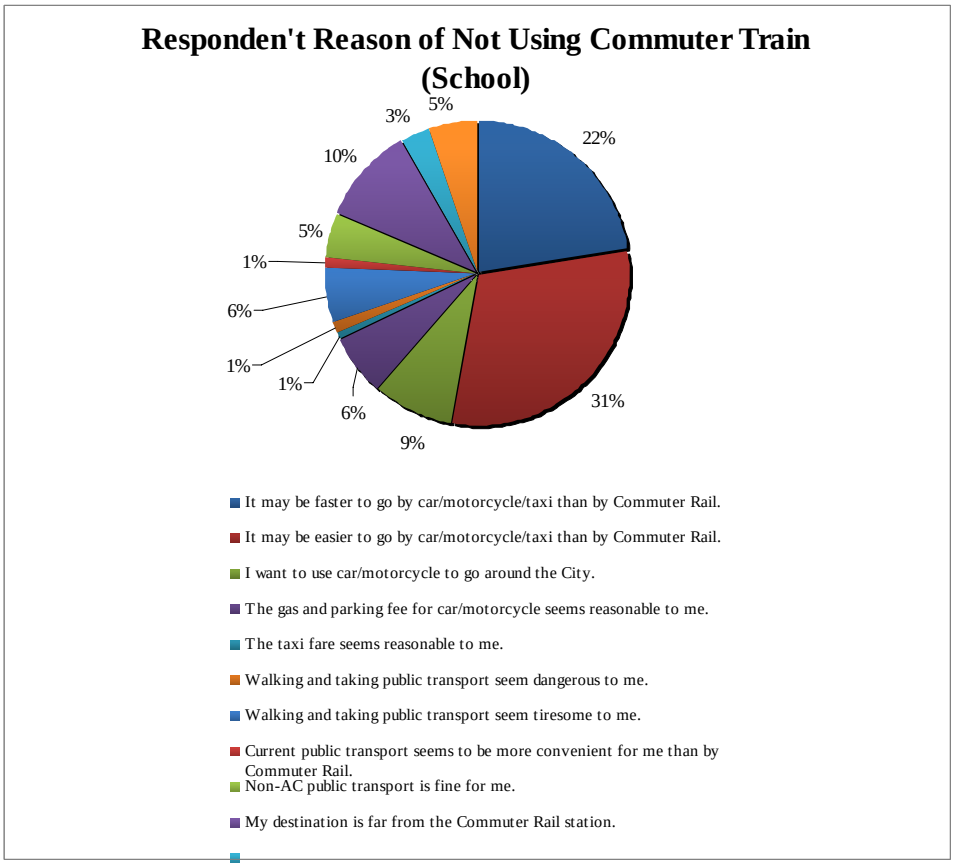
Most of respondents with working purposes did not use train with the reason that using private vehicle are faster and easier. Respondents who said using private vehicle is faster are 265 respondents and respondents who considered that using private vehicle is easier are 24% respondents. The detail of number of respondents traveling for work by their reason of not using commuter train is presented in figure 28.




Source: CJRR Study Team, Stated Preference Survey, 2008

**Figure 1.4.28 Number Of Respondents Traveling For Work By Their Reason Of Not Using Commuter Train**

Furthermore, for respondents with school purpose have almost the similar reason to respondents with working purpose for not using commuter train. Most of the respondents with school purposes did not use commuter train with the reason that using private vehicles is faster and easier. There are 23% respondents who said that using private vehicles is faster. Respondents who said that using private vehicles is easier are 30% respondents. Other reasons, which quite many, are the fuel and parking costs are still very reachable for them. The detail of number of respondents traveling for school by their reason of not using commuter train is presented in figure 29.

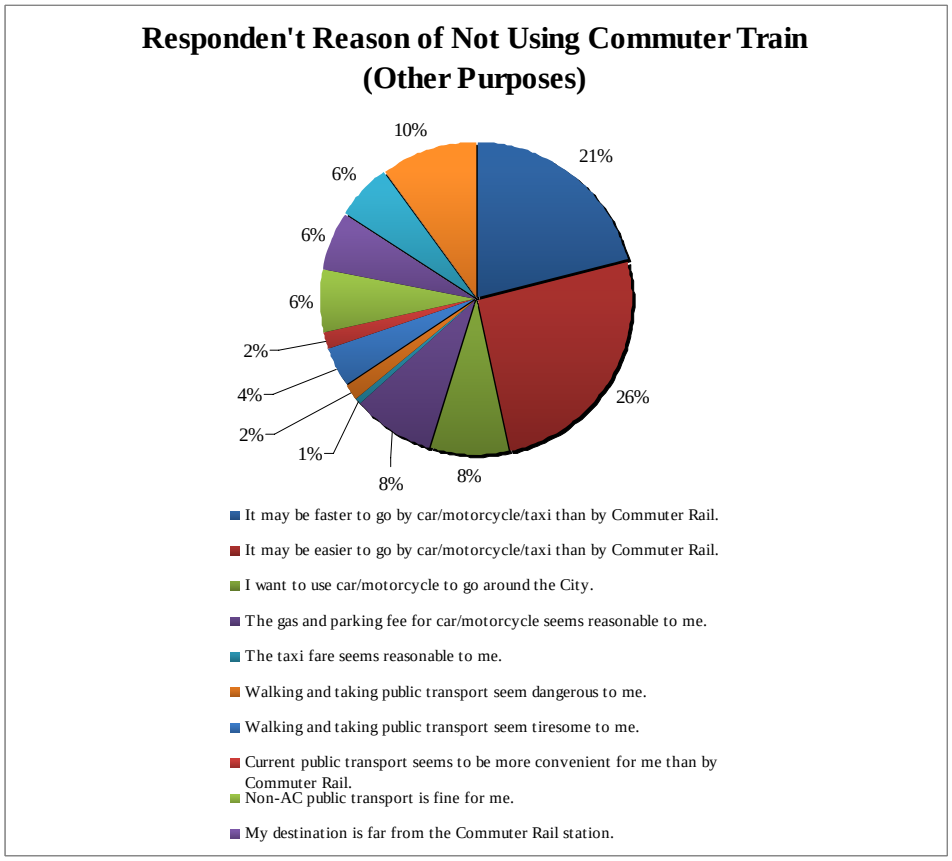



Source: CJRR Study Team, Stated Preference Survey, 2008

**Figure 1.4.29 Number Of Respondents Traveling For School By Their Reason Of Not Using Commuter Train**

Most of respondents with purposes other than school and working did not use train because it is faster and easier using private vehicles for them. Respondents who said that using private vehicle is faster are 21% respondents. And respondents who considered that using private vehicle is easier are 26% respondents. Other reason that quite many is that they thought using public transportation is quite dangerous. There are 10% respondents with this reason from all respondents with trip purposes other than school and working. The detail of number of respondents traveling for purpose other than school and work by their reason of not using

commuter train is presented in figure 30.




Source: CJRR Study Team, Stated Preference Survey, 2008

**Figure 1.4.30 Number of Respondents Traveling for Purpose Other than School and Work by Their Reason of Not Using Commuter Train**

### 7) CONCLUSION

In general, the survey has been conducted well in accordance to the TOR. Important input for the implementation of similar activities in the future is the necessity to previously determine the zone system, both internal and external study location, to be used in the survey before it is executed so that identification and data inputting process will be much easier.

The Center for Transportation and Logistics Studies (PUSTRAL) UGM would like to thanks to Oriental Consultants Co., Ltd., for the trust to conduct the activity. Hopefully, the cooperation will be much better in the future.

## 1.5 Weigh Bridge Interview Survey

### 1) Survey Objective

Weigh Bridge Station is located at major boundary of kabupaten/kota in the Central Java region. Since all truck except tanker and empty loaded truck have to pass Weigh Bridge, precise freight

transport data can be obtained by conducting interview survey at weigh bridge stations. Freight transport weight, origin, destination, and commodity type were surveyed for both intra provincial and inter provincial transport.

**2) Survey Contents**

**a. Survey Method**

Interviewer made vehicles entering Weigh Bridge Stations stop with the cooperation of a traffic officer to ask the drivers about trip purpose, OD, commodity type. Interviewer also record total weight by reading weigh bridge indicator and vehicle weight and capacity by reading vehicle registration information labeled on each vehicle. A manual hourly traffic count also was conducted at each survey location by vehicle type.

Source: CJRR Study Team, Weigh Bridge Survey, 2008

**Figure 1.5.1 Weight Bridge Interview Survey Situation**

**b. Survey Period**

The survey shall be conducted on 15, 17 of July for 24 hours.

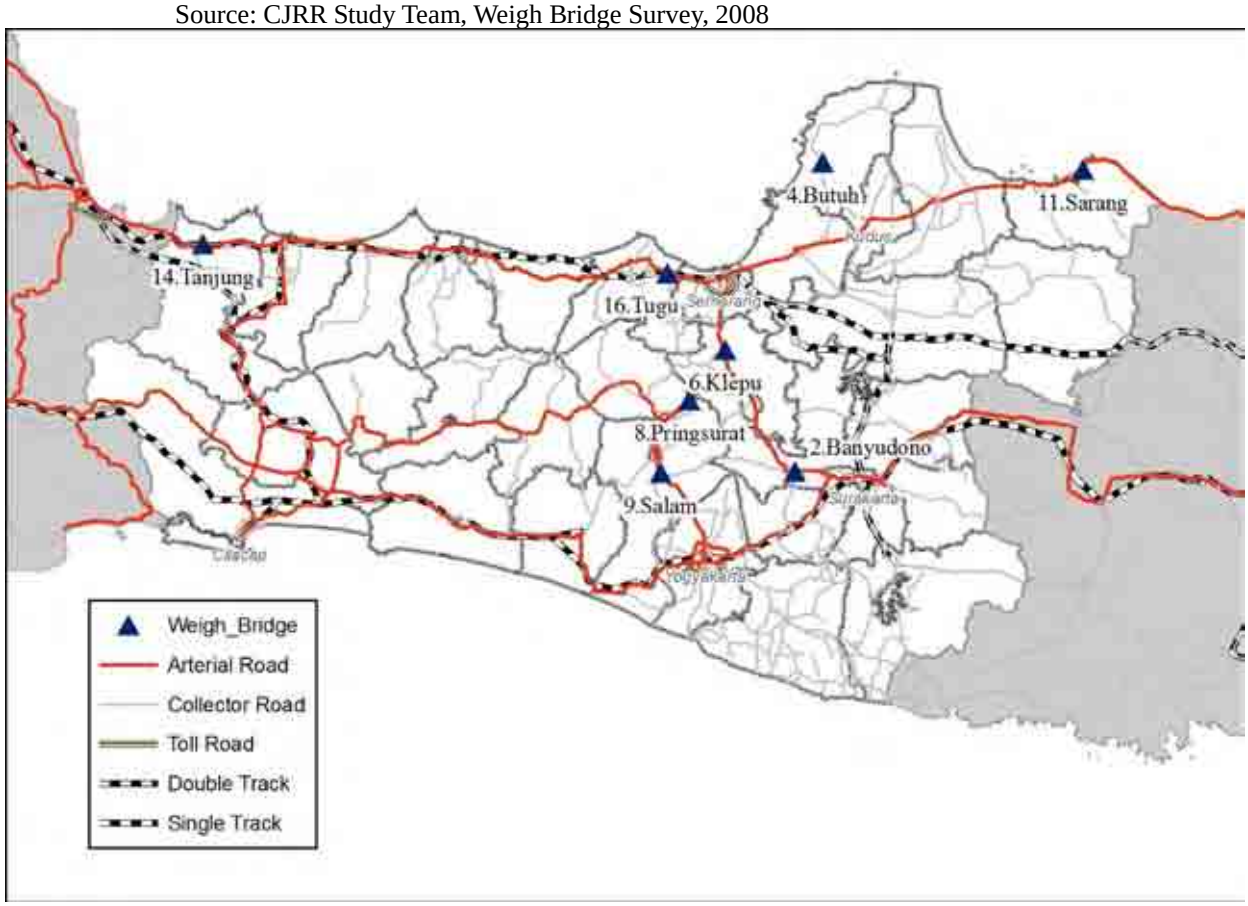
**c. Survey Location**

Interview survey and traffic count shall be conducted at the following 8 Weigh Bridge Stations (Jembatan timbang) out of 17 Weigh Bridge Stations in Central Java Province considering traffic flow in survey area. Since Roadside OD Interview Survey was conducted at Weigh Bridge Station in Yogyakarta Special Province (DIY), Weigh Bridge Station Survey was not conducted at DIY.

**Table 1.5.1 Weigh Bridge Stations in Central Java Province**

| | | Annual Weight 2007 | Daily Average Weight | Estimated Peak-day Average | Selected Survey Stations |
|---|---|---|---|---|---|
| 1 | Ajibarang | 174,337 | 478 | 574 | |
| 2 | Banyudono | 119,598 | 328 | 394 | * to be surveyed |
| 3 | Gubung | 204,925 | 561 | 673 | |
| 4 | Katonsari | 398,941 | 1,093 | 1,312 | * to be surveyed |
| 5 | Butuh | 304,982 | 836 | 1,003 | |
| 6 | Klepu | 443,839 | 1,216 | 1,459 | * to be surveyed |
| 7 | Lebuawu | 233,538 | 640 | 768 | |
| 8 | Pringsurat | 222,678 | 610 | 732 | * to be surveyed |
| 9 | Salam | 261,864 | 717 | 860 | * to be surveyed |
| 10 | Sambong | 136,333 | 374 | 449 | |
| 11 | Sarang | 370,255 | 1,014 | 1,217 | * to be surveyed |
| 12 | Selogiri | 111,097 | 304 | 365 | |
| 13 | Subah | 475,014 | 1,301 | 1,561 | |
| 14 | Tanjung | 442,586 | 1,213 | 1,456 | * to be surveyed |
| 15 | Toyoga | 234,400 | 642 | 770 | |
| 16 | Tugu | 571,896 | 1,567 | 1,880 | * to be surveyed |
| 17 | Wanareja | 143,472 | 393 | 472 | |

Source: CJRR Study Team, Weigh Bridge Survey, 2008



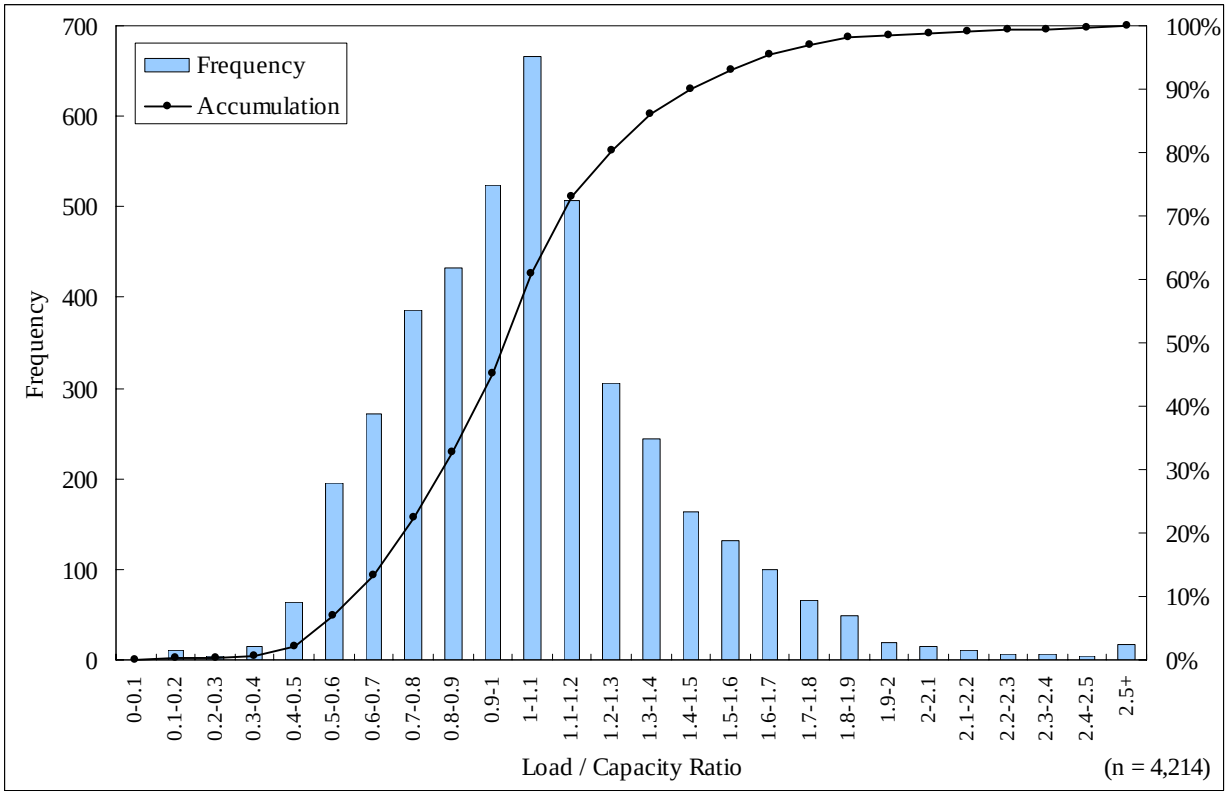

Source: CJRR Study Team, Weigh Bridge Survey, 2008

**Figure 1.5.2 Weigh Bridge Stations in Central Java Province**

### 3) Descriptive Survey Results

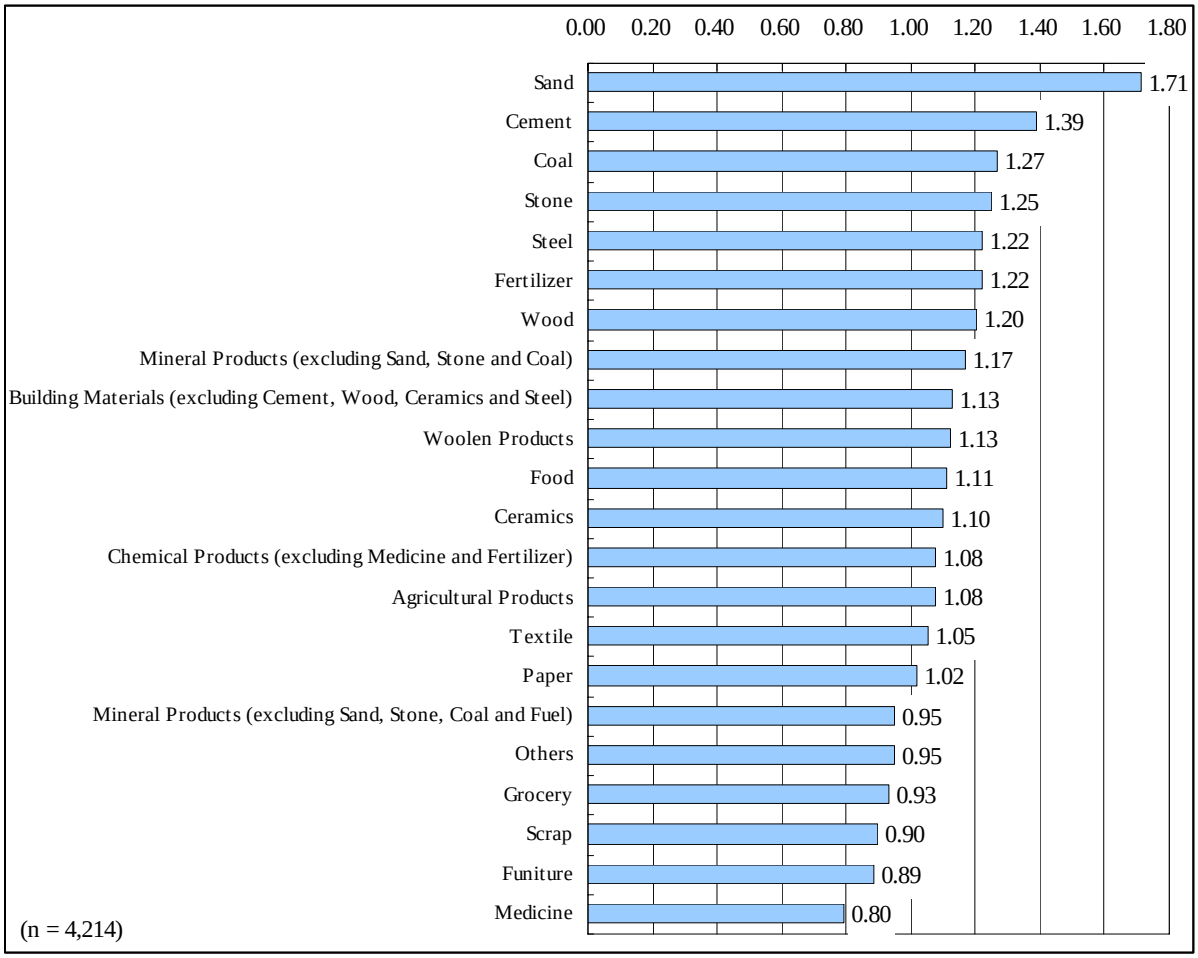
In spite of government policy to reduce over loaded trucks by fine, the majority of trucks load over their capacity. The following figure depicts distribution of load / capacity ratio of trucks in Central Java region based on Weigh Bridge Survey conducted at 9 weigh bridge stations in Central Java Region. Load / capacity ratio and average axle load are also depicted by commodity type in Figure 1.5.4 and Figure 1.5.5.

Roughly half of the trucks carry cargo more than their capacities, and even some trucks carry cargo with 2.5 times of its capacity. By commodity types, bulky cargo including sand, cement, coal, stone, fertilizer and steel is relatively high in both load / capacity ratio and average axle weight.



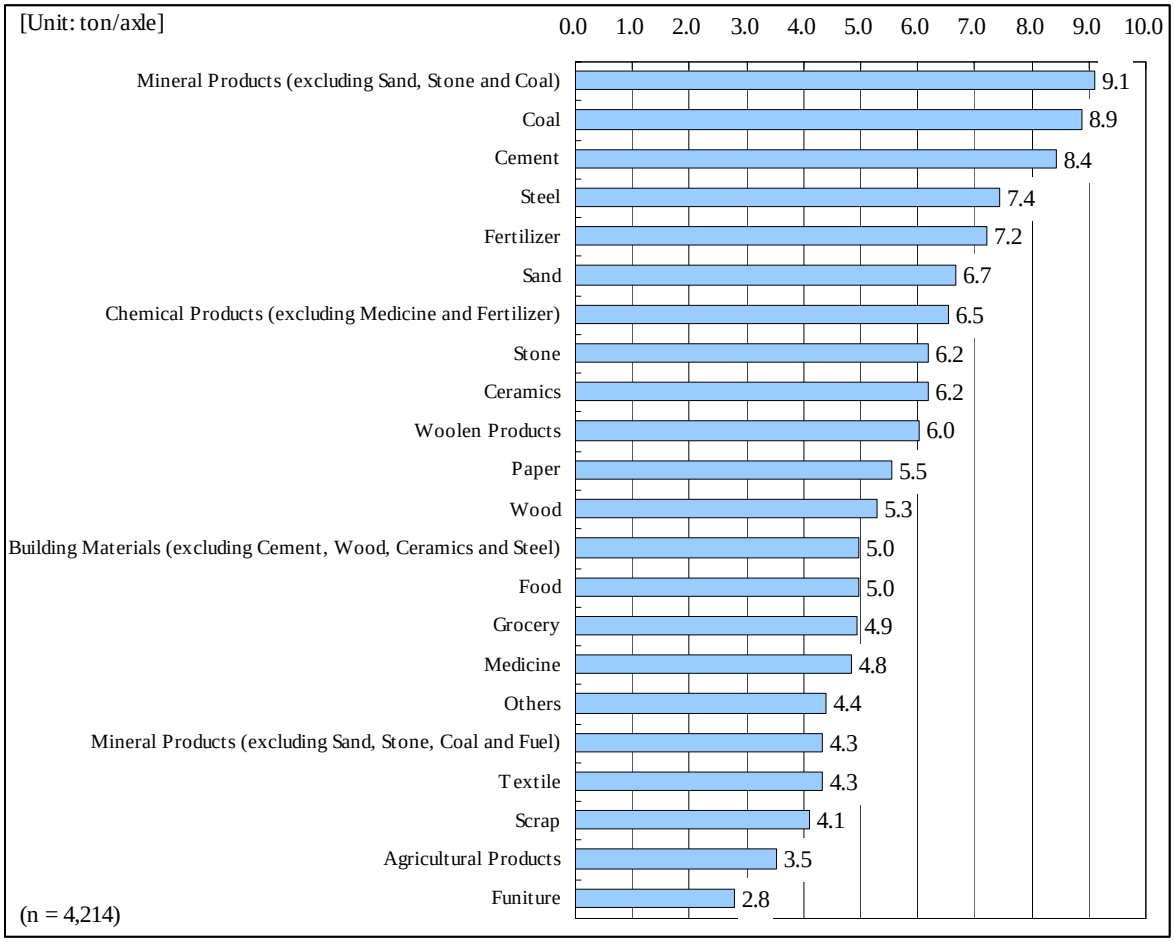

Note: Load capacity ratio is calculated by dividing cargo weight (excluding vehicle weight) by cargo weight capacity.
Source: CJRR Study Team, Weigh Bridge Survey, 2008

**Figure 1.5.3 Load / Capacity Ratio Distribution of Trucks at Weigh Bridges**




Note: Load capacity ratio is calculated by dividing cargo weight (excluding vehicle weight) by cargo weight capacity.
Source: CJRR Study Team, Weigh Bridge Survey, 2008

**Figure 1.5.4 Load / Capacity Ratio by Commodity Type at Weigh Bridges**




Note: Average axle weight is calculated by dividing gross weight including vehicle and cargo .by number of axles. Vehicles with more than five axles are assumed to be 5.5 axles.
Source: CJRR Study Team, Weigh Bridge Survey, 2008

**Figure 1.5.5 Average Axle Weight by Commodity Type at Weigh Bridges (ton / axle)**

### 4) Origin Destination Table Calibration and Analyses

#### a. Sampling Ratios

Sampling ratio for each weigh bridge station is shown as follows. Sampling ratios was set not to cause traffic congestion.

**Table 1.5.2 Sampling Ration of Weigh Bridge Stations**

| Location | Direction (to) | 2 Axles Truck | | | 3 Axles Truck | | | Truck with More than 4 Axles | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | No. of Samples | TC | Sample Ratio | No. of Samples | TC | Sample Ratio | No. of Samples | TC | Sample Ratio |
| Banyudono | Semarang | 290 | 857 | 33.8% | 44 | 120 | 37% | 5 | 278 | 1.8% |
| Katonsari | Surabaya | 282 | 939 | 30.0% | 78 | 235 | 33% | 72 | 202 | 35.6% |
| Klepu | Semarang | 367 | 1,768 | 20.8% | 78 | 260 | 30% | - | 10 | 0.0% |
| Pringsurat | Magelang | 360 | 2,206 | 16.3% | 44 | 261 | 17% | - | - | 0.0% |
| Salam | Semarang | 211 | 481 | 43.9% | 40 | 45 | 89% | - | 61 | 0.0% |
| Salam | Yogyakarta | 338 | 661 | 51.1% | 39 | 61 | 64% | 2 | 20 | 10.0% |
| Sarang | Semarang | 105 | 354 | 29.7% | 101 | 319 | 32% | 110 | 295 | 37.3% |
| Tanjung | Semarang | 170 | 715 | 23.8% | 173 | 681 | 25% | 42 | 326 | 12.9% |
| Yogyakarta (Tugu) | Jakarta | 327 | 1,458 | 22.4% | 27 | 183 | 15% | 11 | 146 | 7.5% |
| Kulonprogo | Wates | 106 | 274 | 38.7% | 37 | 80 | 46% | 23 | 55 | 41.6% |
| Kulonprogo | Purworejo | 127 | 388 | 32.8% | 37 | 101 | 37% | 11 | 39 | 27.9% |
| Depok | Klaten | 198 | 473 | 41.8% | 19 | 78 | 24% | 12 | 47 | 25.3% |
| Depok | Yogyakarta | 265 | 956 | 27.7% | 44 | 172 | 26% | 20 | 69 | 28.9% |

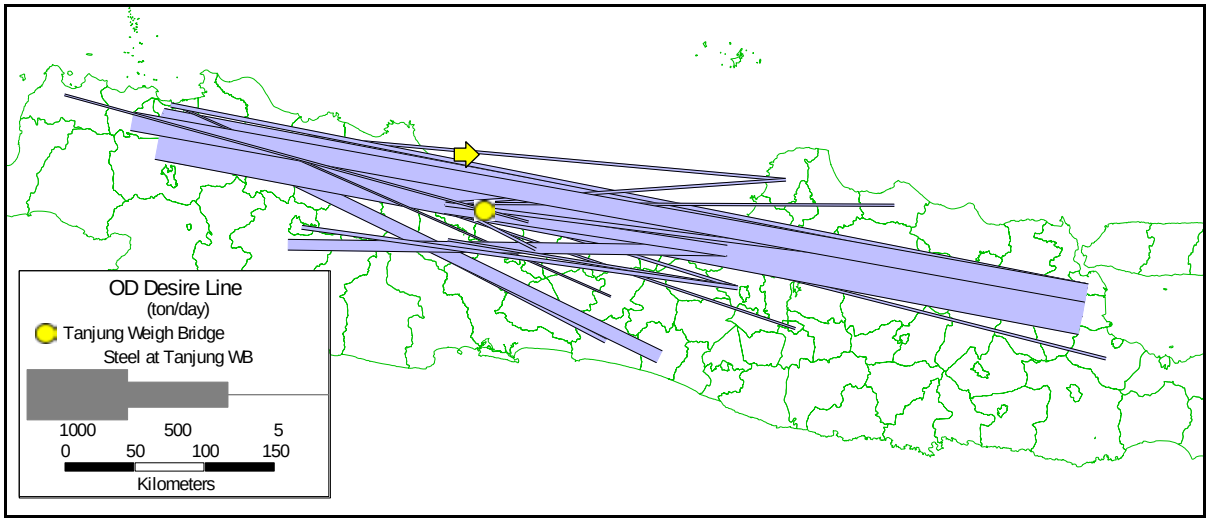
Source: CJRR Study Team, Weigh Bridge Survey, 2008

### b. Methodology

OD matrix formulation procedure is as same as freight transport of roadside OD interview survey.

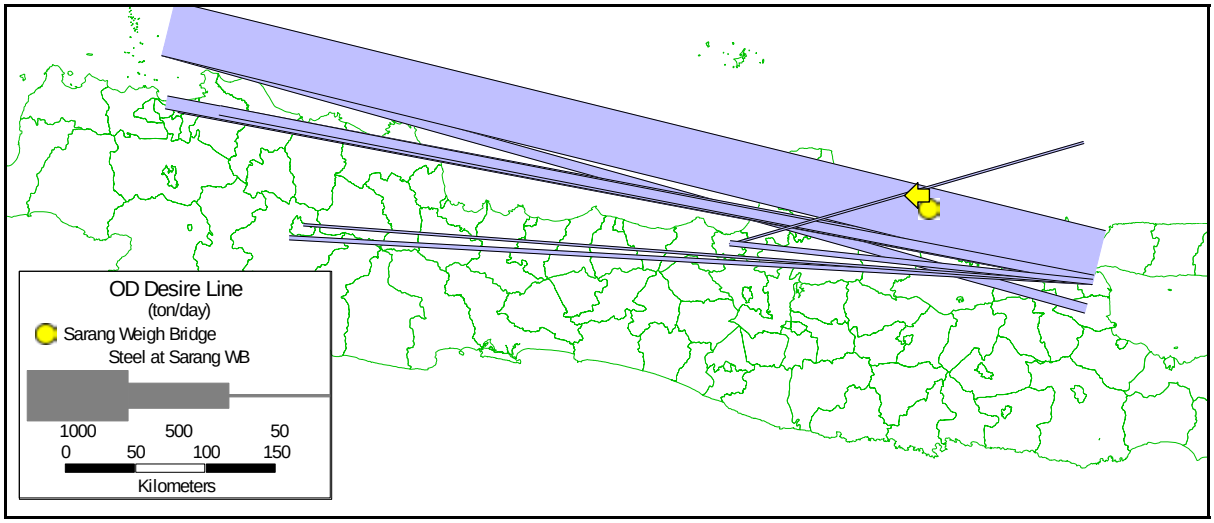
### c. Weight Desire Line by Major Commodity Type

Steel is one of the major commodity types on the Northern Java Corridor. Traffic flow of steel was surveyed at two major weigh bridges, Tanjung and Sarang. Tanjung weigh bridge, located on the border of Central and West Java provinces, monitors almost all east bound freight vehicle on the Northern Java Freight, and Sarang weigh bridge, located on the border of Central and East Java provinces, monitors west bound freight on the corridor. Desire lines of both weigh bridges are shown in the figures below. It is noteworthy that approximately 1,000 tons of steel is transported more than 500 km for both east and west bound traffic on a daily basis such as Jakarta – Surabaya, while short distance flow is relatively smaller.




Note: Only east bound traffic was surveyed.
Source: CJRR Study Team, Weigh Bridge Survey, 2008

**Figure 1.5.6 Desire Lines of Steel at Tanjung Weigh Bridge**

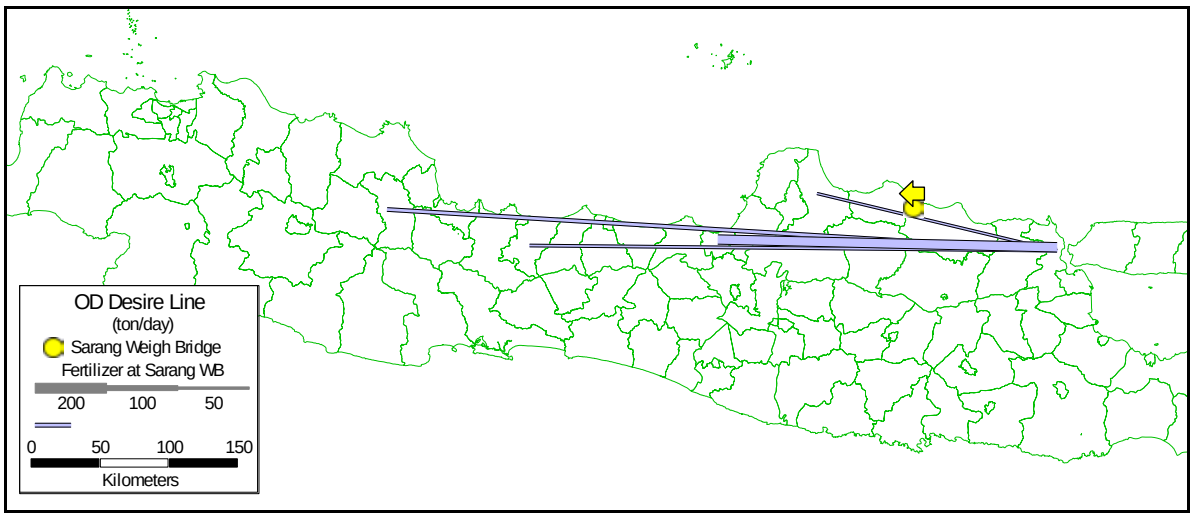



Note: Only west bound traffic was surveyed.
Source: CJRR Study Team, Weigh Bridge Survey, 2008

**Figure 1.5.7 Desire Lines of Steel at Sarang Weigh Bridge**

**Fertilizer**

Although transported weight of fertilizer across the Central Java region is relatively smaller than cement, sand, steel and fuel, approximately 200 tons / day of fertilizer is transported from Gresik to Semarang according to the weigh bridge survey at Saragn weight bridge. According to Road traffic survey by the study team, approximately 200 tons / day of fertilizer is also transported from Kabupaten Semarang to Kota Semarang and Grobogan.




Source: CJRR Study Team, Weigh Bridge Survey, 2008

**Figure 1.5.8 Desire Lines of Fertilizer at Sarang Weigh Bridge**