Chapter 5

Existing Urban Transportation System and Problems

5. Existing Urban Transport System and Problems

5.1 General

This chapter analyzes the existing transport system and transport demand in the Jabotabek region. First of all, overall travel demand in the region is examined from the viewpoints of magnitude, spatial distribution and historical development. Then the existing transportation system is investigated by sub transport sector such as the road network system. And its related traffic control and management system, bus transport, and railway transport. At the same time, relevant issues such as traffic safety and environmental problems caused by the transportation system are discussed in Sections 5.4 and 5.7 respectively. Based on the analysis of the existing transport system, the level of services is assessed and the present urban transportation problems are identified. The identified problems should be taken as a basis for formulating an urban transportation master plan.

5.2 Present Travel Demand and Characteristics

5.2.1 Transport Surveys

In the Phase (1) study, several types of transport survey were conducted to understand the existing travel demand as well as to assess the performance of the existing transport system. The executed transport surveys include (a) a Traffic count survey, (b) a Travel speed survey, (c) a Bus passenger survey, (d) a Railway passenger survey, (e) a Mini person trip survey and (f) an Opinion survey. In this section, the present travel demand and its characteristics are explored based on the results of the transport survey mentioned above.

Various travel characteristics were examined and transport demand forecast models were basically developed through the analysis of person trip data obtained in the Mini person trip survey, although sample size was limited at 950 households and the accuracy of the transport models was not high. These transport models will be reinforced since the full-scale person trip survey is scheduled to be implement in the Phase (2) study thus based on more accurate data the transport models should be reviewed.

5.2.2 Trip Production Rates

Trip production rates were estimated by trip purpose and by income group based on the trip data obtained by the Mini Person Trip Survey. For Home-Based Work purpose, the trip production rate was calculated per employee by income level as listed in Table 5.2.1, while the trip rate for Home-Based School was estimated per student by income level as shown in Table 5.2.2. For the other trip purposes such as Home-Based Others, Non-Home Based Business, Non-Home Based Others, the trip rate was obtained based on per person. As indicated in Tables 5.2.1 and 5.2.2, the trip rates for HBW and HBS do not vary significantly by income level; on the other hand, the trip rates for Non-Home Based trips vary according to income level.

Compared to the trip production rate of 1.69 per person per day observed in 1985, the overall trip production rate has remained at the same level of 1.70. Taking increased availability of private modes of transport into account, the trip rate should have increased. This unchanged trip rate may be attributed partly to the rise in unemployment due to the economic crisis.

Table 5.2.1 Home Based Work Trip Production Rate per Employee

Income Group	Home to Work Place	Work Place to Home
High & U Middle	0.823	0.816
Lower Middle	0.824	0.839
Low	0.796	0.784
All Income	0.813	0.812

Source: SITRAMP Mini Person Trip Survey, 2000

Table 5.2.2 Home Based School Trip Rate per Student

Income Group	Home to School	School to Home
High & U Middle	0.984	0.951
Lower Middle	0.984	0.981
Low	0.974	0.988
All Income	0.980	0.976

Source: SITRAMP Mini Person Trip Survey, 2000

Table 5.2.3 Trip Production Rates for Other Trip Purposes

(unit: trips per person per day)

Income Group	All Purpose	Home to Others	Others to Home	Non Home Based Business	Non Home Based Others	Non Home Based Total
High &U Middle	1.846	0.212	0.225	0.037	0.109	0.146
Lower Middle	1.699	0.161	0.160	0.017	0.064	0.081
Low	1.604	0.163	0.163	0.010	0.029	0.039
All Income	1.701	0.175	0.178	0.019	0.062	0.082

Source: SITRAMP Mini Person Trip Survey, 2000

5.2.3 Trip Distribution

(1) Average Trip Length

Gravity models have been developed by trip purpose and income level based on the OD pair trip data obtained by the Mini person trip data as shown in Table 5.2.4. Average trip length varies according to trip purpose and income level. In general higher income groups had longer average trip length, except for Non-Home Based. Compared with the other trip purposes, the trip length for Home Based School trips were relatively shorter on average.

Table 5.2.4 Average Trip Length by Trip Purpose and Income Group

(Unit : km)

Income Level	To Work		To School	
	1985 1)	2000 2)	1985	2000
High	8.98	10.22	4.36	7.43
U. Middle	8.05	10.04	3.47	4.59
L. Middle	7.02	9.96	2.65	3.89
Low	5.58	5.95	2.14	1.96
All	6.68	8.51	2.69	3.52

Source: 1) ARSDS Supporting Report No3., JICA 1985
2) SITRAMP Mini Person Trip Survey, 2000
Note: ARSDS Home Interview Survey was conducted in DKI Jakarta only.

As urbanized areas have expanded outward to Botabek, around 760000 workers commute to Jakarta every day. The average trip length for “to work” purpose has increased from 6.68 km in 1985 to 8.51 km in 2000, while the length for “to school” trips also increased from 2.69 km to 3.52 km. This increase in trip length has imposed a heavier burden on the transport network in terms of person kilometers.

(2) Concentration of Trips in CBD

The concentration of travel demand in CBD causes traffic congestion on the road network as well as overcrowding of buses and train. Trip attraction of “to work” as illustrated in Figure 5.2.1, is concentrated in the central area enclosed by the railway semi-loop line, the newly developed “Sudirman-Kuningan Golden triangle” area and areas along the Cawang – Grogol – Pluit toll road (Jakarta Intra Urban Tollway S-W section). The trip attraction of these areas accounted for 53 percent of the total trip attraction of “to work” trips in DKI Jakarta.

5.2.4 Modal Composition

(1) Modal Composition in 2000

The modal composition in the Jabotabek region was estimated as shown in Table 5.2.5. Of all the person trips made by motorized modes of transport, more than 50 percent were made by buses. Even though the number of buses has been decreasing due to the economic crisis, a bus is still the most significant mode of transport used by the majority of citizens in the region. On the other hand, among private modes of transport, cars were used by 30 percent of people and motorcycles were used by 18 percent of people. Compared to the modal share in 1985, the share of public transport has decreased slightly from 57 percent to 52 percent. In contrast, the share of private cars has increased from 22.8 percent to 30.8 percent. The share of motorcycles has reduced from 20.2 percent to 14.2 percent. A general trend in modal shift from public transport to private mode has been observed during the last 15 year period.

Table 5.2.5 Person Trips by Mode of Transport, 2000

Description	Person trips per day	Composition Of all modes	Of motorized modes
All modes of transport	29,168,330	100.0%	-
Non-motorized modes of transport	8,402,771	28.8%	-
Motorized modes of transport	20,765,559	71.2%	100.0%
- Motorcycle	2,954,512	10.1%	14.2%
- Car	6,404,503	22.0%	30.8%
- Bus (incl Patas AC)	10,938,646	37.5%	52.7%
- Train	416,426	1.4%	2.0%

Source: SITRAMP Estimate

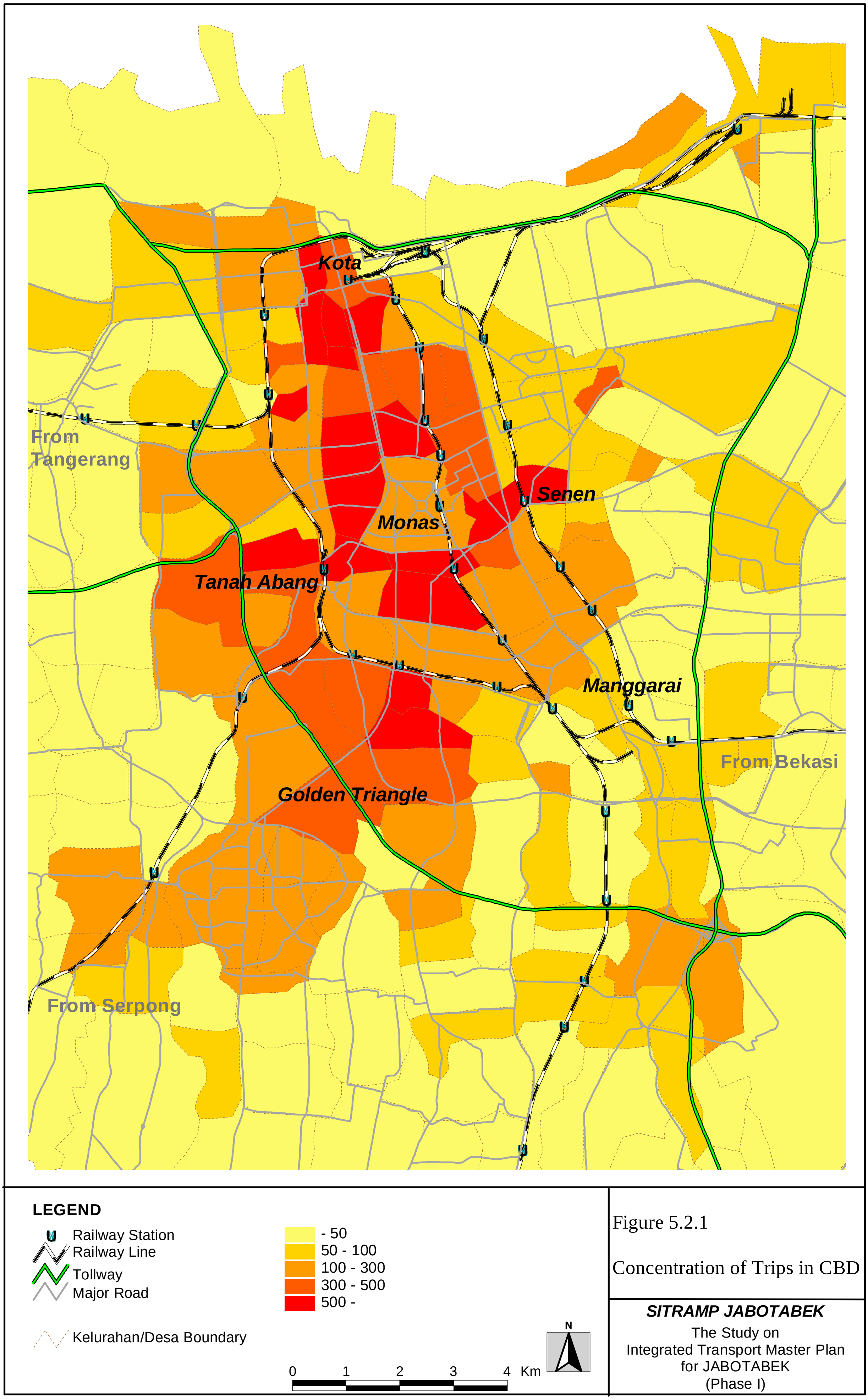

Figure 5.2.1

Concentration of Trips in CBD

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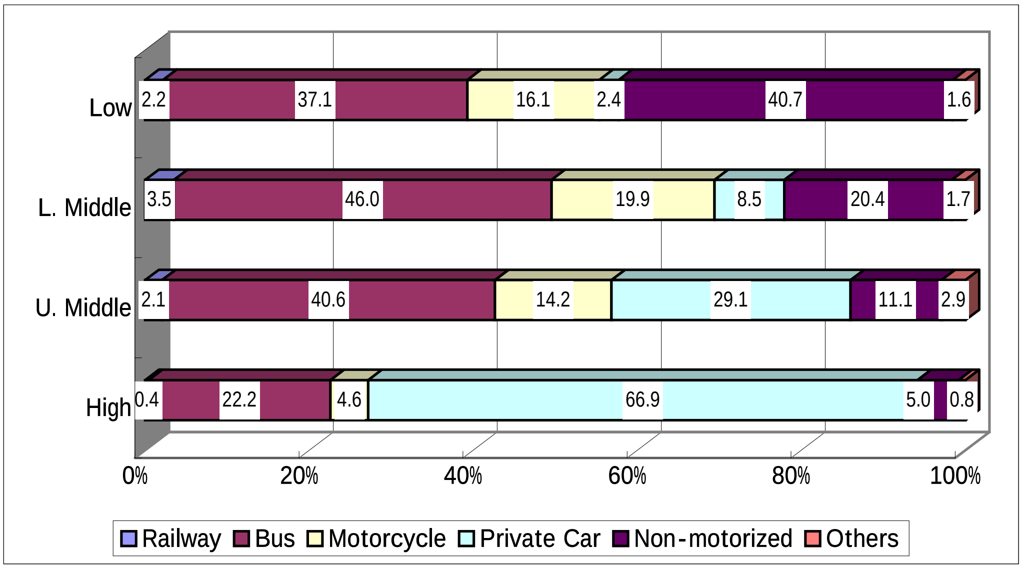
(2) Limited Choice of Transport Modes

The modal share varies according to the income level. High-income households depend greatly private cars for their travel needs and its share amounts to 66.9 percent as illustrated in Figure 5.2.2. Even though not as high as the high-income group, the upper middle-income households also rely on the use of private cars. The usage of public and non-motorized transport is rather limited for these two income groups. Public transport, non-motorized transport and motorcycles are the dominant modes for the lower middle as well as the low-income group. For instance, for the lower middle-income group, bus transport accounts for 46.0 percent and motorcycles for 19.9 percent. For the low income group the share of non-motorized transport is as high as 40.7 percent. This implies that even public transport is economically difficult to use for the low-income group. Thus they heavily rely on non-motorized modes. Therefore, the provision of a means of transportation for the transportation poor is one of the important issues which need to be tackled.



Source: SITRAMP Mini Person Trip Survey, 2000

Figure 5.2.2 Modal Share by Income Level

(3) Modal Choice Model

In addition, the modal choice analysis revealed that people are not willing to change their mode of transport easily even if travel time or travel costs were reduced considerably. As the modal choice models listed in Table 5.2.6 shows, the mode specific constant is so large that a reduction in travel time or travel time does not contribute significantly to a modal shift. In other words, the decision making on modal choice is largely explained by income level and availability of transport modes. This implies that merely improving the transport service would not shift many people from private modes of transport.

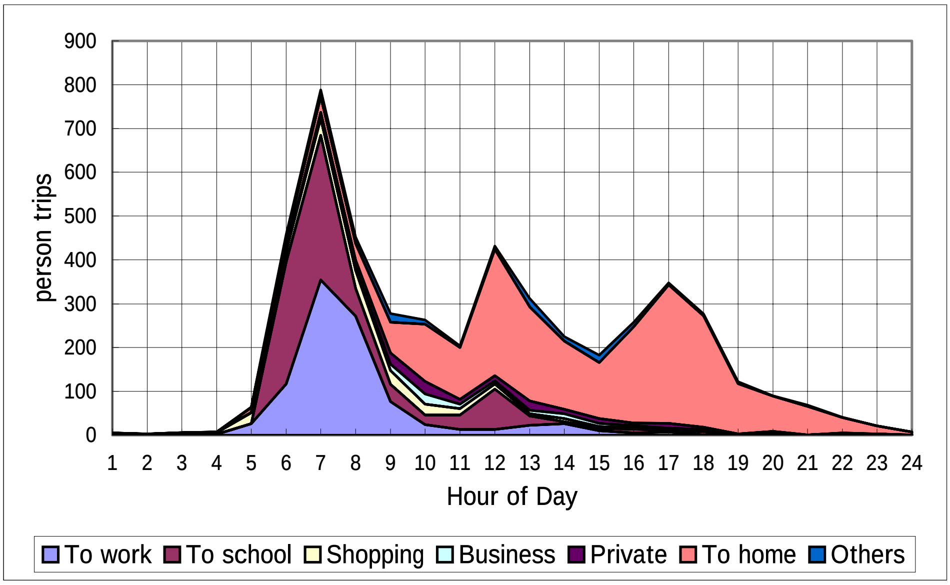
Table 5.2.6 Modal Choice Models

Variable	Trip Purpose			
	Home Based Work	Home Based School	Home Based Others	Non Home Based
Motor Cycles constant (1)	-0.8316 (-3.45)	-0.8882 (-3.27)	-1.5666 (-4.68)	-2.7390 (-4.47)
Bus constant (3)	-2.9655 (-12.84)	-1.5441 (-6.45)	-2.2214 (-7.38)	-3.9052 (-7.86)
Train constant (4)	-4.6386 (-18.41)	-4.1629 (-13.98)	-6.4822 (-12.13)	-5.8252 (-8.36)
Bus AC constant (5)	-4.2784 (-20.24)	-4.3754 (-17.26)	-5.6159 (-16.31)	-5.0367 (-9.43)
Time (1,2,3,4,5) ; in minute	-0.01354 (-3.49)	-0.03374 (-3.76)	-	-
Cost/Income (1,2,3,4,5) ; in Rp./Rp.	-207.2561 (-3.93)	-297.0044 (-2.33)	-	-
1/Generalized-cost* (1,2,3,4,5); in 1/Rp.	-	-	906.6932 (2.54)	1727.9700 (1.81)
Distance specific to bus (3); in km.	-	-	-0.0847 (-5.14)	-
Distance specific to train (4); in km	-	-	0.02329 (1.57)	-
Rho-squared	0.512	0.663	0.688	0.653
Sample size	1387	1007	784	225

Note:
1=motorcycles; 2=car; 3=bus; 4=train; 5=bus ac
Figures in brackets indicate t-value.
*Generalized-cost = travel cost + value of time * travel time
where : value of time = Rp. 6,000/hour for high and upper middle income people
= Rp. 3,000/hour for lower middle income people
= Rp. 1,500 /hour for lower middle and low income people

5.2.5 Hourly Fluctuation of Person Trip Demand

Three peak periods were observed in a day, i.e., morning peak period (6:00-9:00), noon peak period (12:00-13:00) and evening peak period (16:00-19:00). (See Figure 5.2.3). As many as 34.6 percent of daily trips were concentrated in the morning peak hours, while about 18 percent of trips were generated during the evening peak hours. This peak demand is a problem for public transport operation because if the public transport system were designed to meet the peak demand it would result in over-investment since passenger demand during off peak hours is much less than the peak demand.



Source: SITRAMP Mini-Person Trip Survey, 2000

Figure 5.2.3 Hourly Fluctuation of Person Trip Demand by Trip Purpose

5.3 Road Network and Traffic Demand

5.3.1 Present Road Network in Jabotabek and Drawback

(1) Shortage of Collector Streets in DKI Jakarta

The road network in Jakarta has a unique characteristic in that there are several major arterial streets with more than six lanes for both directions on to which narrow local streets connect directly. (Refer to Figure 5.3.1) The road network lacks an intermediate class of roads, namely, collector streets, which connect the arterial streets to the local streets. The road network hierarchy is not well organized in this regard. In DKI Jakarta, the total length of collector streets is merely 1.6 times of arterial streets. (See Table 5.3.1) The overall road density including local streets is 7.2 percent, whereas the density of only toll roads, arterial and collector streets is merely 3.3 percent. Areas with higher road density are found in the central area or in well-organized residential areas in suburbs.

Table 5.3.1 Present Road Length in DKI Jakarta

Classification	Length (km)	Ratio (percent)	Operation & Maintenance
Toll Road	113.0	1.7	Jasa Marga and Private Firms
Primary Road	153.5	2.4	
Arterial Road	101.9	1.6	National Government
Collector Road	51.6	0.8	National Government
Secondary Road	1,325.0	20.3	
Arterial Road	501.1	7.7	Provincial Government
Collector Road	823.9	12.6	Provincial Government
Local Road	4,936.9	75.6	Local Government
Total	6,528.4	100.0	

Source: Jakarta Dalam Angka (Jakarta in Figures), BPS. 1998

Although it has been widely recognized that a more comprehensive collector and local street network is required, the construction of such a collector street always causes social friction such as land acquisition, which is a sensitive issue particularly during the present evolution of democracy.

(2) Shortage of Arterial and Collector Roads in Botabek

The road network in Botabek area is not well established compared to DKI Jakarta. (Refer to Figure 5.3.3) Radial primary roads and regional expressways are the major components of the road network in Botabek. Thus traffic generated in the residential or industrial concentrates on these roads. The road density in Botabek is much lower than in Jakarta as shown in Figure 5.3.3 and the areas with relatively high road density are located along the major radial arterial roads.

As discussed in Sub-Section 2.3.2, another difficulty in developing arterial road in suburban areas is due to the fact that many housing complexes have been developed without reference to the road network development plan. Therefore it is essential to establish a road network master plan, which is consistent with the land use plan. Furthermore, the issue on road development is clarification of responsibility for road development in/out of those housing complexes.

(3) Slow Development of Arterial and Collector Road Network

During the last 15 years, the development of the Jakarta – West Java toll road system has progressed significantly. (See Figure 5.3.4) All sections of the Jakarta Intra Urban Tollway were completed in 1996. The Jakarta – Cikampek Toll Road was opened in 1988, and the Jakarta – Merak Toll Road was also extended to Merak in 1996. The South Section, the Pondok Pinang and Pasar Rebo section and the E-2 Section of the Jakarta Outer Ring Road have commenced operations.

On the other hand, few arterial streets have been developed in Jabotabek. In DKI Jakarta, new arterial street construction during the same period was limited and included Jl. Casablanca, Jl. Sultan Iskandar Muda, among others. Emphasis of road network development in DKI Jakarta has shifted from new road construction to the construction of flyovers and underpasses, due to the difficulty in new road construction as a result of advanced urbanization. In Botabek a very few number of roads have been newly developed and a few flyovers have been constructed.

(4) Weak East – West Connection of Road Network

Jakarta has been developed in a delta plain of rivers which flow from south to north and the rivers have been a natural barrier against east-west connection. (See Figure 5.3.5) Fewer arterial roads have been developed in the east-west direction, compared with the north-south direction. The present obstacles to providing an east-west connection in Jakarta are the highly developed central districts where there is little remaining space for widening existing streets or constructing new roads.

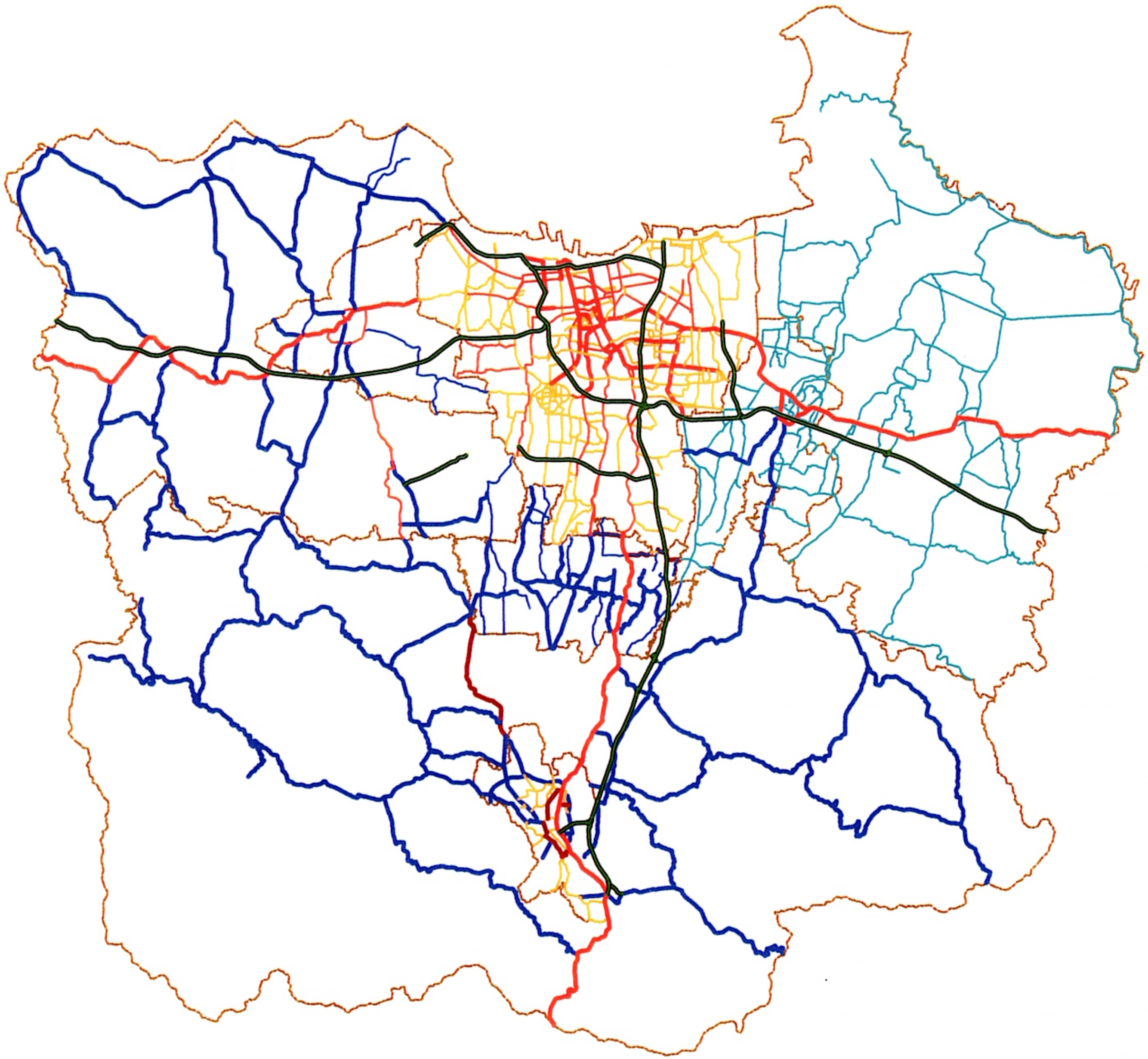


Figure 5.3.1

Road Network in Jabotabek

LEGEND

Tollroad

Primary Arterial
Primary Collector
Secondary Arterial
Secondary Collector
Primary Local

Primary or Secondary not specified

Arterial
Collector

Kabupaten Boundary

Source:
<Jakarta>
Jakarta Planning Atlas 1995
<Kab. Bekasi>
Hearing from Kab.Bekasi
<Kota Bekasi>
Hearing from Kota Bekasi
<Kab. Tnagerang>
RTRW Kab. Tangerang 1994
<Kota Tangerang>
Data Pokok Pembengunan Kota Tangerang
<Kab.Bogor>
RTRW Kab. Bogor (Draft) 2000
<Kota Bogor>
Rencana Umum Tata Ruang Kota 1995,
Hearing from Kota Bogor
<Kota Depok>
Rencana Tata Ruang Willayah
Kota Depok (Draft) 2000

N

0 5 10 15 20 25 Km

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Figure 5.3.2

Road Density in Jakarta

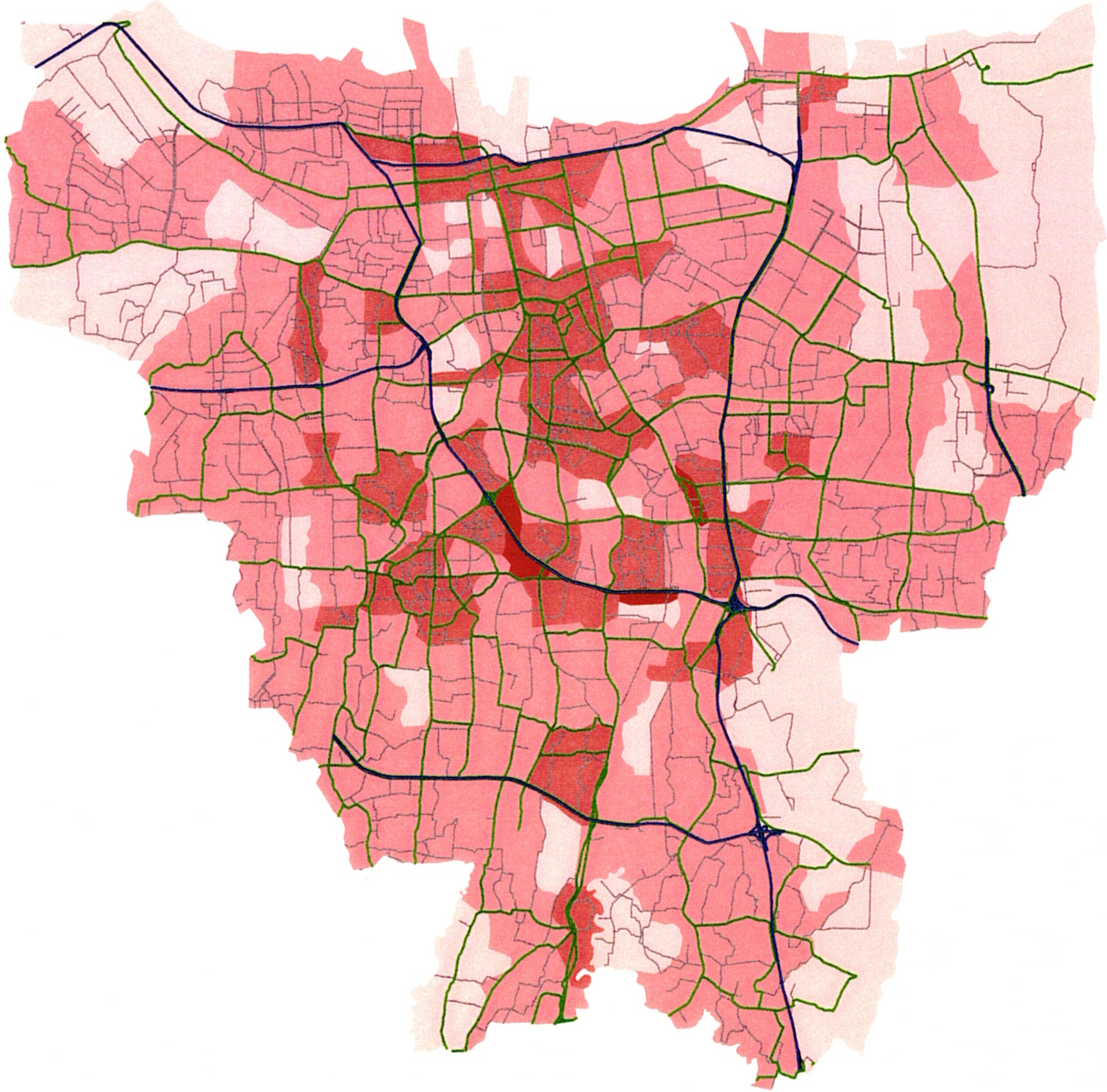

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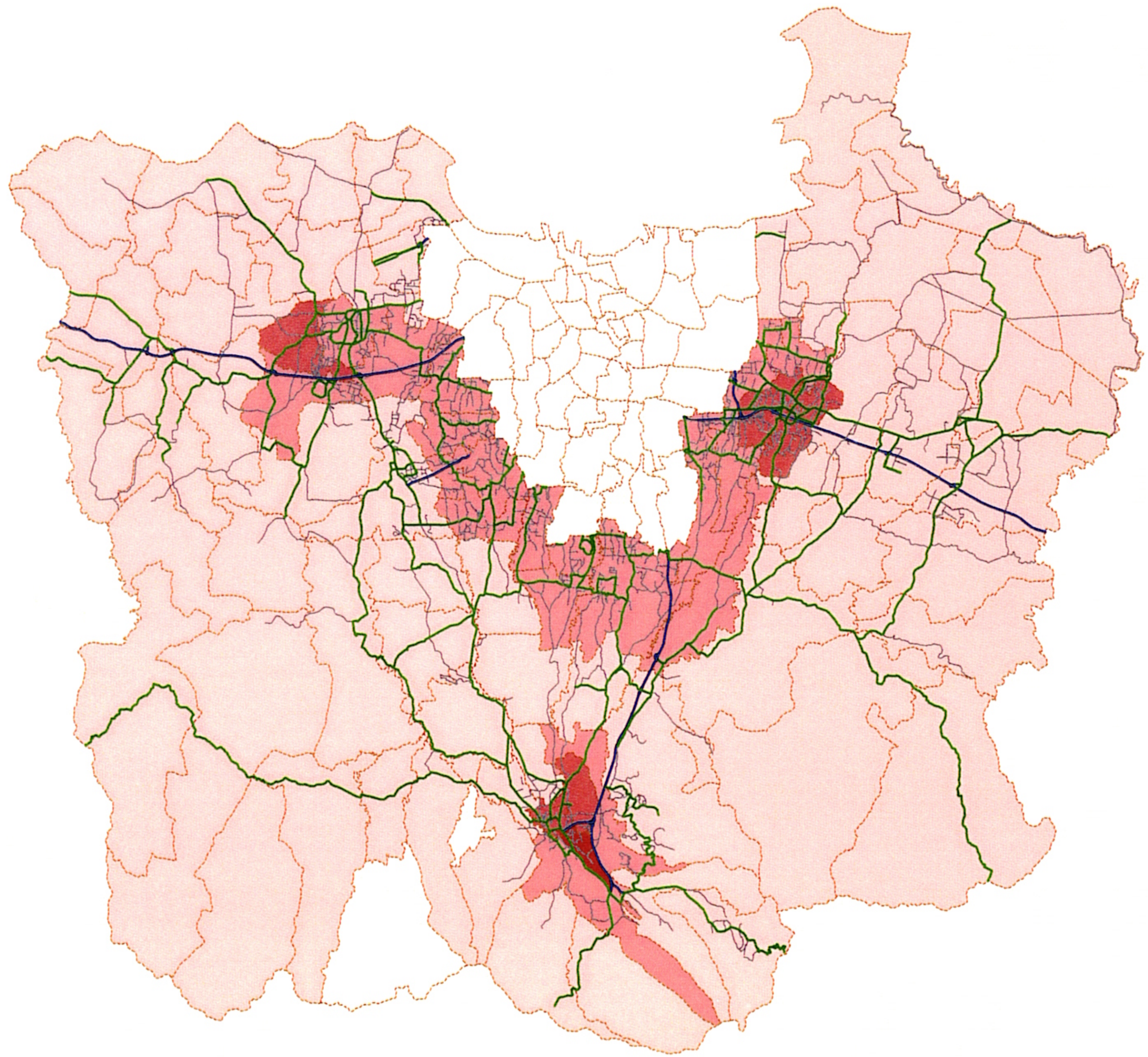
Figure 5.3.3

Road Density in BOTABEK



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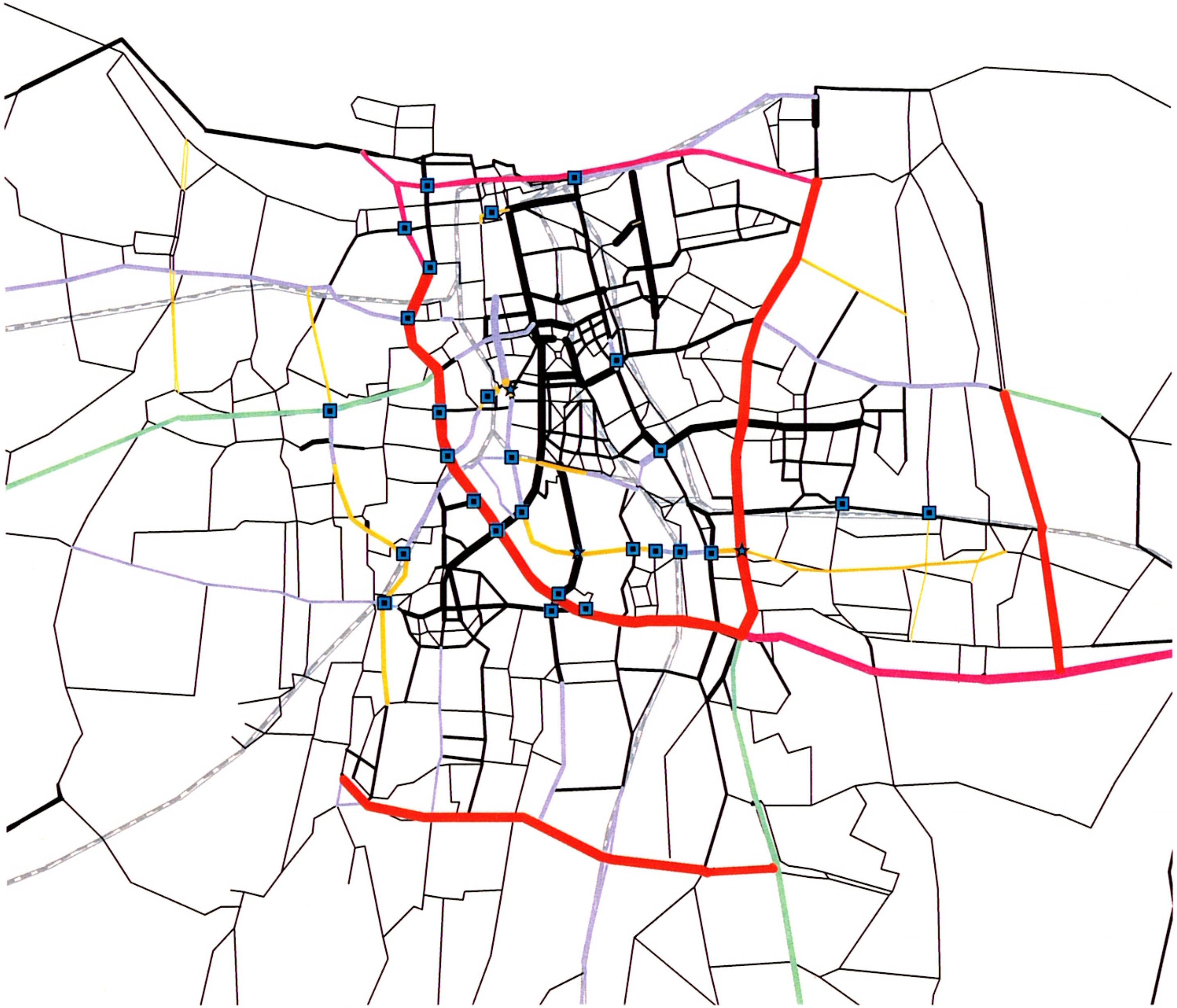

Figure 5.3.4
Historical Road Development
in Jakarta

LEGEND

Number of Lanes
- 1 - 2 lanes
- 3 - 4 lanes
- 5 - 6 lanes
- 7 - 10 lanes
- More than 10 lanes

Improvement
- Widening (Arterial Road)
- Widening (Tollway)
- New Construction (Arterial Road)
- New Construction (Tollway)
- New Construction (Tollway & Arterial Road)
- Flyover
- Underpass
- Railway

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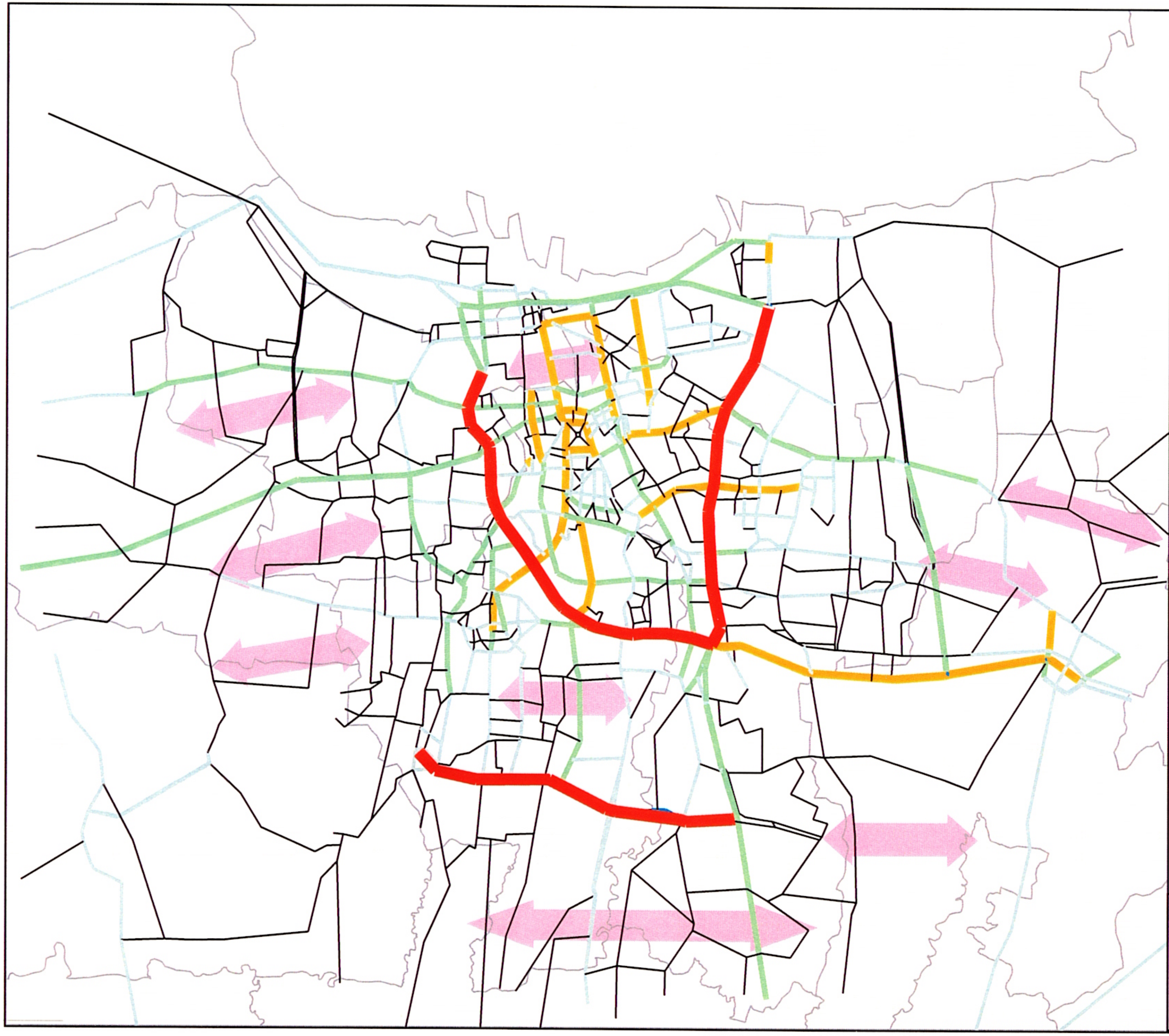

Figure 5.3.5

Weak East-West Road Connection

LEGEND

1 - 2 lanes
3 - 4 lanes
5 - 6 lanes
7 - 10 lanes
More than 10 lanes
Kota Kabupaten Boundary

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5.3.2 Pedestrian Facilities

There is a tendency in the present traffic facility management policy to give a higher priority to vehicular traffic whereas pedestrian facility development is left behind or paid little attention to. Therefore the present level of pedestrian facilities is generally poor and discourages people from walking.

(1) Pedestrian Sidewalks

The length and quality of pedestrian sidewalks are generally poor. Most of the existing sidewalk surface is paved by blocks and the majority of pedestrians find them uncomfortable to use due to poor maintenance. Electrical poles and traffic signs are installed in a poorly organized manner on the sidewalks. In addition street vendors occupy the sidewalks thus forcing pedestrians to spill over on to the carriageway. In contrast few street trees have been planted to provide comfortable sunshade.

(2) Pedestrian Crossings

The number of pedestrian crossings, especially signalized pedestrian crossings, is still limited in Jabotabek. In some instances, cars pass continuously through intersections without a break and prevent pedestrians from crossing the road.

- Poor Standard and Improper Location of Pedestrian Crossings

Some pedestrian over-bridges have been built at improper locations, and as a result people do not use them to cross the streets. In addition, the standard of pedestrian bridge is still poor; the width is narrow and height is too high making pedestrians feel uncomfortable.

- Shortage of At-Grade Pedestrian Crossing

A few stand-alone pedestrian crossings have been placed on busy streets but they are seldom accompanied by traffic signals for pedestrians. Pedestrians often cross the street by weaving through vehicles approaching them at high speeds regardless of whether there is a crossing or not. Few drivers pay heeds to pedestrians even at authorized crossings, and pedestrians are threatened by cars.

- No Exclusive Signal Phase for Pedestrian

At-grade intersections have pedestrian crossings at every entrance/exit of intersections, however the phase exclusive for pedestrians is not set at some intersections under present signal control system. For example, in a four-phase traffic control system vehicles always close 3 exits and give no chance for pedestrians to cross the street if an extra all-red-phase is not provided in one cycle.

5.3.3 Traffic Demand on Road Network

Traffic demand on the road network is continuously growing. The 16-hour traffic demand on the cordon lines in 1993 showed a total volume of 523000 vehicles, excluding motorcycles (Table 5.3.2; an increase from the 290000 vehicles in 1988, the volume continued to grow to 782000 vehicles in 2000. Thus, the total cordon line traffic demand has increased by almost six (6) percent per annum during 1993-2000; a rate lower than that during 1988-1993 (around 12.6 percent per annum).

Analysis of the cordon traffic growth by direction (see also Figure 5.3.6) confirms the general decline in the growth rate. Although during 1988-1993 the traffic at the west and east segment of the cordon line grew at a similar rate of around 16 percent per annum, the rate declined to 8.1 percent p.a. and 6.4 percent p.a., respectively during 1993-2000. The south segment of the cordon line had the smallest growth at 7.4 percent p.a. throughout 1988-1993, yet the growth rate declined further to 3.4 percent p.a. during 1993-2000.

On the other hand, traffic in inner Jakarta has maintained a stable growth rate over the past decade. From 1988 to present, traffic on the screen line A grew at a rate ranging from 6.1 percent to 6.5 percent p.a., while that of screen line B grew at a modest 1.9 percent to 2.2 percent p.a.. The growth of 16-hour traffic (excluding motorcycles) on screen line B is lower than that on screen line A, particularly because of the fairly small increase in traffic to/from south Jakarta.

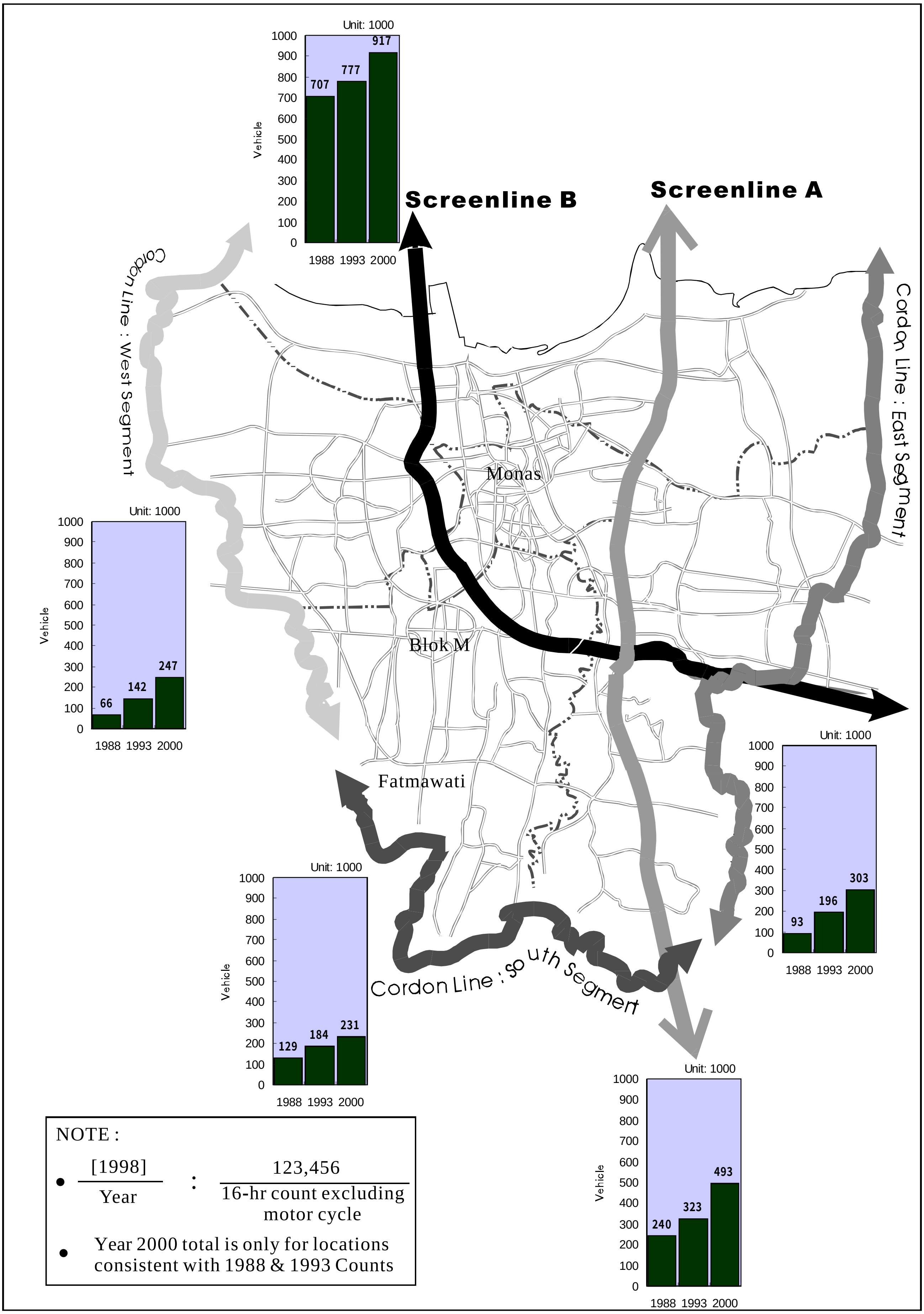
The traffic growth analysis indicates a continuous traffic growth along the east-west axis of the Jakarta metropolitan area which exceeds that of the north-south axis.

Table 5.3.2 Screen Line and Cordon Line Traffic Volume Comparison 1988-2000

(unit: 000 vehicles per 16 hours)

Section	**Traffic Volume**(1)			**Growth Rate**	
	1988(2)	1993(3)	2000(4)	1988-1993	1993-2000
Cordon Line					
- West Segment	67	142	245	16.3%	8.1%
- South Segment	129	185	233	7.4%	3.4%
- East Segment	94	196	304	16.0%	6.4%
Cordon Line Total	**290**	**523**	**782**	**12.6%**	**5.9%**
Screen Line A	241	323	501	6.1%	6.5%
Screen Line B	708	777	905	1.9%	2.2%

(1) 16-hour volume excluding motorcycle
(2) Source : Jakarta Outer Ring Road Study, 1988
(3) Source : Arterial Road System Development Study, JICA, 1993
(4) Only on locations consistent with those in 1993
Source: SITRAMP Traffic Count Survey, 2000



Source: SITRAMP Traffic Count Survey, 2000

Figure 5.3.6 Traffic Growth on Screen and Cordon Lines: 1988-2000

5.3.4 Traffic Congestion

(1) Location of Traffic Congestion

Congestion is the most visible symptom of a traffic problem. Generally speaking, congestion occurs when and where demand exceeds capacity. Traffic congestion on the road network is indicated by travel speed during the morning peak hours in Figure 5.3.7.

(2) Causes of Traffic Congestion

There are numerous locations in Jabotabek where traffic congestion is a daily occurrence. These locations are shown in Figure 5.3.8. Various root causes of congestion are described below. Often congestion is caused by multiple reasons.

(a) Physical bottleneck due to inconsistent carriageway width

Most arterial and collector road carriageway in Jabotabek consist of only two lanes per direction and there is often an inconsistent capacity along some roads in terms of the number of lanes which leads to unstable traffic flow. If the road width becomes narrower than the upstream section, congestion is unavoidable at the bottleneck. Typical locations are:

- Bridge section connecting Jl. Rasuna Said and Jl. Cokroaminoto
- Railway bridge of Bekasi Line over Matraman Raya

On the other hand, unnecessarily wide carriageway sometimes creates temptation for some drivers to overtake and later forcefully merge back in front of other vehicles. This is exacerbated by the lack of adherence to traffic rules, resulting in an even worse traffic congestion.

(b) Intersection

An intersection is a place where conflicting movements have to share the same space, and the right of way is given to movements either alternatively or sequentially. Because of this fact, intersection capacity is much smaller than that of road section. Most of the congested areas in the study area are in fact intersections. Even when there is a fly-over for decongestion some intersections are still congested. One example is:

- Mampang Prapatan – Kapten Tendean
- Street market/street vendors

(c) Street market/Street vendors

Street market and street vendors illegally occupy the road space blocking the passage of vehicles. There are many locations in the study are where this is happening. Two typical locations are:

- Matraman Raya
- Pasar Minggu

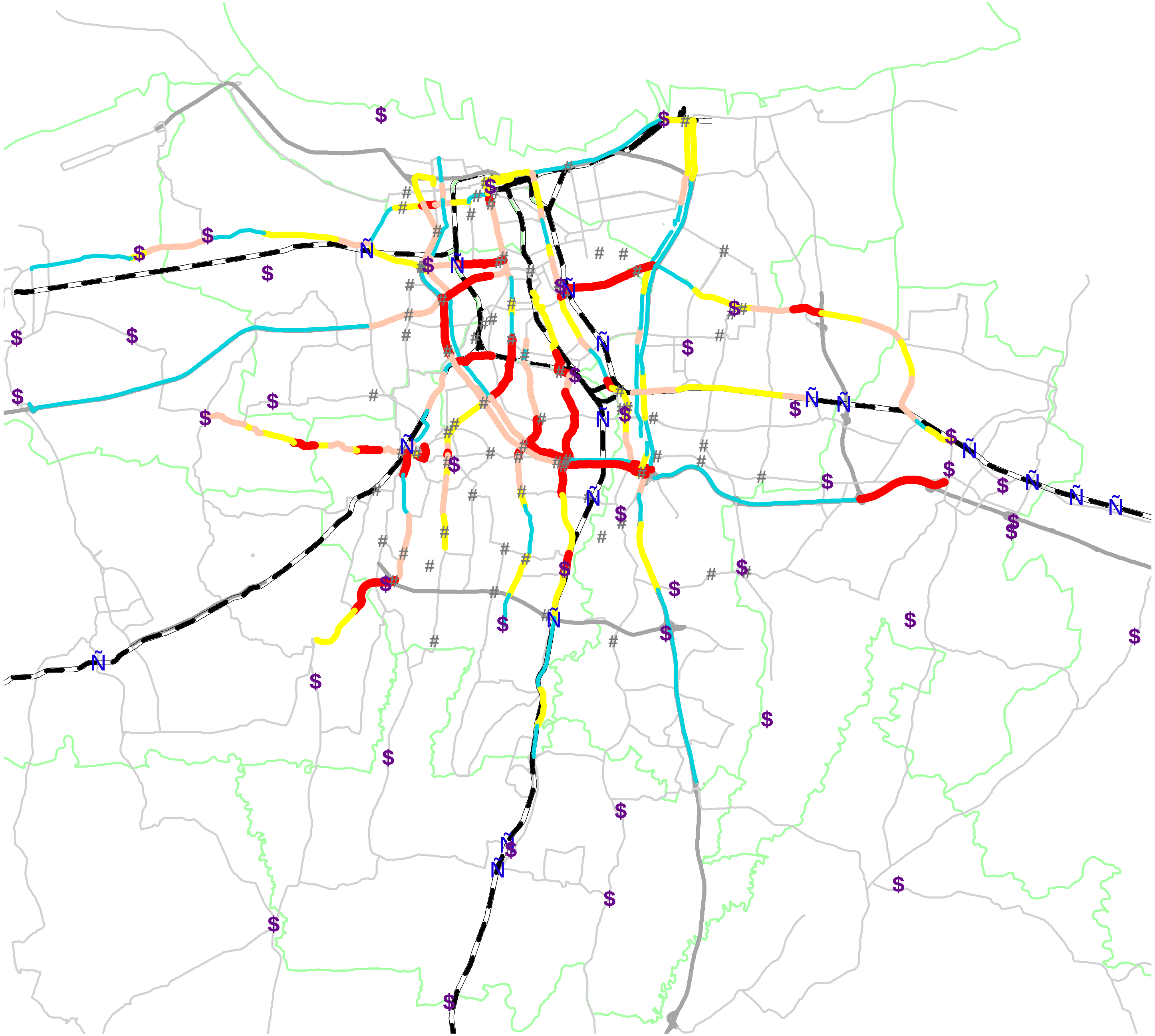


Figure 5.3.7
Travel Speed in
Morning Peak Hours

LEGEND

- $ Bus Terminal
- Ñ Railway Crossing
- # Morning Congestion Point

Travel Speed (to Central)

- 0 - 10 [km/h]
- 10 - 20 [km/h]
- 20 - 30 [km/h]
- more than 30 [km/h]

- Toll Road
- Arterial Road
- Railway

- Kota Kabupaten Boundary

N

0 2 4 6 8 10 Km

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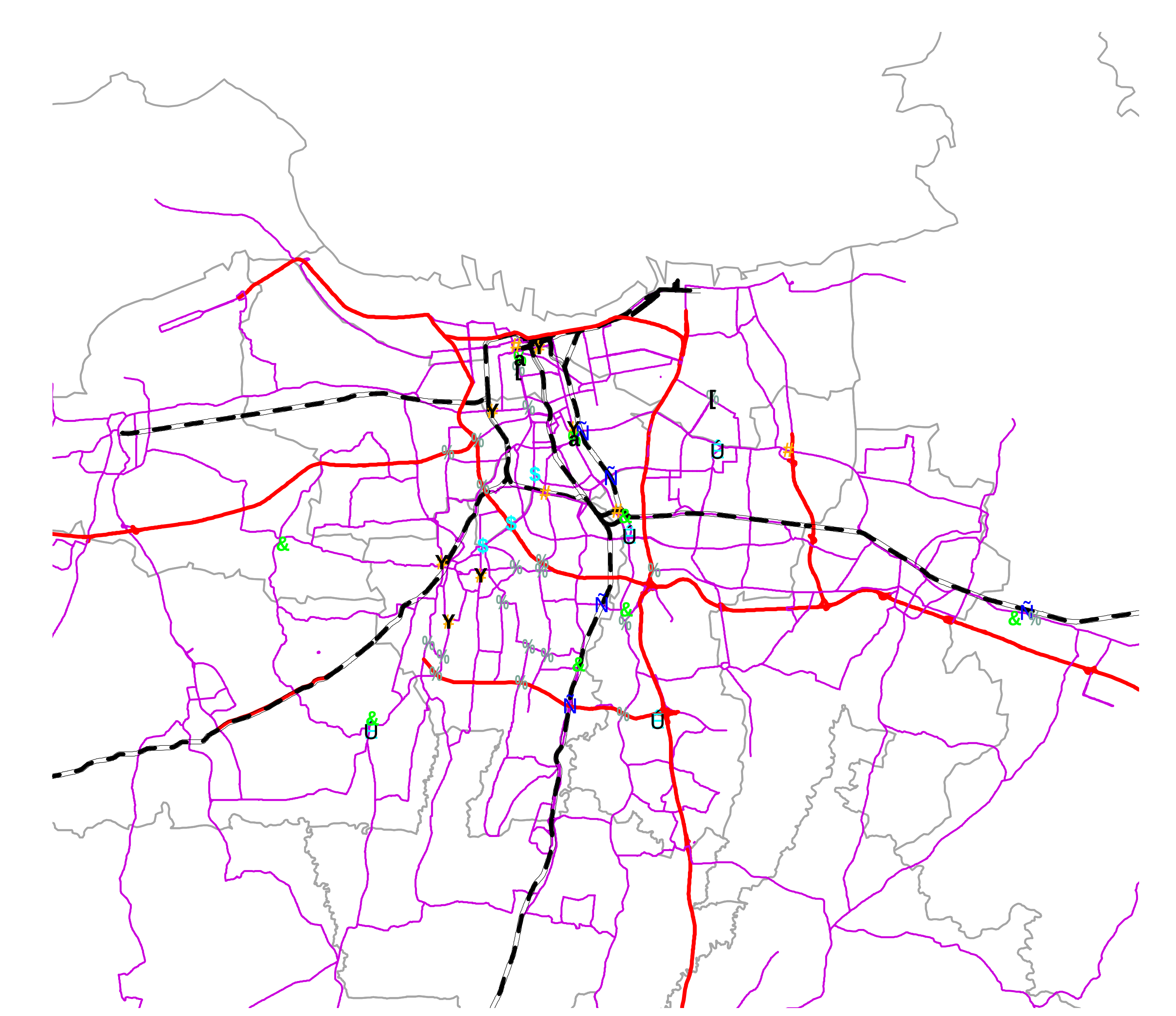

Figure 5.3.8
Causes of Traffic Congestion

LEGEND

- # Reduction of Lanes
- % Intersection
- $ Merge
- & Street Market / Street Vendors
- Y Inadequate Bus Boarding/Alightining
- [On-Street Parking
- Ü Bus Terminal
- a Mnay Small Bus Operation
- Ñ Raiway Crossing
- Toll Road
- Arterial Road
- Railway
- Kota Kabupaten Boundary

N

0 2 4 6 8 10 Km

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(d) Inadequate Space for Bus Passenger Boarding and Disembarking

Buses occupy a lane while they load and unload passengers which reduce road capacity and causes congestion. The phenomenon is seen in front of many large shopping malls and markets such as Manggadua Mall and ITC on Jl. Manggadua, Roxy Mas Trade Center on Jl. Hasyim Asyhari, Senen Market along Jl. Pasar Senen, Kebayoran Lama Market along Jl. Kebayoran Lama, Pondok Indah Mall on Jl. Metro Pondok Indah, etc.

(e) On-Street Parking (illegal parking, double parking and parking maneuver)

On street parking, even when it is allowed, takes up road space and reduces capacity. Parking maneuvers disturb the smooth flow of traffic. Illegal parking and double parking, both of which are common in the Study area, are worse in terms of their disturbance on the traffic flow. Typical locations of on street parking are

- Jl. Gajah Mada,
- Jl. Hayam Wuruk, and
- Kelapa Gading Boulevard.

(f) Bus Terminal

Large and small buses concentrate at bus terminals which result in congestion. The situation is compounded by the manner these vehicles behave. Small buses often load and unload passengers not inside the bus terminal but at the entrance or exit points taking advantage of the location. Street vendors also gather at these points, as there are many potential customers. Roads around almost all bus terminals are congested. Two typical locations are:

- Kampung Melayu Bus Terminal
- Pulo Gadung Bus Terminal

(g) U-turn

Due to the limited road network, U-turn is allowed along many arterial streets in DKI Jakarta. Although it does not cause serious congestion, it does disturb traffic flow in both directions. The phenomenon is seen along Jl. Rasuna Said, Jl. Fatmawati, Jl. Mampang Prapatan, etc.

Actually, U-turn facilities can provide several benefits to traffic flow as long as the traffic volume does not exceed an acceptable level. Under an ideal condition, no signal control is necessary and traffic does not have to stop to give way to turning flows. In the face of the prevailing traffic condition in the urban area, it is time to study whether application of such a U-turn facility is suitable or not.

(h) Railway Crossing

Railway crossings, like intersections, interrupt the traffic. The railway crossings for the Bogor line, where the train frequency is higher than other lines, are already a cause of congestion. Two typical railway crossings causing congestion are:

- Railway crossing at Jl. Kalibata

- Railway crossing at Jakarta Outer Ring Road (service road)

(3) Others Causes

Congestion is created also by other causes such as weaving (Semanggi Bridge), bad pavement (Jl. Manggadua), flooding (Dr. Sediyatmo Toll Road to Soekarno Hatta Airport), and the like.

5.4 Traffic Control and Management System and Problems

5.4.1 Existing Traffic Control System

(1) Existing Traffic Signal System and Complexity

(a) Three Different Systems and Burden for Operation and Maintenance

A traffic signal is the most basic facility for traffic control. Currently, there are three ATC systems in Jakarta supplied by Sainco of Spain, Siemens of Germany, and AWA of Australia through Telnic of Indonesia. The Sainco system has 130 traffic signals covering the central part of Jakarta, including Kebayoran Baru. The Siemens system consists of 42 signals covering the western part of Jakarta. The AWA system has 83 signals covering the eastern part of Jakarta. The coexistence of these different systems is a result of the consolidation of the previously fragmented traffic signal system. The approach taken would have been economical in the short term. But DLLAJ had to procure three different kinds of central systems and now has to maintain three systems requiring different sets of spare parts. In addition, the DLLAJ staff has to master the control software and database for each system, which imposes a burden on the human resources.

(b) Signal Timing not responded to Real Time Traffic Demand

All ATC signals operate in a time-of-day (TOD) mode, in which the central computer selects one of the pre-defined signal timing sets according to the time of day. Only the Sainco system has vehicle detectors at about 100 intersection approaches to measure the congestion index, which is calculated using traffic volume and occupancy rate. More than half of these detectors are, however, not functioning and the data from the rest of the detectors are not reliable. In effect, data from the vehicle detectors is not used for signal timing or traffic condition monitoring.

(c) Expensive Operation and Maintenance Cost for Communication

ATC signals at intersections are connected to the central computer system through a dedicated cable owned by DKI Jakarta (Sainco system) and through leased telephone line from PT. Telkom (Siemens and Telnic systems). Maintenance of self-owned cable system creates technical as well as budgetary problems, while monthly telephone bill payment is a constraint on maintaining and upgrading the system. As a result, many signals are isolated from the system.

(d) Minimal Hardware Maintenance

Three maintenance contractors undertake hardware maintenance of the system, with each contractor covering one system. As far as the signal lamps are observed, maintenance work is minimal, as broken bulbs are not replaced in a timely manner nor is the lamp unit cleaned and adjusted.

(e) Insufficient Updating of Signal Timing

Signal timing was prepared when the system was initially installed using timing the calculation software, TRANSYT/7F. Subsequently, a periodical and systematic timing review program has not been established. Signal timing is adjusted only when the timing is found to be inadequate. Even when signal timing is modified, the adjustment is made based on observation of the traffic by the staff and a traffic count survey not carried out.

(f) Shortage of Traffic Signals in Botabek

In Botabek the number of signals is much fewer than Jakarta as summarized in Table 5.4.1. The condition of these signals is, if not worse, comparable to that of Jakarta. They are fixed time signals with one pattern of signal timing. No vehicle actuation is used. Maintenance is minimal and some of them are not working, due probably to the lack of spare parts, capable personnel or funds for repair.

Table 5.4.1 Number of Existing Traffic Signals

	Non-ATC Signal	ATC Signal	Total
Jakarta	276	255	531
Kota Bekasi	16	n.a.	16
Kabupaten Bekasi	4	n.a.	4
Kota Tangerang	n.a.	n.a.	n.a.
Kabupaten Tangerang	5	n.a.	5
Kota Depok	2	n.a.	2
Kota Bogor	n.a.	n.a.	n.a.
Kabupaten Bogor	n.a.	n.a.	n.a.

Note: n.a.: not available.

(2) Difficult Application of One-way System

One-way system restricts the flow direction to one direction. It increases the capacity of the road section as well as the intersection, and it simplifies movement at an intersection. On the other hand, the trip length becomes longer, due to the restriction of flow direction, and public transport users suffer inconvenience due to route diversion. To circumvent the second disadvantage, the one-way is not applied and one lane is assigned only to buses in the opposite direction along Melawai Raya (permanent) and Panglima Polim (during contra flow time). Normally the one-way system is applied to two streets parallel to each other. But this is not a case for the most of the one-way systems in the Study area. Most of the one-way systems in the Study area have irregular shape due to the peculiar road network configuration.

(3) Right-turn Prohibition and U-turn Problem

On almost all major roads, right-turns are not allowed, thus, vehicles, which want to turn to the right must turn left 3 times or make a U-turn on the road. However 3-time left turn is not practical in Jakarta due to the scarify of suitable roads for turning left. Vehicles, therefore, are forced to use the U-turn openings of the median strip. Since a U-turn maneuver greatly disturbs the traffic flow, U-turn openings are generally at long intervals from each other and a long queue of waiting vehicles can be observed at every U-turn opening. The prohibition of right-turns at intersections prevents traffic obstruction caused by right-turn vehicles especially at intersections without traffic signal, and allows the main road traffic to travel a high speed until the obstruction at the next U-turn opening. Thus on some of major trunk roads therefore, median openings are only located long interval to maintain high vehicular speed. This traffic control was effective back when the traffic volume was not large and signal control had not been introduced. However it may be time to review this policy from the viewpoint of time and energy consumption and the also environment.

5.4.2 Traffic Demand Management System

(1) 3-in-1 Policy as a Traffic Restraint Policy Measure and its Drawback

In Jakarta, a 3-in-1 scheme is applied to Jl. Thamrin, Jl. Sudirman and a part of Jl. Gatot Subroto from 6:30 a.m. to 10:00 a.m. from Mondays through Fridays. During the restricted time, only vehicles with three or more passengers are allowed to enter the restricted road sections. Taxis and public buses are exempted from this restriction. Enforcement is done through surveillance by traffic police and offenders are apprehended on the spot.

The scheme is generally observed and the measure is effective in reducing the number of vehicles entering the restricted zone resulting in a smooth traffic flow during the restricted time. But it has problems.

(a) Congestion on Parallel Streets

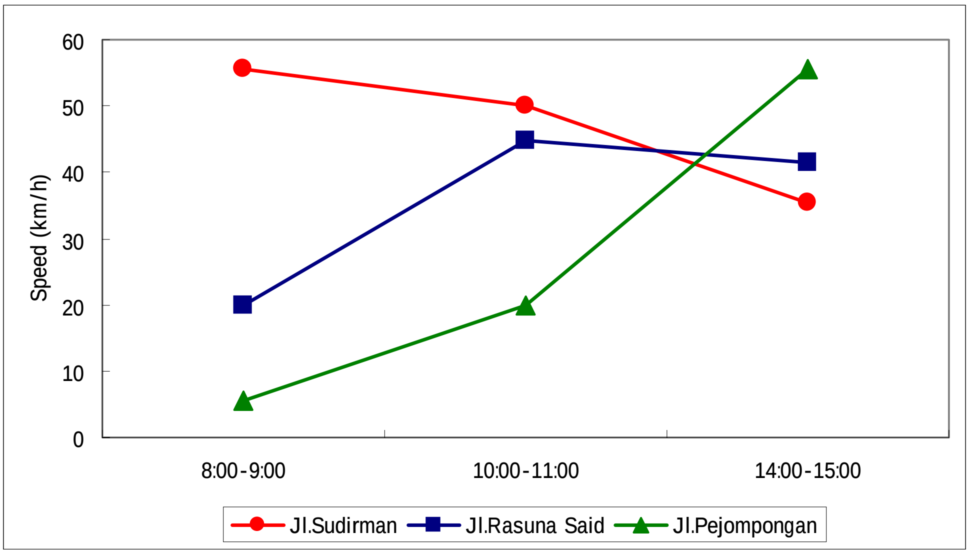
The streets running parallel to the restricted streets, such as Jl. Rasuna Said and Jl. K. H. Mas Mansyur, are crowded with the vehicles bypassing the restricted streets. Consequently traffic demand on the parallel streets increases during the restricted hours and decreases the travel speed significantly. (See Figures 5.4.1 and 5.4.2) Therefore it is questionable whether traffic restriction on one road can achieve efficiency for the whole network.

(b) Jockey Problem

Furthermore temporary passengers called “jockeys” wait just outside of the restricted zone to satisfy the number of passenger requirement for normally Rp2,000. This practice reduces the effectiveness of the traffic restraint policy by interfering with one of the objectives of reducing vehicular traffic on restricted roads.

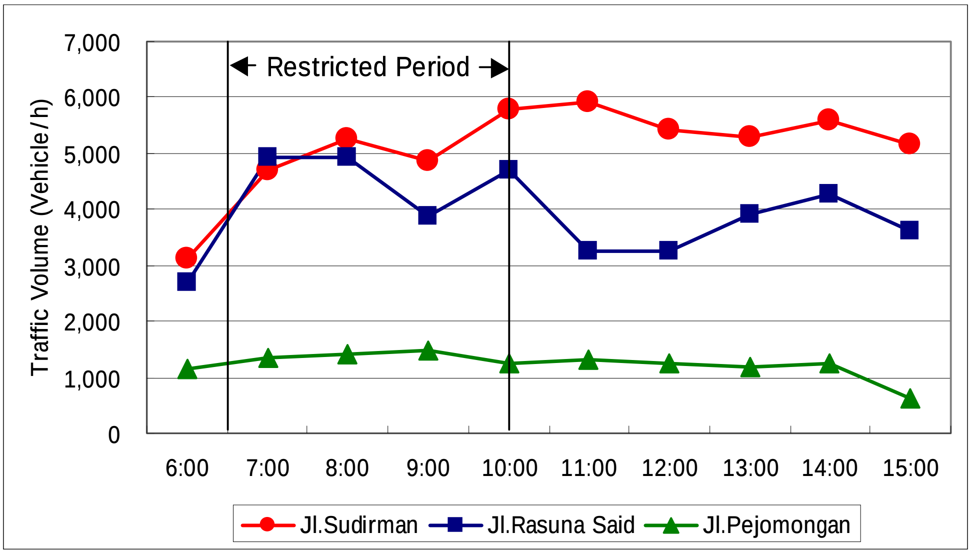
(c) Infexibility and Lack of Revenue

Other drawbacks of the 3-in-1 are inflexibility and lack of revenue. The current minimum requirement of three passengers cannot be raised for stricter restriction nor eased for more lenient restriction. The former would be too restrictive and the latter would be too generous in Jakarta where it is common hire drivers for private cars. Unlike congestion charging or road pricing, there is no revenue for the City Government, while a cost is incurred by the traffic police for enforcement.



Source: SITRAMP Travel Speed Survey, 2000

Figure 5.4.1 Impact of "3 in 1" Policy on Travel Speeds of the Parallel Streets



Source: SITRAMP Traffic Count Survey, 2000

Figure 5.4.2 Impact of "3 in 1" Policy on Traffic Demand of the Parallel Streets

5.5 Traffic Safety

5.5.1 Traffic Accidents on Non-Toll Roads in Jakarta Metropolitan Area

The total number of traffic accident victims in the Jakarta metropolitan area has significantly decreased in the last decade as shown in Figure 5.5.1. The total number of accident victims in 1998 was one third of those in 1986. However the total number of lives lost in traffic accidents has not decreased and it hovers around 500 persons in a year.

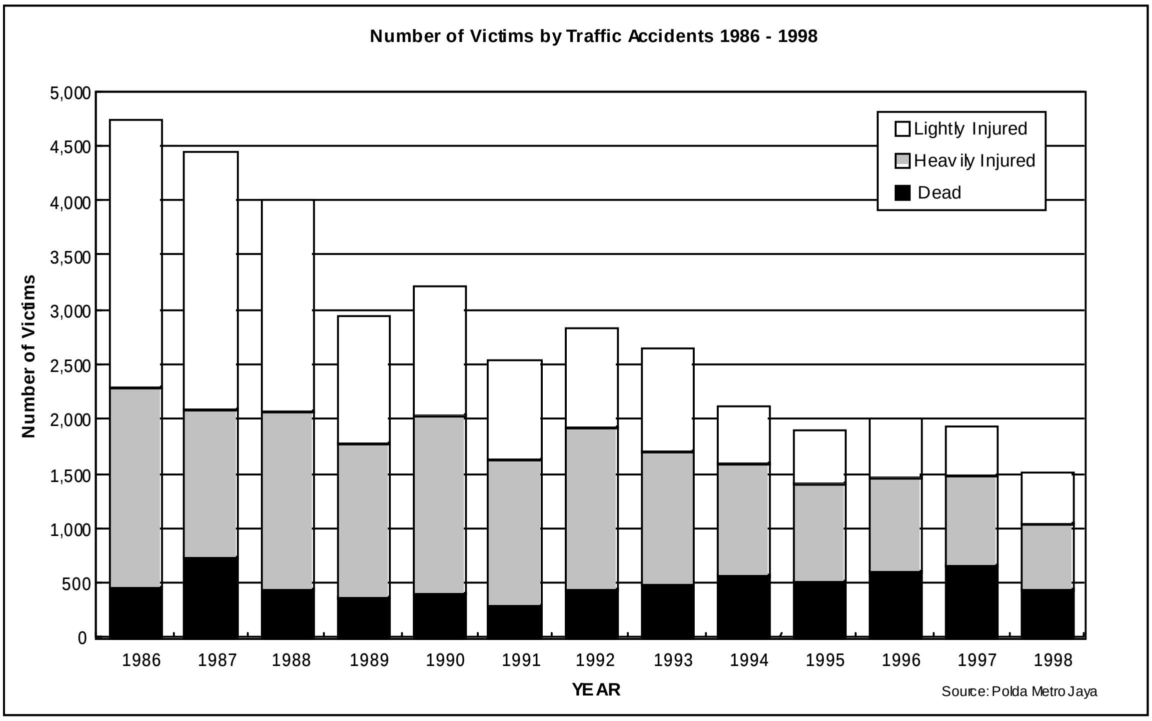


Figure 5.5.1 Number of Traffic Accident Victims: 1986 – 1998

5.5.2 Causes of Traffic Accidents on Non-Toll Roads

The causes of traffic accidents are largely categorized into four groups, namely; driver's mistake, lack of vehicle maintenance, lack of road maintenance and bad weather as listed in Table 5.5.1. About three fourth of traffic accidents are attributed to the driver's mistake, consisting of "careless driving (26.3 percent)," "violation of traffic law (24.7 percent)," "unskilled driver (15.0 percent)," and so forth. In order to reduce the traffic accidents caused by a driver's mistakes or carelessness, traffic safety education should be enhanced.

It is remarkable that lack of vehicle maintenance accounts for 16.3 percent of traffic accidents. Tire problems amounts to 9.3 percent whereas brake problem is 6.7 percent. Nevertheless car drivers should have primary responsibility for vehicle maintenance to drive a car safely on the road expansion of vehicle inspection to private vehicles should be taken into consideration in order to reduce traffic accidents due to lack of vehicle maintenance and to let drivers pay attention to vehicle maintenance for driving safety.

In addition, bad road conditions such as holes in the road and damaged or slippery roads also cause traffic accidents, accounting for 9.5 percent of total accidents. Traffic accidents due to poor road maintenance should be minimized through appropriate road maintenance by the authority for the respective roads.

Table 5.5.1 Causes of Traffic Accidents in 2000

Cause of Traffic Accidents		# of Accidents	Composition
Driver's Mistake	Careless	222	26.3%
	Sleepy	53	6.3%
	Drunk	7	0.8%
	Unskilled	127	15.0%
	Disobey	209	24.7%
	Subtotal	**618**	**73.1%**
Lack of Vehicle Maintenance	Brake	57	6.7%
	Tires	79	9.3%
	Light	2	0.2%
	Subtotal	**138**	**16.3%**
Bad Road Condition	Hole	14	1.7%
	Damaged	20	2.4%
	Slippery	46	5.4%
	Subtotal	**80**	**9.5%**
Bad Weather	Landslide	1	0.1%
	Rain	8	0.9%
	Subtotal	**9**	**1.1%**
Total		845	100.0%

Source: Polda Metro Jaya
Note: Data for December is not included

5.5.3 Traffic Accidents on Toll Roads

The number of traffic accidents on toll roads has not decreased. The number of traffic accidents in 1996 was recorded at 3,123 and it has remained at the same level in 1999 as shown in Table 5.5.2. The probability of traffic accident occurrence, however, has been decreased because the total number of vehicles on toll roads has increased over the same period. The traffic accident rate[1], which was 48.6 accidents per 100 million vehicle kilometers in 1996 dropped to 39.6 in 1999. The injury rate[2] has also steadily decreased from 64.3 persons per 100 million vehicle kilometers in 1996 to 47.8 persons in 1999, whereas fatality rate[3] declined from 4.81 persons in 1996 to 3.64 in 1999. Although both the injury and fatality rates of toll road accidents has been reduced significantly in recent years, the rate is still high compared with the injury rate of 16 persons and the fatality rate of 0.4 persons per 100 million vehicle kilometers in Japan for the year 1998. Therefore more efforts to reduce traffic accidents should be made by the relevant agencies.

5.5.4 Causes of Traffic Accidents on Toll Roads

Similar to the causes of traffic accidents on non-toll roads, traffic accidents on toll roads are also mostly due to the driver’s mistakes. The share of accidents attributed to driver related causes amounted to more than 60 percent in the last four years as shown in Table 5.5.3.

[1] Traffic accident rate is obtained by dividing the number of traffic accidents by the total vehicle kilometers in 100 million.
[2] Injury rate is obtained by dividing the number of victims injured involved in traffic accidents by the total vehicle kilometers in 100 million
[3] Fatality rate is obtained by dividing the number of fatalities by the total vehicle kilometers in 100 million.

Table 5.5.2 Traffic Accidents on Toll Roads : 1996 - 1999

	1996	1997	1998	1999
Road length (km)	441	446	478	478
Traffic volume per day (number of vehicles)	1,192,399	1,267,352	1,336,662	1,620,894
Average travel length (km)	14.8	15.9	14.1	13.6
Total vehicle km per day	17,609,826	20,209,180	18,874,359	22,081,599
Number of traffic accidents	3,123	3,267	2,972	3,192
Traffic accident rate per 100 million vehicle km	**48.6**	**44.3**	**43.1**	**39.6**
Number of accidents without victims	1,399	1,582	1,403	1,523
Number of accidents with light injury	788	789	704	756
Number of accidents with heavy injury	727	673	656	711
Number of fatal accidents	209	223	209	202
Number of victims with light injury	2,739	2,377	2,046	2,504
Number of victims with heavy victims	1,397	1,317	1,236	1,347
Number of fatalities	309	335	277	293
Injury rate per 100 million vehicle km	**64.3**	**50.1**	**47.6**	**47.8**
Fatal accident rate per 100 million vehicle km	3.25	3.02	3.03	2.51
Fatality rate per 100 million vehicle km	**4.81**	**4.54**	**4.02**	**3.64**

Source: Traffic accident monthly report of December [*Laporan Kecelakan Lalu Lintas di Jalan Tol*], each year from 1996 to 1999, PT. Jasa Marga
Note: All the traffic accidents in Indonesia are included

Table 5.5.3 Cause of Traffic Accidents on Jabotabek Toll Roads 1996-1999

	1996		1997		1998		1999	
Driver related causes								
Lack of anticipation	530	24.5%	947	43.4%	536	28.7%	536	29.6%
Careless	152	7.0%	167	7.7%	123	6.6%	101	5.6%
Sleepy	398	18.4%	359	16.5%	314	16.8%	360	19.9%
Drunk	14	0.6%	6	0.3%	7	0.4%	5	0.3%
Close distance between vehicles	349	16.1%	55	2.5%	145	7.8%	95	5.2%
Other driver related causes	0	0.0%	3	0.1%	3	0.2%	0	0.0%
Subtotal	**1,443**	**66.6%**	**1,537**	**70.5%**	**1,128**	**60.4%**	**1,097**	**60.5%**
Vehicle related causes								
Flat tire	407	18.8%	376	17.2%	467	25.0%	466	25.7%
Slippery	110	5.1%	73	3.3%	112	6.0%	97	5.4%
Break malfunction	52	2.4%	51	2.3%	51	2.7%	37	2.0%
Engine trouble	6	0.3%	6	0.3%	2	0.1%	9	0.5%
Mechanical trouble	86	4.0%	50	2.3%	45	2.4%	62	3.4%
Overloaded	0	0.0%	0	0.0%	3	0.2%	0	0.0%
Other vehicle trouble	0	0.0%	7	0.3%	3	0.2%	7	0.4%
Subtotal	**661**	**30.5%**	**563**	**25.8%**	**683**	**36.5%**	**678**	**37.4%**
Environmental causes								
Parking on road shoulder	5	0.2%	4	0.2%	0	0.0%	1	0.1%
Villagers' crossing road	47	2.2%	65	3.0%	48	2.6%	32	1.8%
Vehicle emission	1	0.0%	0	0.0%	0	0.0%	0	0.0%
Smoke from neighborhood	2	0.1%	3	0.1%	0	0.0%	0	0.0%
Social disturbance	1	0.0%	1	0.0%	1	0.1%	2	0.1%
Animal	2	0.1%	2	0.1%	3	0.2%	1	0.1%
Obstacles on road	4	0.2%	3	0.1%	1	0.1%	0	0.0%
Subtotal	**62**	**2.9%**	**78**	**3.6%**	**53**	**2.8%**	**36**	**2.0%**
Unknown	**0**	**0.0%**	**2**	**0.1%**	**5**	**0.3%**	**2**	**0.1%**
Total	**2,166**	**100.0%**	**2,180**	**100.0%**	**1,869**	**100.0%**	**1,813**	**100.0%**

Source: Traffic accident monthly report of December [*Laporan Kecelakan Lalu Lintas di Jalan Tol*], each year from 1996 to 1999, PT. Jasa Marga

Among the driver related mistakes, “sleepy” was remarkably high at some 20 percent of all the accidents, compared with non-toll road accidents. Just as with non-toll road traffic safety, driving education programs should be enhanced and driving techniques on the expressway should be incorporated into the program.

Bad road conditions did not appear as a cause of toll road accidents because of the well maintained roadway, although, causes related to the lack of vehicle maintenance had a higher ratio of 37.4 percent in 1999 than for non-toll road accidents. Among the causes related to the vehicle, “flat tire” accounted for as much as 25.7 percent, followed by “slippery” at 5.4 percent. To deal with this problem, a vehicle inspection system for private vehicles should be introduced as soon as possible, since vehicle malfunction can result in severe traffic accidents especially on expressway.

5.6 Present Bus Transport Services and Problems

5.6.1 Bus Route Structure

(1) Complexity of Bus Route Structure

Bus route structure in DKI Jakarta is complex probably because new routes have been added as the metropolitan area has expanded. A comprehensive review of the bus route structure has not been done in the past, and bus routes have been added to the previous route network in an ad-hoc manner.

(2) Concentration of Bus Routes on Jl. Sudirman

Another feature of the bus route structure is that many bus routes concentrate in the CBD. Out of around 468 bus routes, 72 routes ply the section between Semanggi and the roundabout in front of Hotel Indonesia on Jl. Sudirman, since this district has the largest passenger demand along the corridor in Jakarta. (See Table 5.6.1) This concentration is clearly seen in PATAS AC operation, in that 35 percent of the total PATAS AC bus routes ply this corridor.

Table 5.6.1 Concentration of Bus Routes on Jl. Sudirman

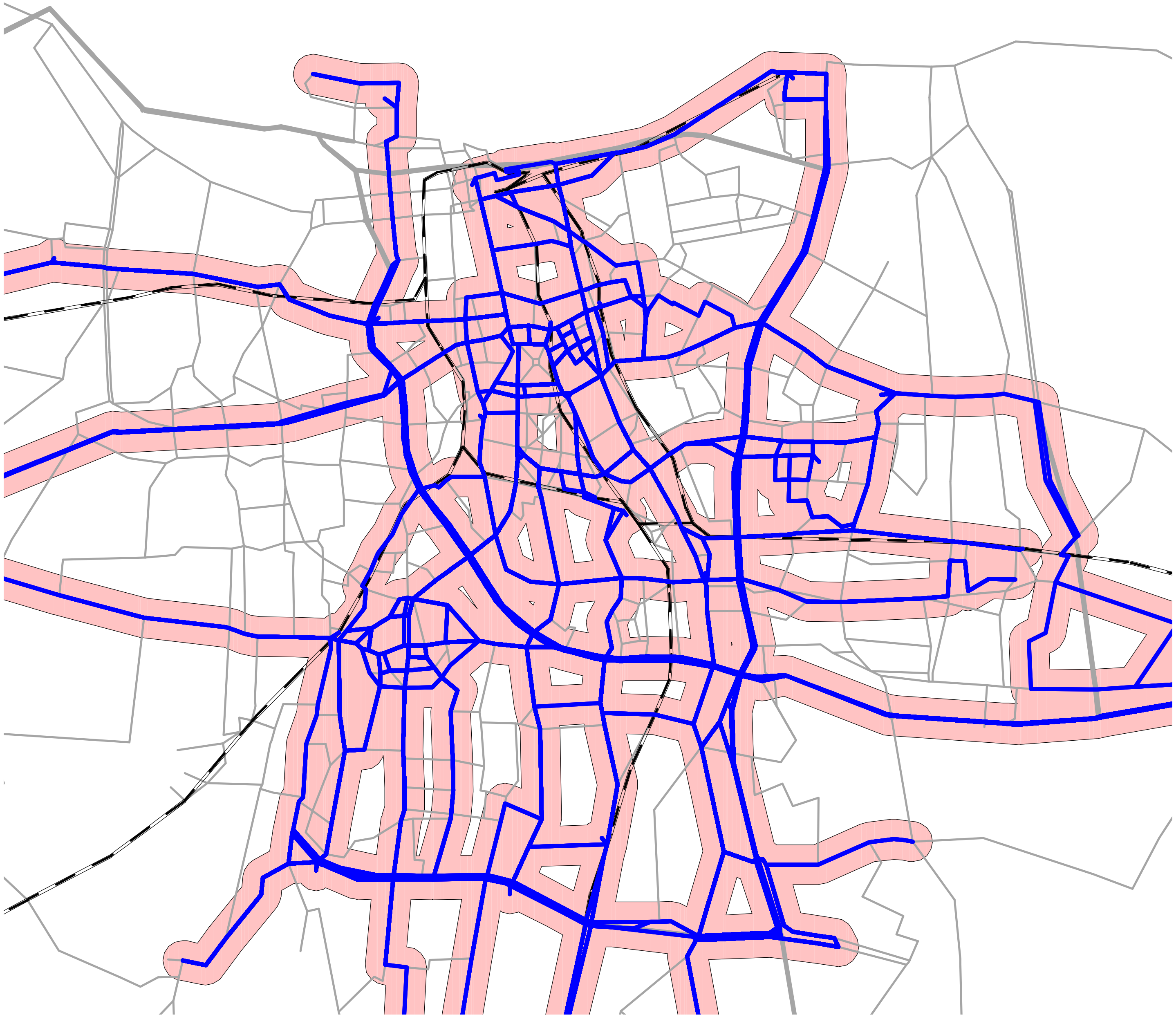
Bus Type	Number of Bus Routes		Composition (%)
	Total	Jl. Sudirman [1)]	
PATAS AC	90	32	35.5
PATAS	96	24	25.0
Regular	62	13	21.0
Medium Bus	100	3	3.0
Small Bus	120	0	0.0
Total	468	72	15.4

Source: Compilation of DLLAJ data and adjusted by the SITRAMP Bus Count Survey, June 2000
Note 1): Semanggi – Hotel Indonesia Section

(3) Insufficient Bus Service Coverage

Almost all of the central area is serviced by large buses if coverage area is defined as being within 500 meter from the street served by a bus. (See Figure 5.6.1). In contrast, suburban areas are not fully served by large buses due to the lack of wide streets for large bus operation. Instead small/medium size buses fulfill the bus travel demand in these areas (See Figures 5.6.2 and 5.6.3). In Botabek many areas are not served by city bus services although the urbanized area has expanded to Botabek.

Figure 5.6.1
Large Bus Service Area



LEGEND

Large Bus

Road

Toll Road

Railway

Large Bus Service Area

N

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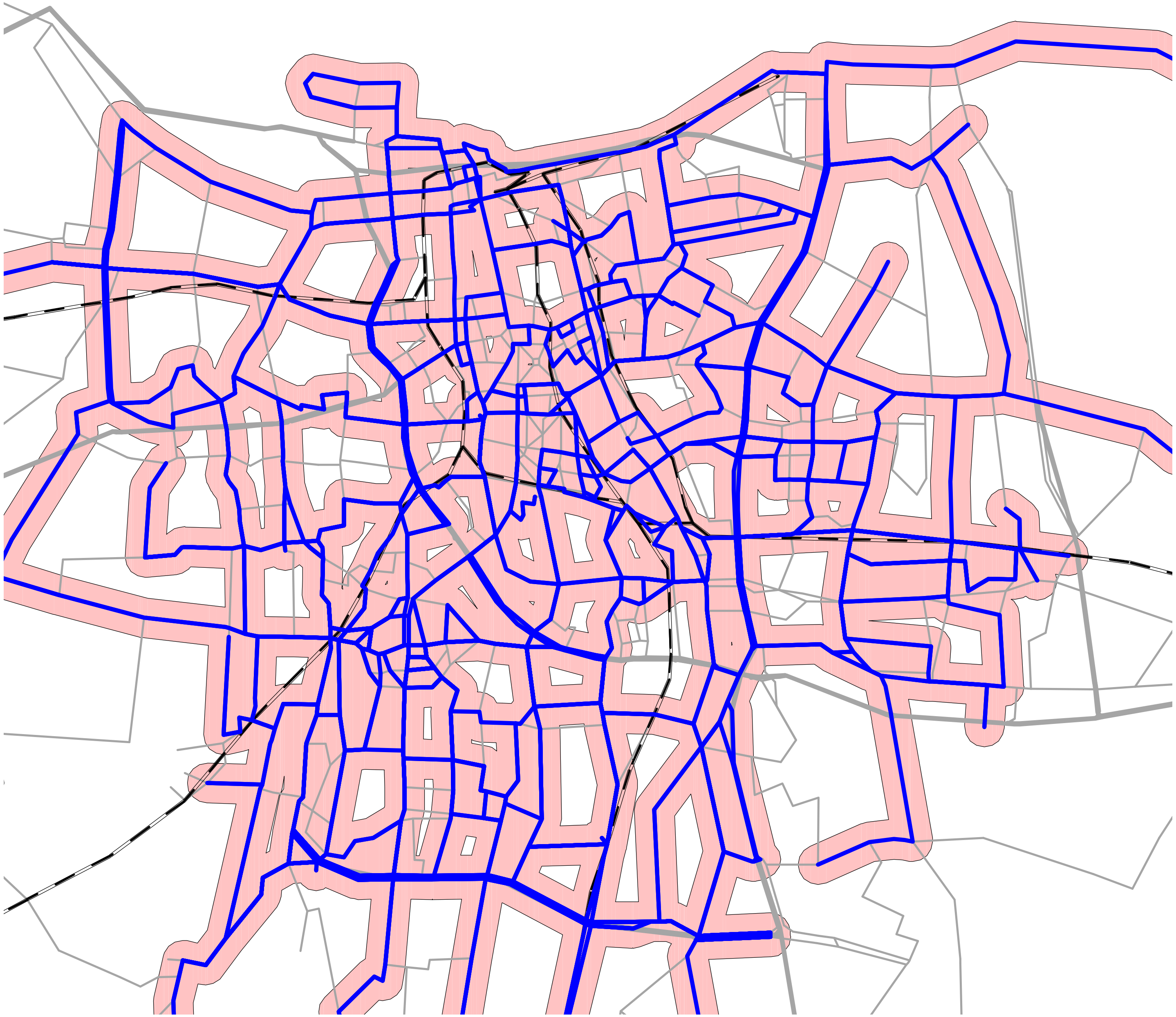
Figure 5.6.2
Medium Bus Service Area



LEGEND

Medium Bus
Road
Toll Road
Railway
Medium Bus Service Area

N

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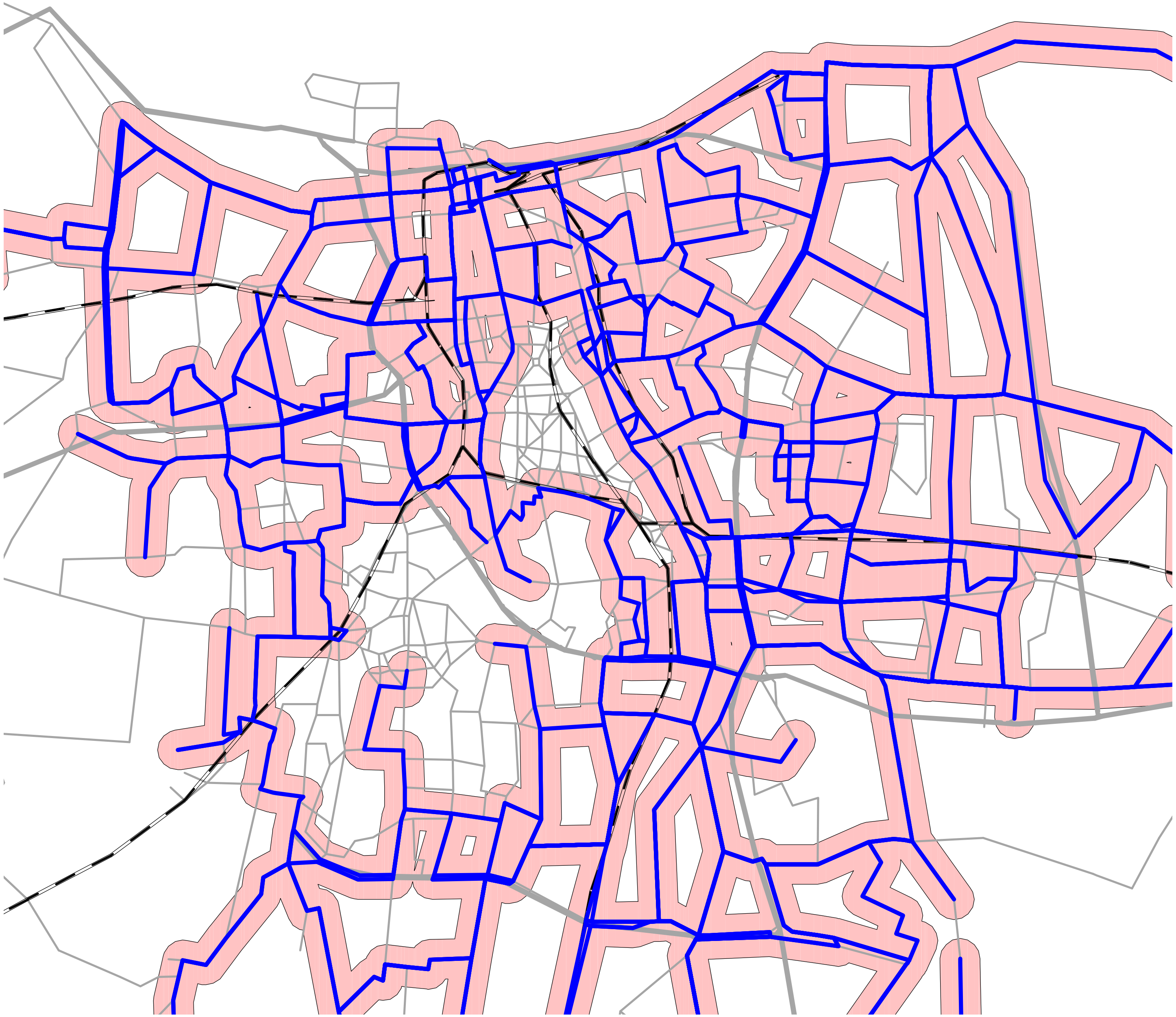

Figure 5.6.3
Small Bus Service Area

LEGEND

Small Bus
Road
Toll Road
Railway
Small Bus Service Area

N

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5.6.2 Inadequate Bus Transport Facilities

(1) Priority Bus Lanes

Several bus lanes are located along the kerbs of sidewalks, but buses are often disturbed by access traffic to office buildings and shopping centers. On some wide streets with a median and middle separator, such as, Jl. Pramuka and Jl. Pemuda, bus lanes are placed in the fast lane next to middle separators. This bus lane alignment enables buses to run more smoothly than the conventional one. Both types of bus priority lanes however are bound to be invaded by private vehicles and bus operation can be disturbed by traffic congestion. Contra-flow bus lanes have also been introduced on some road sections, such as Jl. Melawai for the whole day and Jl. Panglima Polim Raya in the morning peak period. Since bus operation is not affected by private cars and motorcycles, this scheme appears to provide an effective way to achieve smooth and reliable bus operation.

(2) Bus Shelter

In general, bus shelters have been damaged and are illegally occupied by street vendors. Furthermore, the bus shelter space is insufficient at some shelters where there are a considerable number of passengers. Some bus shelters are not utilized by bus passengers at all because the bus shelters are located far from the pedestrian bridges, and instead of waiting at the shelters people wait for the bus near the pedestrian bridges. In addition, some passengers stand at the corner of intersections which is dangerous.

(3) Inadequate Usage of Bus Terminals

Generally, bus terminals are crowded with buses and passengers. To some extent this is attributable to the bus operation itself which is slow and stop for a long time at the terminal. These practices diminish the terminal's original purpose of being a place for passengers to interchange modes of transport. On top of, thus, street vendors sometimes occupy the road space and thereby reduce the road capacity around the terminal.

5.6.3 Financial Difficulty in Bus Operation

(1) Increase in Operational Cost due to the Economic Crisis

The monetary and economic crisis, which commenced in 1997, has had a severe negative impact on urban public transport with a sharp increase in operational costs. Bus fares, however, had not risen correspondingly until April 2000, and revenues are not sufficient to sustain the current bus services.

On April 30, 2000, the Government increased the maximum bus fare level. In line with the Government decision, bus fares increased from Rp 300 to Rp 500 for regular buses, Rp 500 to Rp 700 for small buses, Rp 2,300 to Rp 2,500 for Patas AC and Rp 100 to Rp 200 for students.

(2) Insufficient Cost Recovery

Although bus fares were raised recently, most bus operators are still facing financial difficulties, since the Government allowed merely a 10 to 40 percent fare increase to maintain affordability and for political reasons. In fact, only

Patas AC can achieve full cost recovery at the present approved tariffs, while for the other bus services, the fare revenue is insufficient to achieve full cost recovery.

Bus operators claim that at the current level of bus fare, they can only survive by minimizing expenditure but they cannot afford to maintain their bus fleets properly or purchase new buses to replace old ones.

5.6.4 Drawback of Current Bus Revenue Sharing System

(1) Current Bus Revenue Sharing System

There are currently three types of revenue sharing agreements between bus owners and bus crews.

(a) Borongan

"Borongan" is a bus revenue sharing system under which he bus crew pays the bus owner a certain amount of daily bus rental charge. Bus crews can retain all of the passenger revenue after paying the rental charge, fuel cost and other costs related to operation.

(b) WAP (Wajib Angkut Penumpang)

WAP is a bus revenue sharing system to similar "Borongan." Under the "Borongan" the rental charge is determined on a daily basis, whereas under the "WAP" system it is determined on a bus trip basis and it varies depending to the period of day of operation.

(c) Komisi

Bus crew earnings are pre-determined as a percentage of the bus passenger revenue. The bus crew's share usually ranges between 10 to 17.5 percent, according to the type of bus service.

Bus operators control their bus operation under the "Komisi" and "WAP" systems. The operators usually place *timer*s, who are responsible for counting the number of trips, and *checker*s, responsible for counting the number of passengers on board. In addition, supervisors check the activities of checkers and timers.

(2) Inadequate Bus Operation caused by Current Bus Revenue Sharing System

Under the current bus revenue share systems, bus crews attempt to maximize their income by collecting as many bus passengers as possible. Consequently bus crews stop for long periods of time at the entrance and exit of bus terminals, and at non-designated places along the road without any care for passenger inconvenience. They sometimes stop operating even though there are still passengers on board, and go back to the terminal to seek new bus passengers. After sufficient bus passengers have been collected, the bus driver then drives fast without any consideration for the safety of the passengers as well as themselves. They also often violate traffic laws and regulations, such as making illegal stops at improper places, and overtaking on prohibited sections. These practices are still commonly observed despite the efforts made by DLLAJ to normalize of bus operation.

5.6.5 Problem on Bus Transport Licensing Legislation

(1) Transport Business Licenses

In order to operate a public passenger transport business the organization, including public and private-owned enterprises, a co-operatives and individuals, should take a transport business license. The operator must declare the place in which the vehicles will be kept the ability to maintain the vehicles and to maintain passenger insurance, and submit an annual report of the operation.

(2) Route License

Route license is required for every vehicle on a fixed route operation and it is valid for five years. A "control card" must be issued at the same time for each vehicle and the card should be carried on board the vehicle. Ministerial Decree No.68/1993 specifies the obligations of route license holders as being as follows;

- Bus crews must operate the vehicle according to a timetable
- License holders should maintain the standard of comfort and cleanliness of the vehicles
- Bus crews must wear a uniform which identifies the company.
- Bus company must issue a ticket to the passengers.

The current regulation on bus operation is based on a route licensing for each vehicle. The current regulation framework implies that the licensing authority, DLLAJ, has to determine the route and the level of service, while bus operators have little flexibility to alter their operation without approval of such changes. The regulatory authority, however, is not able to establish a timetable for each route based on passenger demand nor monitor and control individual bus operation. Planning bus route structure and frequency and monitoring bus operation requires substantial data on supply and demand and analysis and planning capability of the authority. In the absence of such data and capability the regulation would only be enforced partially.

5.6.6 Discrepancy between Current Bus Operation and Bus Transport Policy

(1) Current Bus Transport Policy on Bus Fleet

DLLAJ recommended "2 in 1" bus transport operation policy in which suggests to replace two small buses with one medium bus and two medium buses with one large bus. Bus operators have resisted this policy since employing this policy would result in a reduction of jobs.

(2) Composition of Non-Economy Bus

In DKI Jakarta several types of buses are being operated, which include large, medium and small buses. Large buses are divided into the following three types of services; PATAS AC (Air-conditioned express bus), PATAS (Express bus), and regular bus service.

The Ministry of Communication Decree No. 44/1990 set seat capacity for non-economy class is maximum 40 percent, however in actual operation, bus operators prefer to operate non-economy buses because it is more profitable.

Actual bus operation is indicated in Table 5.6.2. If bus service is limited to large buses, the condition of non-economy bus set by the Decree is not met since 70 percent of the passenger capacities are provided by non-economy buses.

Table 5.6.2 Bus Fleet and Routes in DKI Jakarta

Bus Type	Large Bus				Medium Bus	Small Bus	Total
	Patas AC	Patas	Regular	Total			
Capacity	54	54	54	-	24	12	-
Bus Fleet	1,095 (4.8)	2,260 (10.0)	1,432 (6.3)	4,978 (21.1)	4,981 (22.0)	12,907 (56.9)	22,675 (100.0)
Passenger Capacity	59,130 (11.1)	122,040 (22.9)	77,328 (14.5)	258,498 (48.5)	119,544 (22.0)	154,884 (28.5)	532,926 (100.0)
Bus Routes	98 (19.0)	107 (20.7)	74 (14.3)	279 (54.0)	105 (20.3)	133 (25.7)	517 (100.0)

Note: Figures in parentheses indicate percent share.
Source: DLLAJ, as of May 2000

(3) Road Class and Bus Size

Appropriate bus route by bus size is recommended by Ministerial Decree is that large buses should operated on arterial streets, medium buses on collector streets and small buses on local streets. However actual bus operation is differs from this recommendation. A considerable number of Mikrolet routes ply on major arterial streets such as Jl. Gajah Mada/Hayam Wuruk, Jl. Gunung Sahari, Jl. Kramat Raya, Jl.. Salemba Raya, Jl. Letjen Suprapto among others. As a result the operation of many small buses on such major arterial streets causes traffic congestion problems. On the other hand, the shortage of arterial streets limits large bus operation.

5.6.7 Bus Problem Structure

Factors causing bus transport problems related to other factors and many factors are in “cause and effect” relation. This relationship can be expressed in a problem structure diagram as depicted in Figure 5.6.4. The existing bus operation regime, namely the bus rental system, weak financial capability of the bus operators, weak enforcement and lack of planning and management capability of the regulatory agency have been identified as the “root causes” of urban bus transport problems.

In order to improve bus operation system, the re-organization of the bus operation regime is a priority issue. As planned by the DLLAJ, a complete change of bus licensing scheme, such as a tendering system for bus routes, is urgently needed. To achieve this re-organization materialize the reformation, first of all, the specification for bus operation needed be established.

The two other main planning issues that have to be tacked are the questions of how to monitor the bus operators and how to properly collect bus fares.

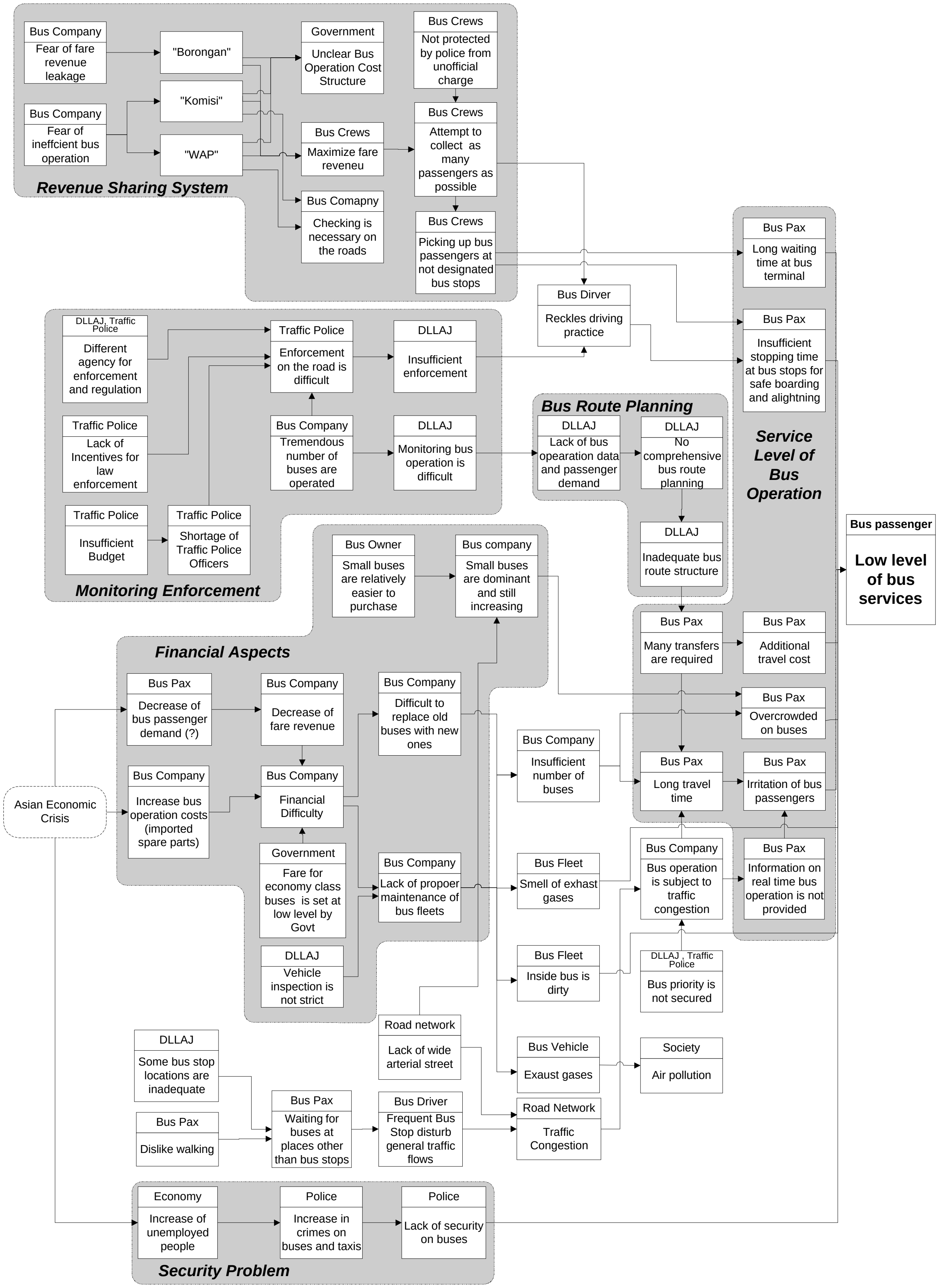


Figure 5.6.4 Bus Transport Problem Structure

5.7 Railway Transport Profile and Problems

5.7.1 Limited Share of Railway in Jabotabek

The total number of passengers served by the Jabotabek railway amounts to 400000 persons per day, according to the SITRAMP railway passenger survey conducted in June 2000. This passenger volume accounts for two percent of the total person trips made by motorized modes of transport in Jabotabek. The passenger demand varies from line to line according to the service level. The line which carries the largest passengers demand appears to be the Central Line and Bogor Line. (Refer to Figure 5.7.1) The line carries about 300000 persons per day, which accounts for 73 percent of the total Jabotabek railway passengers. The other lines transport much fewer numbers of passengers due to their low level of service.

Railway passenger demand has increased even during the economic crisis in 1997 as mentioned in Chapter 3. However the coverage of the Jabotabek railway is still limited as illustrated in Figure 5.7.2.

5.7.2 Low Frequency of Jabotabek Railway

Except for the Bogor line, train operation is still limited as listed in Table 5.7.1 and Figure 5.7.3 due to the lack of rolling stock as well as other necessary upgrading of relevant systems.

Table 5.7.1 Number of Trains by Railway Line in 2000 (Up & Down/day)

Jabotabek Railway			Number of Trains					Single / Double Track		Electrification		Auto-matic Signaling System
Line	Section	Distance (Km)	Middle / Long Train	Commuter Train	Freight Train	Dead-Head Train	Total	Double Track	Single Track	Completed	Not completed	
Central	Jak-Mri	10	86	181	0	42	309	C		C		C
Bogor	Mri-Boo	45	0	178	0	2	178	C		C		C
East	Jak-Jng	12	31	57	24	29	141	C		C		C
TPK Line	Jak-Tpk	8	0	6	0	0	6	C		C		-
	Tpk-Kmo	4	3	4	8	3	18	C		C		-
West	Jak-Kpb	3	16	104	0	10	104	C		C		C
	Kpb-Mri	14	5	28	0	4	37	C		C		C
	Mri-Jng	3	91	28	0	46	165	C		C		C
Bekasi	Jng-Bks	15	122	85	24	0	231	C		C		C
Tangerang	Du-Tng	19	0	20	0	0	20	-	C	C		C
Serpong	Tnb-Srp	23	8	46	14	0	68	-	C	C		C
	Srp-Mrk	81			-	-	-	-	C	-	UC	-

Note: C = Completed, UC = Under Construction, - = Not Completed
Source: PT KAI

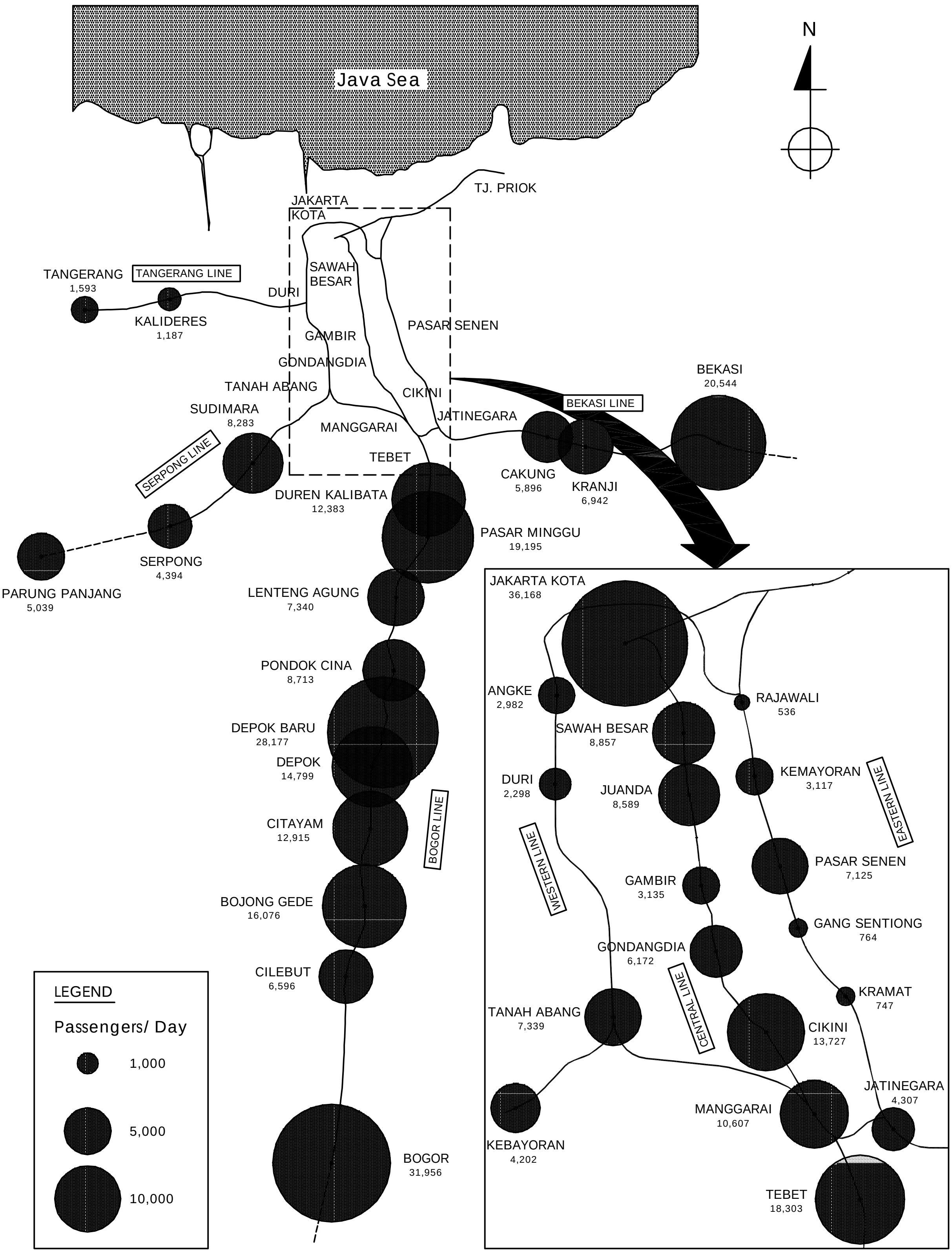
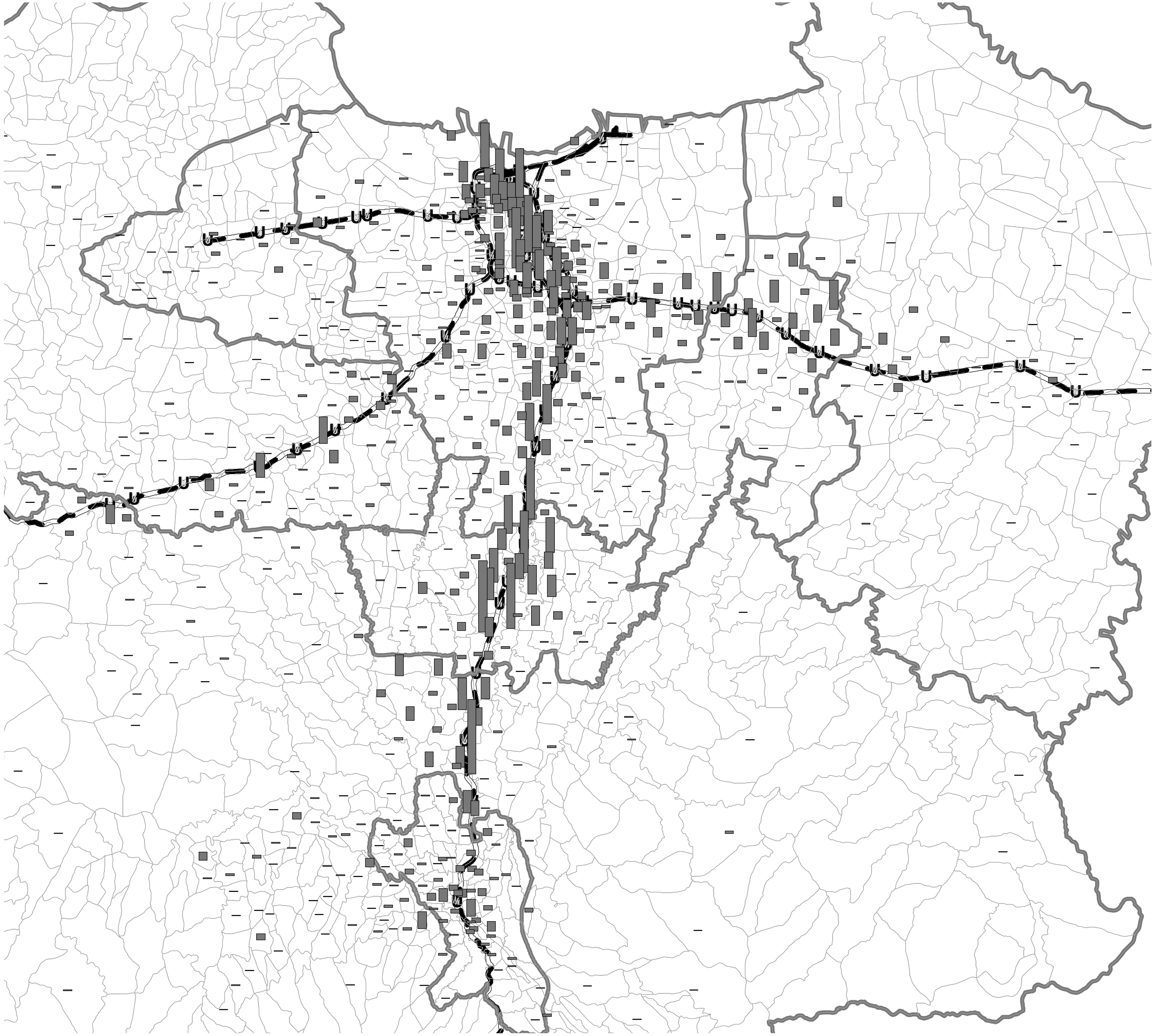


Figure 5.7.1 Jabotabek Railway Passenger Demand

Figure 5.7.2
Limited Coverage of
Jabotabek Railway



LEGEND

Access to Station
(Unit : Passengers per day)

10000
5000
2500
1000

Kelurahan Boundary

Kota Kabupaten Boundary

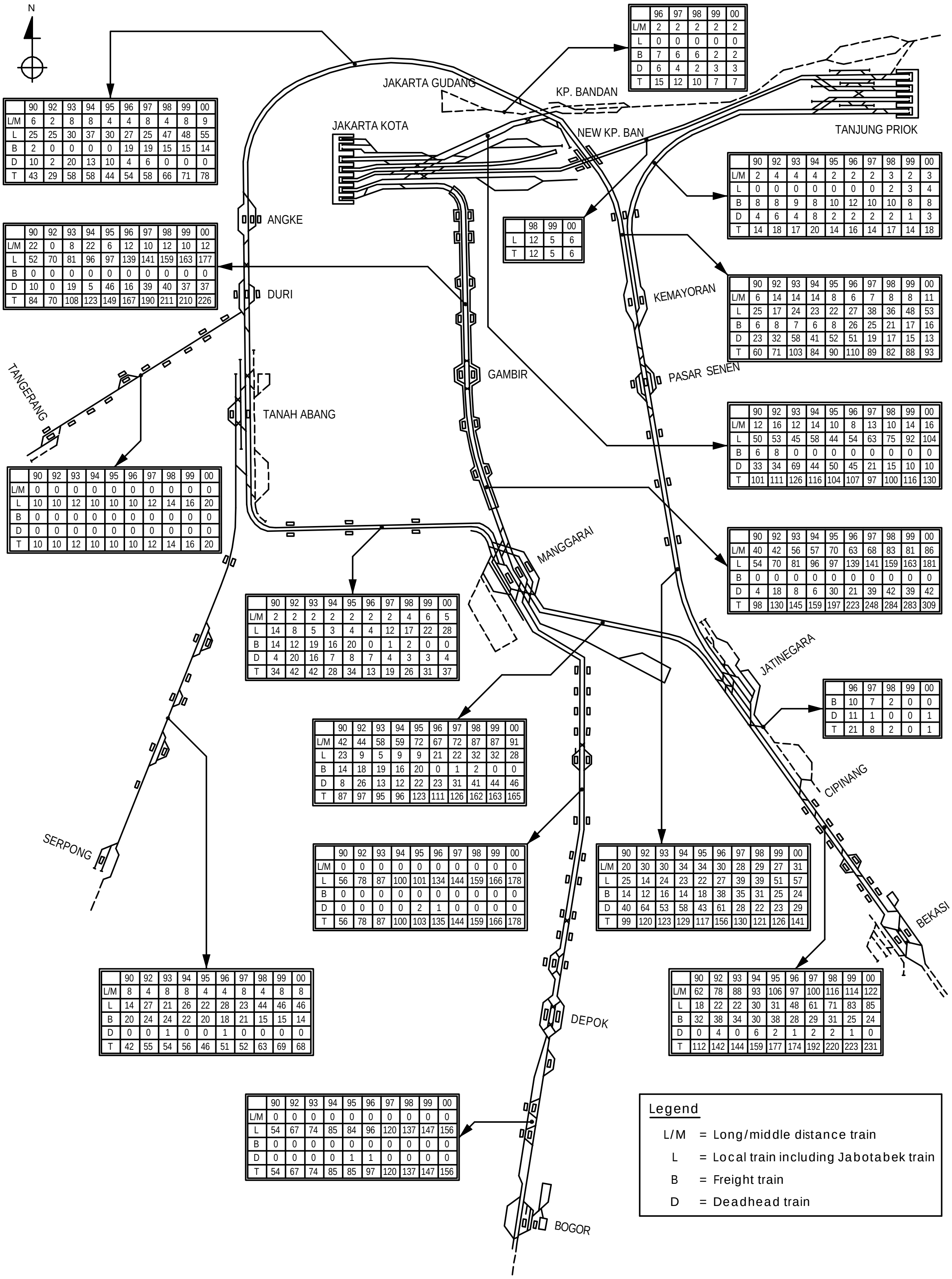
Station

Railway

N

0 5 10 15 20 Km

SITRAMP JABOTABEK
The Study on
Integrated Transportation Master Plan
for JABOTABEK
(Phase I)



	96	97	98	99	00
L/M	2	2	2	2	2
L	0	0	0	0	0
B	7	6	6	2	2
D	6	4	2	3	3
T	15	12	10	7	7

	90	92	93	94	95	96	97	98	99	00
L/M	6	2	8	8	4	4	8	4	8	9
L	25	25	30	37	30	27	25	47	48	55
B	2	0	0	0	0	19	19	15	15	14
D	10	2	20	13	10	4	6	0	0	0
T	43	29	58	58	44	54	58	66	71	78

	90	92	93	94	95	96	97	98	99	00
L/M	2	4	4	4	2	2	2	3	2	3
L	0	0	0	0	0	0	0	2	3	4
B	8	8	9	8	10	12	10	10	8	8
D	4	6	4	8	2	2	2	2	1	3
T	14	18	17	20	14	16	14	17	14	18

	98	99	00
L	12	5	6
T	12	5	6

	90	92	93	94	95	96	97	98	99	00
L/M	22	0	8	22	6	12	10	12	10	12
L	52	70	81	96	97	139	141	159	163	177
B	0	0	0	0	0	0	0	0	0	0
D	10	0	19	5	46	16	39	40	37	37
T	84	70	108	123	149	167	190	211	210	226

	90	92	93	94	95	96	97	98	99	00
L/M	6	14	14	14	8	6	7	8	8	11
L	25	17	24	23	22	27	38	36	48	53
B	6	8	7	6	8	26	25	21	17	16
D	23	32	58	41	52	51	19	17	15	13
T	60	71	103	84	90	110	89	82	88	93

	90	92	93	94	95	96	97	98	99	00
L/M	12	16	12	14	10	8	13	10	14	16
L	50	53	45	58	44	54	63	75	92	104
B	6	8	0	0	0	0	0	0	0	0
D	33	34	69	44	50	45	21	15	10	10
T	101	111	126	116	104	107	97	100	116	130

	90	92	93	94	95	96	97	98	99	00
L/M	0	0	0	0	0	0	0	0	0	0
L	10	10	12	10	10	10	12	14	16	20
B	0	0	0	0	0	0	0	0	0	0
D	0	0	0	0	0	0	0	0	0	0
T	10	10	12	10	10	10	12	14	16	20

	90	92	93	94	95	96	97	98	99	00
L/M	40	42	56	57	70	63	68	83	81	86
L	54	70	81	96	97	139	141	159	163	181
B	0	0	0	0	0	0	0	0	0	0
D	4	18	8	6	30	21	39	42	39	42
T	98	130	145	159	197	223	248	284	283	309

	90	92	93	94	95	96	97	98	99	00
L/M	2	2	2	2	2	2	2	4	6	5
L	14	8	5	3	4	4	12	17	22	28
B	14	12	19	16	20	0	1	2	0	0
D	4	20	16	7	8	7	4	3	3	4
T	34	42	42	28	34	13	19	26	31	37

	96	97	98	99	00
B	10	7	2	0	0
D	11	1	0	0	1
T	21	8	2	0	1

	90	92	93	94	95	96	97	98	99	00
L/M	42	44	58	59	72	67	72	87	87	91
L	23	9	5	9	9	21	22	32	32	28
B	14	18	19	16	20	0	1	2	0	0
D	8	26	13	12	22	23	31	41	44	46
T	87	97	95	96	123	111	126	162	163	165

	90	92	93	94	95	96	97	98	99	00
L/M	0	0	0	0	0	0	0	0	0	0
L	56	78	87	100	101	134	144	159	166	178
B	0	0	0	0	0	0	0	0	0	0
D	0	0	0	0	2	1	0	0	0	0
T	56	78	87	100	103	135	144	159	166	178

	90	92	93	94	95	96	97	98	99	00
L/M	20	30	30	34	34	30	28	29	27	31
L	25	14	24	23	22	27	39	39	51	57
B	14	12	16	14	18	38	35	31	25	24
D	40	64	53	58	43	61	28	22	23	29
T	99	120	123	129	117	156	130	121	126	141

	90	92	93	94	95	96	97	98	99	00
L/M	8	4	8	8	4	4	8	4	8	8
L	14	27	21	26	22	28	23	44	46	46
B	20	24	24	22	20	18	21	15	15	14
D	0	0	1	0	0	1	0	0	0	0
T	42	55	54	56	46	51	52	63	69	68

	90	92	93	94	95	96	97	98	99	00
L/M	62	78	88	93	106	97	100	116	114	122
L	18	22	22	30	31	48	61	71	83	85
B	32	38	34	30	38	28	29	31	25	24
D	0	4	0	6	2	1	2	2	1	0
T	112	142	144	159	177	174	192	220	223	231

	90	92	93	94	95	96	97	98	99	00
L/M	0	0	0	0	0	0	0	0	0	0
L	54	67	74	85	84	96	120	137	147	156
B	0	0	0	0	0	0	0	0	0	0
D	0	0	0	0	1	1	0	0	0	0
T	54	67	74	85	85	97	120	137	147	156

Figure 5.7.3 Jabotabek Train Operation in 2000

5.7.3 Low Level of Railway Transport Safety

In general, the railway is widely known as a safe mode of transport compared to other vehicles, although this is not exactly true in the case of Jabotabek railway.

According to the railway accident records, in 1999, 26 accidents occurred in which the train crashed into persons, and 13 collision accidents occurred with cars or public transport vehicles at level crossings. To reduce the number of accident, it is urgently necessary to improve the level crossings, station facilities, and access roads.

Causes of accidents include shortage of technical staff, lack of facility maintenance, defective maintenance of rolling stock, and low passenger's discipline. It is dangerous to carry more passengers than the train's capacity with the doors open or without any doors.

Table 5.7.2 Train Accident Recapitulation in JABOTABEK Railway

Type of Accident	Year				Total
	1997	1998	1999	2000	
Train collision on the road	-	-	1	2	3
Train collision on station	-	2	1	-	3
Train to the outside rail on the road	-	2	1	-	3
Train to the outside rail on station	8	9	8	1	26
Fire in train	1	1	-	-	2
Shunting collision on station	1	-	1	-	2
Train to the outside rail on shunting time	1	2	4	2	9
Railway coach to the outside rail on shunting time	1	-	-	-	1
Locomotive to the outside on shunting time	1	-	5	-	6
Train collided with public transport	22	16	13	3	54
Train struck the person	35	36	26	3	100
Train struck the animal	-	-	1	-	1
Broken of locomotive wheel	-	-	-	-	0
Broken/Loose of axle lot locomotive	-	-	1	-	1
Broken of locomotive connected equipment	-	-	-	-	0
Broken of locomotive spring	-	-	-	-	0
Broken of train wheel	-	-	-	-	0
Broken of train connected equipment	-	-	-	-	0
Broken of axle lot train	1	-	-	-	1
Broken of train spring	-	-	-	-	0
Disruption of Electrical Locomotive	-	-	-	-	0
Disruption of Diesel machine	-	-	-	-	0
Disruption of Diesel Locomotive Terminal	-	-	-	-	0
Disruption of electrical power	7	3	-	-	10
Disruption of signal	-	1	2	-	3
Damaged Rail	-	-	1	-	1
Landslide	2	-	-	-	2
Train run over the signal	1	1	-	-	2
The other incidents caused by PT. KAI	6	3	1	1	11
The other causal incidents caused by others	26	21	23	-	70
Total	**113**	**97**	**89**	**12**	**311**

Note: Year 2000, up to and including April 2000.
Source: Track Section, DAOP-I Jakarta

5.7.4 Condition of Railway Facilities

(1) Inconvenient Station Facilities for Passengers' Boarding

Low platforms are still found at some stations in Jabotabek. It is necessary to improve these to a high platform type. In particular, the platforms along Bogor and Bekasi lines have to be improved urgently because the service frequency is high and many passengers utilize the lines. In addition, many middle/long distance trains pass through the Bekasi line stations and, it is extremely dangerous for passengers as they have to deal with trains going up and down.

(2) Insufficiency of Electric Cars and Procurement of Spare Parts

The number of electric cars is still insufficient for the satisfactory operation of the Jabotabek railways. The number of electric cars as of March 2000 is shown in Table 5.7.3. Recently 72 recycled electric cars were granted by the Tokyo Metropolitan Government. The establishment of an overhaul and maintenance system for the recycled electric cars is indispensable for satisfactory operation service, and it is also necessary to procure necessary materials.

Table 5.7.3 Number of Electric Cars

<table>
<tr><th>Line</th><th>Number of EC for Peak Two Hours</th><th>After Applied Used EC from TMG</th></tr>
<tr><td>Central/Bogor (1)</td><td>13</td><td>18</td></tr>
<tr><td>Bekasi</td><td>5</td><td rowspan="3">8</td></tr>
<tr><td>Eastern (2)</td><td>2</td></tr>
<tr><td>Western (3)</td><td>1</td></tr>
<tr><td>Serpong</td><td>3</td><td>3</td></tr>
<tr><td>Tangerang</td><td>3</td><td>3</td></tr>
<tr><td>Tanjung Priok</td><td>1</td><td>1</td></tr>
<tr><td>Total</td><td>28</td><td>33</td></tr>
</table>

Source: PT KAI
Note: As of March 2000
(1): Including the one for Thb via Nri from Boo or Dp
(2): Including the one from Bks line
(3): Including the one from Bks line, Srp line and Tng line

(3) Deteriorated Safety Equipment at Railway Crossings

The current level crossing safety equipments were installed in the 1980s and have been maintained by PT. KAI. Collision accidents with electric cars occur frequently due to faults in the safety equipments. This is attributable to deterioration or damages by vehicles of safety equipment.

(4) Damaged Railway Signaling System

Frequent and unexpected strong lightning has caused signaling system faults in Jabotabek. Unfortunately, signaling system damage due to lightnings cannot be repaired promptly because there are insufficient spare parts and the repair work takes a long time.

Signaling system problems are made worse whereby obstacles of automatic block signal have been appearing especially on Bogor line particularly during the last five months as a result of the stealing of impedance bond transformer. At the moment, a total of forty-five (45) automatic block signals are out of operation on up and down tracks between Station Pasar Minggu and Bogor.

(5) Damaged Communication Facilities

The communication system was damaged due a fire caused by a lightning strike at the communication equipment room of the Manggarai station in April 2000. The main equipment including the switching equipment is still out of order.

5.8 Problems in Integration and Coordination of Transport System

5.8.1 Lack of Integration between Land Use and Transport System

Historically the railway in Jabotabek was developed for cargo transportation connecting Jakarta Kota and Tg. Priok with the other regions, and also for middle/long distance trains, connecting Jakarta to the other regions. In other words, until recently, the railway network had not been developed for passenger travel within urban areas. Currently land use surrounding the railway stations is not appropriate for a railway transport system. In order to attract rail passengers, highly dense urban facilities should ideally be located within walking distance from the stations. However at present there are few high-rise office buildings and commercial facilities. At present, the land near the stations is usually occupied by low-class housing in urban areas. Consequently sufficient passenger demand for the railway cannot be expected from the existing urban land use.

5.8.2 Lack of Integration between Different Modes of Transport

Integration between railway and other modes of transport can be made at an interchange transport node, namely, a station plaza. Furthermore integration between railway and road transport is provided by access roads to railway stations. However, these transport facilities have not been well developed.

(a) Insufficient Railway Station Plaza

There are few railway stations that have sufficient space in front of the station for transfer of passengers from/to feeder transports such as buses and taxis.

Some stations have available station plazas, but these spaces sometimes are not utilized in an optimum way. At the Kranji station of the Bekasi line, for example, there is a station plaza in front of the station building but public transport is prohibited from entering the plaza to pick up passengers. As a result, the transfer of passengers takes place on the busy street, creating a traffic jam in front of the station.

PT.KAI has managed own valuable and enormous land in Jabotabek area, but these lands have not been used sufficiently as a functional station plaza.

(b) Lack of Access Roads to Railway Station

The railway coverage area in Jabotabek is still limited s pointed out in Section 5.4. This is partly attributable to the lack of access roads to railway stations and subsequently lack of feeder bus services. At present many access roads to the stations in Jabotabek are either in a poor condition or does not exist.

This is partly attributable to the low accessibility to railway stations. Station plazas have not been well-developed even though lands for station plazas are available at many stations.

5.9 Environmental Problems Caused by Transport

5.9.1 Ambient Air Quality

Air pollution in Jabotabek was not just an occasional annoyance in the past, but it has become a chronic issue which threatens the health of the urban people's. The problem is due mainly to the population concentration, and the dramatic increase in traffic demand and industries. Poor winds in the Jabotabek region and high-rise buildings also accelerate this problem.

(1) Present Air Quality in DKI Jakarta

Air quality levels at fixed monitoring stations in DKI Jakarta, measured in 1998 by *BAPEDALDA DKI Jakarta* (Regional Environmental Impact Management Agency in Jakarta), are presented in Table 5.9.1 and the result is summarized as follows. The ambient air condition along the proposed MRT corridor (roadside measurements) in DKI Jakarta in 2000 surveyed by JICA Study Team is shown in Table 5.9.2. Figure 5.9.1 shows the air quality monitoring where the data was collected, with each measurement result including Botabek.

(a) Total Suspended Particles (TSP)

Daily maximum values of Total Suspended Particles (TSP) exceeded the air quality standard (230 $\mu g/m^3$: 24 hour concentration) at six residential areas, locations one commercial and one industrial location. In the commercial area at Kelurahan Gambir, the value was 2.8 times the standard. In the residential area at Kelurahan Pegadungan and Cipedak, the value was 1.9 times the standard. Along the proposed MRT corridor, all measurements taken on two weekdays and one holiday at the two locations of Jl. RS. Fatmawati and one location of Jl. Gajah Mada exceeded the maximum allowable level. At Jl. Gajah Mada, the values were 1.6 to 2.7 times the standard.

Most of the emission load of TSP in Jabotabek is generated by mobile sources (40%) and factories/ stationary sources (57%), as shown in Table 5.9.5. However, in the case of central Jakarta, mobile sources contributed about 93% of the total TSP pollutant load ("*The Study on the Integrated Air Quality Management for Jakarta Metropolitan Area, JICA 1997*"). In general, compared to gasoline motor vehicles, diesel motor vehicles (public buses, etc.) contribute to TSP emission at a great degree.

(b) Lead (Pb)

The daily maximum values of Lead (Pb) are under the Indonesian National Standards (2.0 $\mu g/m^3$: 24hours concentration), however, at 4 locations in the residential areas, the values were over the WHO (World Health Organization) standards (0.5-1.0 $\mu g/m^3$: 1-year average). Along the proposed MRT corridor, the values of Pb exceeded WHO standards in weekday measurement at Jl. RS. Fatmawati, Jl. Panglima Polim and Jl. Jend. Sudirman.

It is estimated that approximately 90 percent of lead emissions into the ambient air are due to the use of leaded gasoline (*World Bank, 1996*). Most of the lead in ambient air is of fine particles (< 10 µm).

(c) Nitrogen Oxide (Nox)

A concentration level of Nitrogen Oxide (NOx) was measured at every location, and was found to be within the allowable levels.

(d) Sulfur Dioxide (SO_2)

The daily maximum value of Sulfur Dioxide (SO_2) exceeded the standard at the residential area in Kelurahan Pinggilingan. At two other locations (one in a residential and the other in a recreation area), the value almost reached to maximum allowable level. However, the values of SO_2 along the proposed MRT corridor were below the prescribed standards at every location.

Table 5.9.1 Air Conditions in DKI Jakarta in 1998

No	Location	Landuse	NOx ppm		SO_2 ppm		TSP μg/m³		Pb μg/m³	
			Ave.	Max.	Ave.	Max.	Ave.	Max.	Ave.	Max.
1	Kel. Duri Kosambi (IPAK)	Residence	0.0035	0.0145	0.0090	0.0401	144.1	305.3	0.4581	0.8448
2	Kel. Pegadungan (Jl. Kalideres)	Residence	0.0040	0.0209	0.0116	0.0518	154.4	443.9	0.2959	0.6458
3	Kel. Kramat Pela (Ged. Perpustakaan)	Residence	0.0026	0.0104	0.0075	0.0292	187.7	291.6	0.7459	1.4556
4	Kel. Tebet Barat (Kantor Kel. Tebet)	Residence	0.0059	0.0400	0.0128	0.0543	180.4	322.0	0.5180	1.7373
5	Kel. Pinggilingan (Asama Haji P. Gede)	Residence	0.0043	0.0266	0.0163	0.1077	149.3	234.2	0.3713	1.0363
6	Kel. Peggilingan (Kan. Walikota Jak-Tim)	Residence	0.0035	0.0113	0.0154	0.0878	119.1	213.0	0.4577	1.1285
7	Kel. Cipedak (Din. Pertamanan Jl. Kafi)	Residence	0.0032	0.0147	0.0193	0.0970	93.1	447.1	0.1879	0.6110
8	Kel. Gambir (Masjid Istiqlal)	Commercial	0.0034	0.0227	0.0105	0.0649	136.8	652.9	0.3623	0.9442
9	Kel. Celincing (Kan. Kec. Celincing)	Industrial	0.0040	0.0254	0.0140	0.0814	147.1	338.7	0.3543	0.8358
10	Kel. Rawa Terate (PT. JIEP Pulogadung)	Industrial	0.0038	0.0158	0.0111	0.0491	116.6	186.3	0.4606	0.8557
11	Kel. Ancol (Taman I. Jaya Ancol)	Recreation	0.0047	0.0309	0.0153	0.0980	140.3	202.6	0.2763	0.7645
12	Kel. Gelora Senayan (Itora Senayan)	Recreation	0.0058	0.0271	0.0065	0.0207	113.9	218.4	0.3263	0.7840
Air Quality Standard : National & DKI			0.05 ppm (24h)		0.10 ppm (24h)		230 μg/m³ (24h)		2.0 μg/m³ (24h)	
Air Quality Standard : WHO			150 μg/m³		100-150 μg/m³		150-230 μg/m³		0.5-1.0 μg/m³ *	

Note: 1. Measurement value of NOx, SO_2, TSP and Pb shows 24 hours concentration.
2. Measurement was carried out between January to December 1998 (2 to 4 days in every month).
3. Pb standard of WHO is for 1-year average, while others are for 24 hours concentration.

Source: Regional Environmental Impact Management Agency/BAPEDALDA DKI Jakarta, 1998

Table 5.9.2 Air Conditions along Proposed MRT Corridor in DKI Jakarta in 2000

No	Location	Days	NOx ppm	SO_2 ppm	CO ppm	TSP µg/m³	Pb µg/m³
1	RS. Fatmawati (Jl. RS. Fatmawati)	Day1	0.0043	0.0037	11.08	316.7	0.6088
		Day2	0.0057	0.0073	6.55	374.3	0.3923
		Day3	0.0135	0.0069	9.21	409.9	0.5312
2	Cipte Utara (Jl. RS. Fatmawati)	Day1	0.0080	0.0023	4.21	246.8	0.6635
		Day2	0.0087	0.0034	9.73	354.7	1.4773
		Day3	0.0052	0.0027	3.10	347.9	0.4152
3	Block M (Jl. Panglima Polim)	Day1	0.0071	0.0097	4.50	317.5	1.7599
		Day2	0.0059	0.0031	3.96	202.7	0.1980
		Day3	0.0082	0.0037	4.19	208.1	0.7338
4	Plaza BRI (Jl. Jend. Sudirman)	Day1	0.0025	0.0068	5.46	179.1	1.5918
		Day2	0.0023	0.0074	5.47	199.3	1.2518
		Day3	0.0060	0.0076	2.79	86.5	0.1937
5	President H. (Jl. M.H. Thamrin)	Day1	0.0051	0.0020	1.40	196.4	0.2916
		Day2	0.0046	0.0164	2.33	185.3	0.2903
		Day3	0.0087	0.0031	2.58	271.1	0.2333
6	Gajah Mada (Jl. Gajah Mada)	Day1	0.0115	0.0103	6.69	361.8	0.5737
		Day2	0.0100	0.0062	7.50	614.8	0.2502
		Day3	0.0069	0.0045	5.73	571.0	0.2355
Air Quality Standard (National & DKI)			0.05	0.10	20	230.0	2.00

Note: 1. Measurement value of NOx, SO_2, TSP and Pb shows 24 hours concentration.
2. Day1, Day2: weekday / Day3: Sunday (All measurement has done at the roadside).
Source: Environmental Site Survey on MRT by JICA Study Team, July 2000

(2) Present Air Quality in Botabek Area

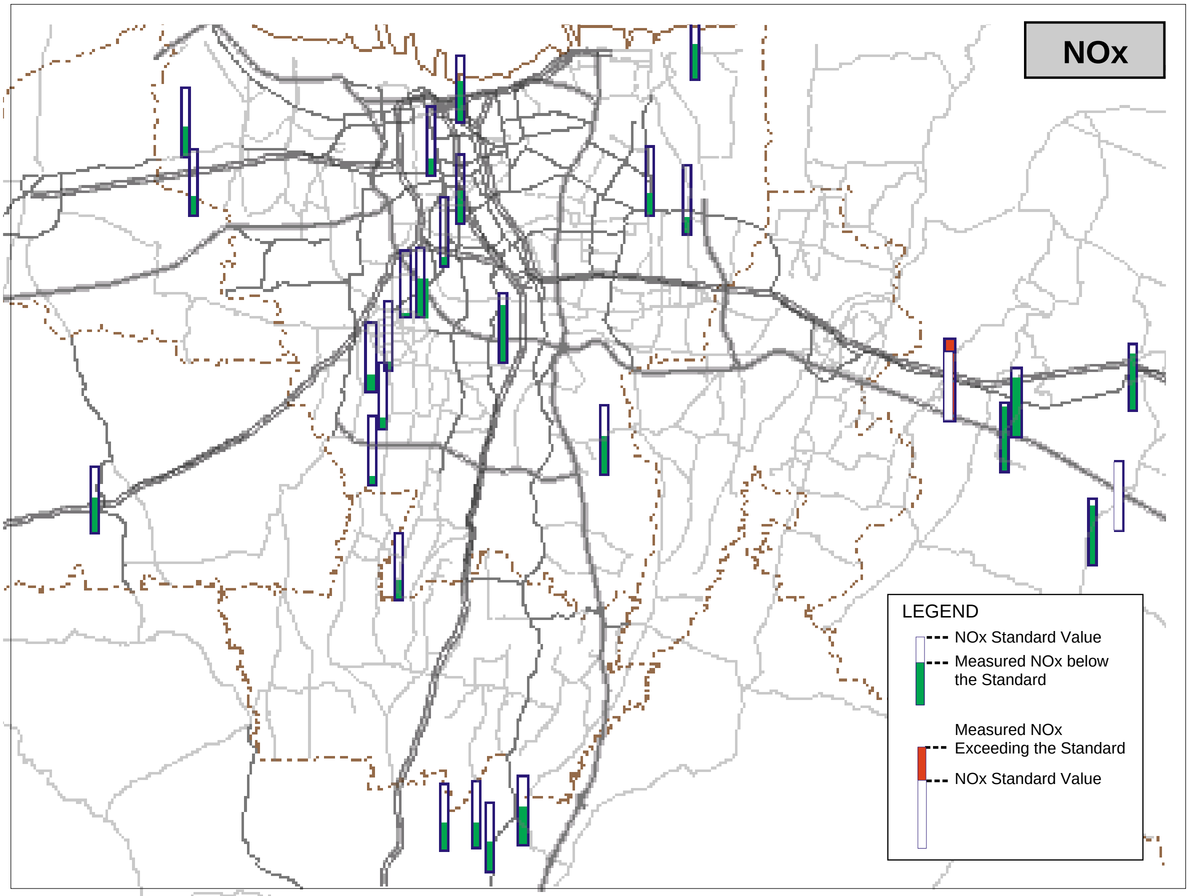
Two fixed monitoring stations for an ambient air quality exist in the Botabek area. One is in Pusarpedal (EMC: Environmental Management Center) in Serpong, Kabupaten Tangerang and the other is in Shinta, Kota Tangerang. Table 5.9.3 shows the air conditions measured by the Pusarpedal station.

Table 5.9.3 Air Conditions in Serpong, Tangerang (Pusarpedal)

Year	NOx ppm	SO_2 ppm	TSP (Debu) µg/m³	CO ppm
1997	0.079	--	288	1.64
1998	0.049	0.013	207	1.78
1999	0.026	0.038	240	4.43
Air Quality Standard (National & DKI)	0.05 (24h)	0.10 (24h)	230 (24h)	20 (24h)

Note: Described figures are average of maximum value of each month in each year.
Source: Pusarpedal 1997-1999

Availability of ambient air quality data in the Botabek area is limited, except for the two monitoring stations mentioned above. However, several air condition data in the Botabek area which have been measured by the local governments and/or some studies are presented in Table 5.9.4. From the measurements, it can be said that, in Bogor, all emission loads are within the standards, while in Bekasi, emission load of TSP is higher than the standards, and NOx and CO loads are closed to standards.



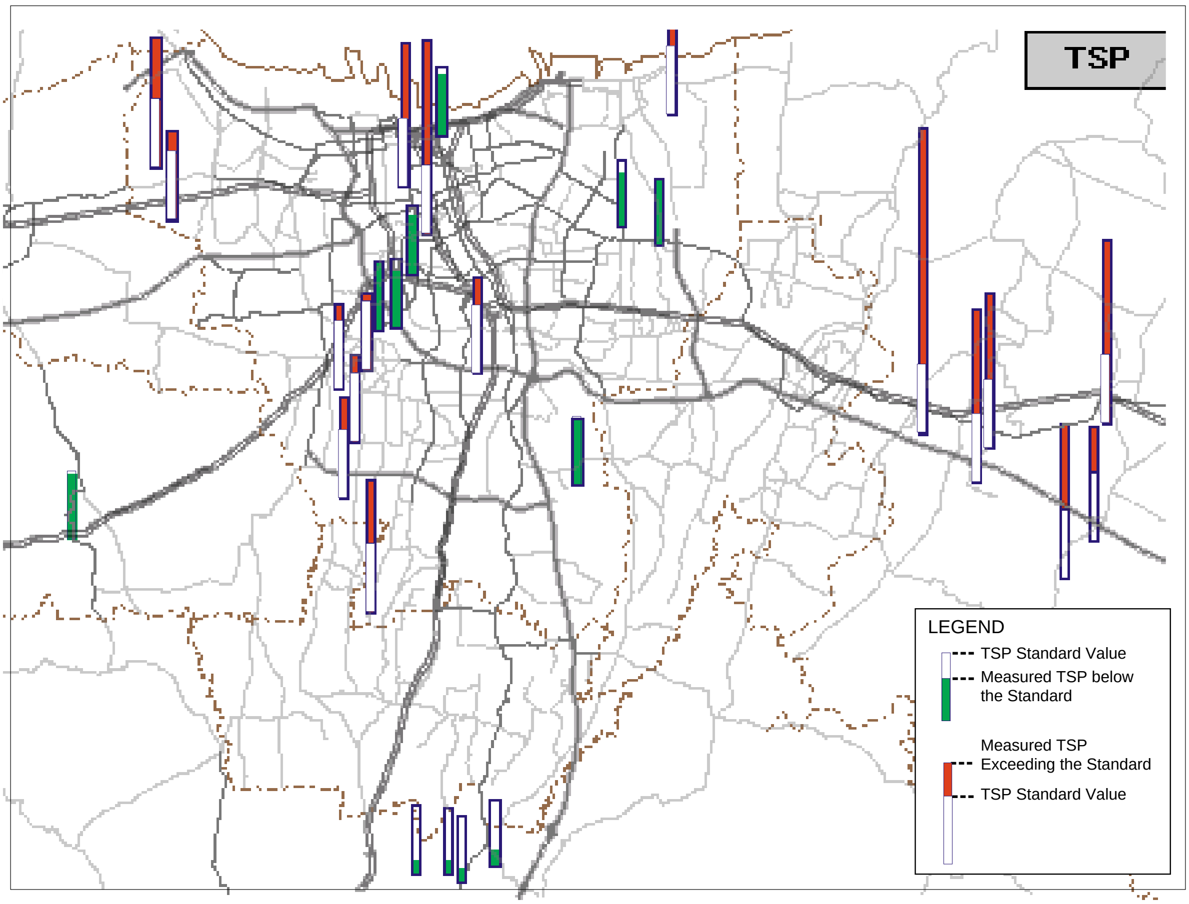
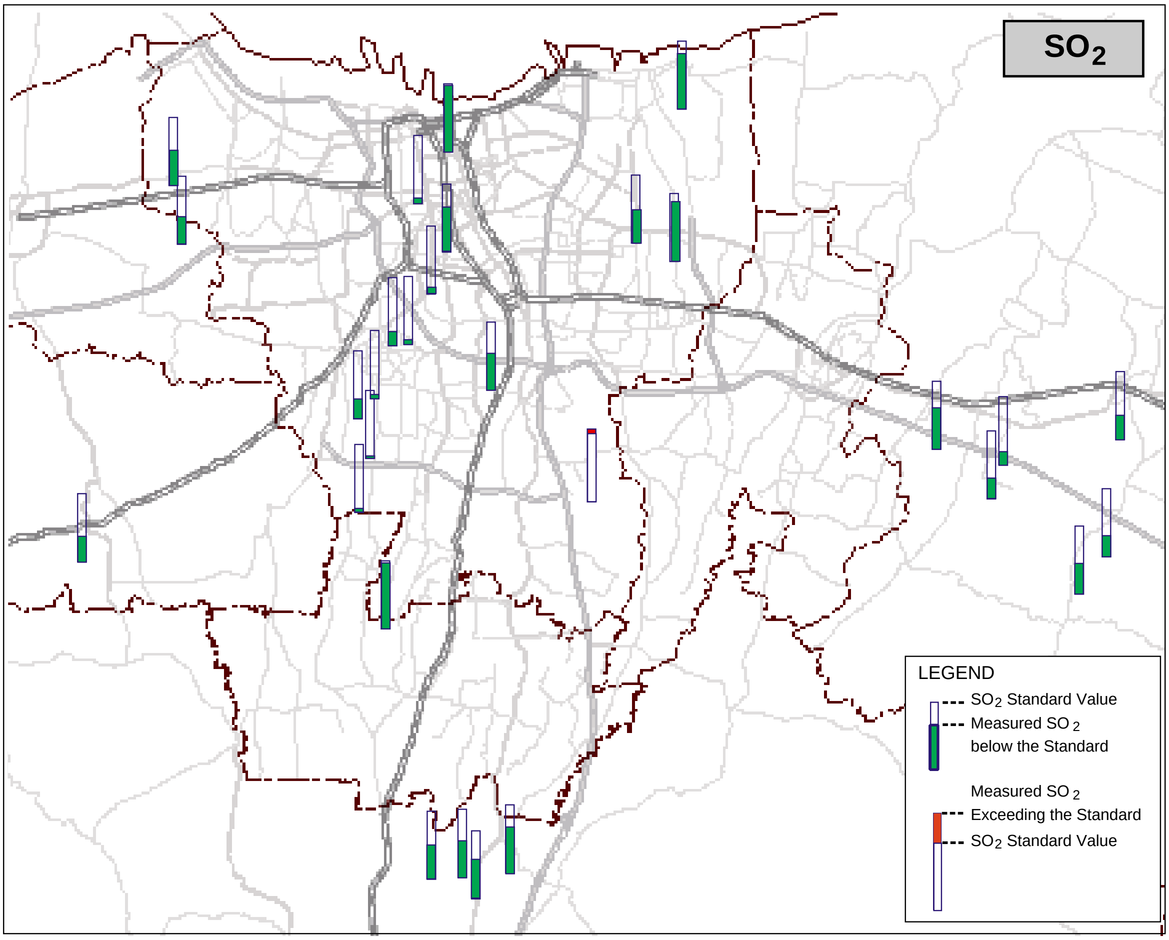


Figure 5.9.1(1) Ambient Air Quality (NOx, TSP) in Jabotabek



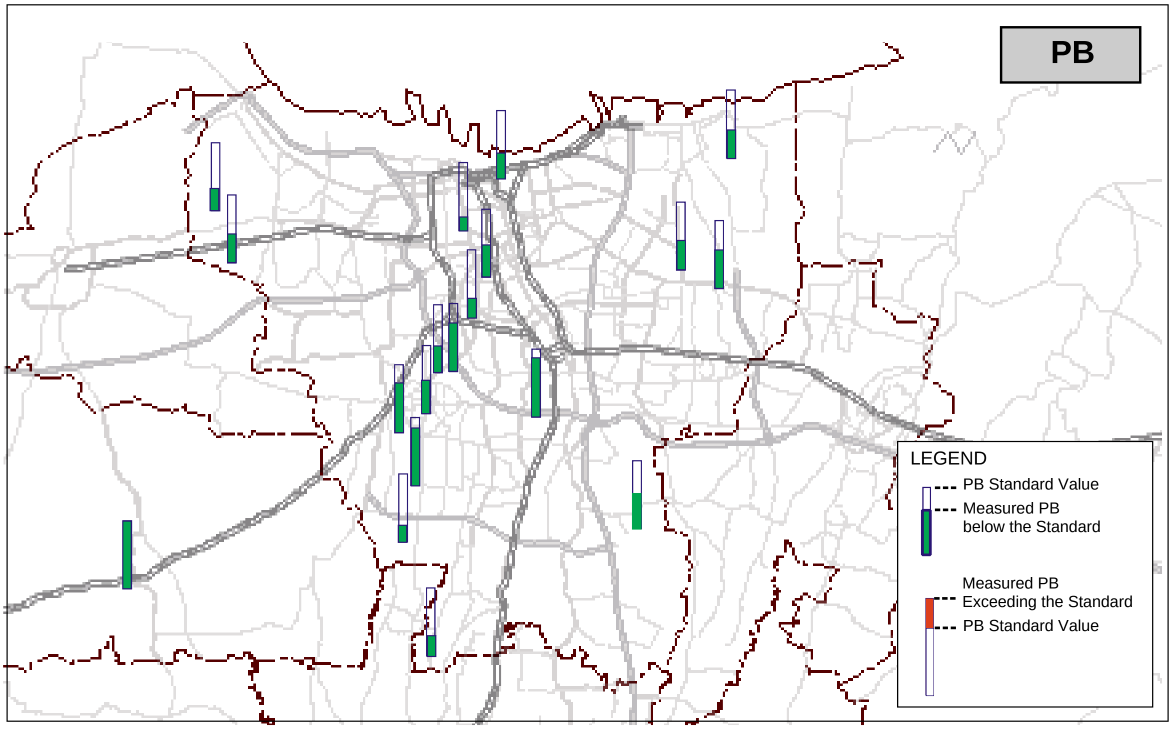


Figure 5.9.2 Ambient Air Quality in JABOTABEK (SO2, PB)

It should be noted that the accuracy/ reliability of the data shown in Table 5.9.4 is questionable, because the measurement method, equipment used, measurement duration, location, weather of the day, etc. have not been clearly described. Also, there are usually some technical difficulties in the maintenance/ adjustment (calibration) of measurement equipment in Indonesia, which will directly affected the inaccuracy of the data.

Table 5.9.4 Air Conditions in Botabek in 1999

No	Location	NOx	SO_2	CO	TSP (Debu)
		μg/m^3	μg/m^3	μg/m^3	μg/m^3
Bogor					
1	TPA Pondok Rajeg (Kec. Cibinong)	40.2	132.1	--	45.7
2	Permahan Nirwana Estate (Kec. Cibinong)	42.4	152.3	--	54.2
3	Industri Nanggewer (Jl. Raya Jakarta-Bogor)	52.1	169.4	--	86.2
4	Wilayah Industri Cibinong (Kec. Cibinong)	54.2	182.1	--	64.5
5	Kawasan P. Taman Palm (Kec. Cibinong)	37.1	144.2	--	52.2
Bekasi					
1	Jl. Hasanudin (Pasar Tambun)	121.8	163.2	12,961.7	1,169.0
2	Jl. Teuku Umar (Warung Bongkok)	86.9	61.8	3,626.0	593.4
3	Tol Cibitung Intersection	92.7	81.5	7,352.6	661.2
4	Tol Cikarang Intersection	103.4	83.0	7,243.9	401.6
5	Terminal Cikarang	82.6	95.9	3,540.2	706.6
6	Lippo Cikarang Intersection	85.0	119.3	9,024.6	602.1
Air Quality Standard (West Jawa)		100.0	265.0	10,000.0	260.0

Note: Air quality in Tangerang measured in Pusarpedal is shown in Table 5.9.3
Source: Bapedalda Kabupaten Bogor, 1999
Laporan Proyek Pengendalian Pencemaran Udara, Bagian Lingkungan Hidup-Kab. Bekasi, 2000

(3) Sources of Air Pollutant Emissions

A summary of air pollutant emissions by source; i.e. industries, households, automobiles, ships, and aircraft, in Jabotabek is shown in Table 5.9.5. As indicated, the main source of air pollutant emissions for NOx is automobiles (68.8%), for SOx is industries (76.3%) and for TSP are industries (57.1%) and automobiles (40.2%).

Table 5.9.5 Estimated Total Pollutant Emissions by Sources in Jabotabek

No	Source	NOx		SOx		TSP	
		(ton/year)	(%)	(ton/year)	(%)	(ton/year)	(%)
1	Industries	36,832	25.7	42,697	76.3	13,581	57.1
2	Households	4,962	3.4	4,220	7.5	642	2.7
3	Automobiles	98,738	68.8	8,142	14.6	9,563	40.2
4	Ships	1,960	1.4	808	1.4	-	-
5	Aircraft	1,026	0.7	91	0.2	-	-
Total		143,518	100.0	55,958	100.0	23,786	100.0

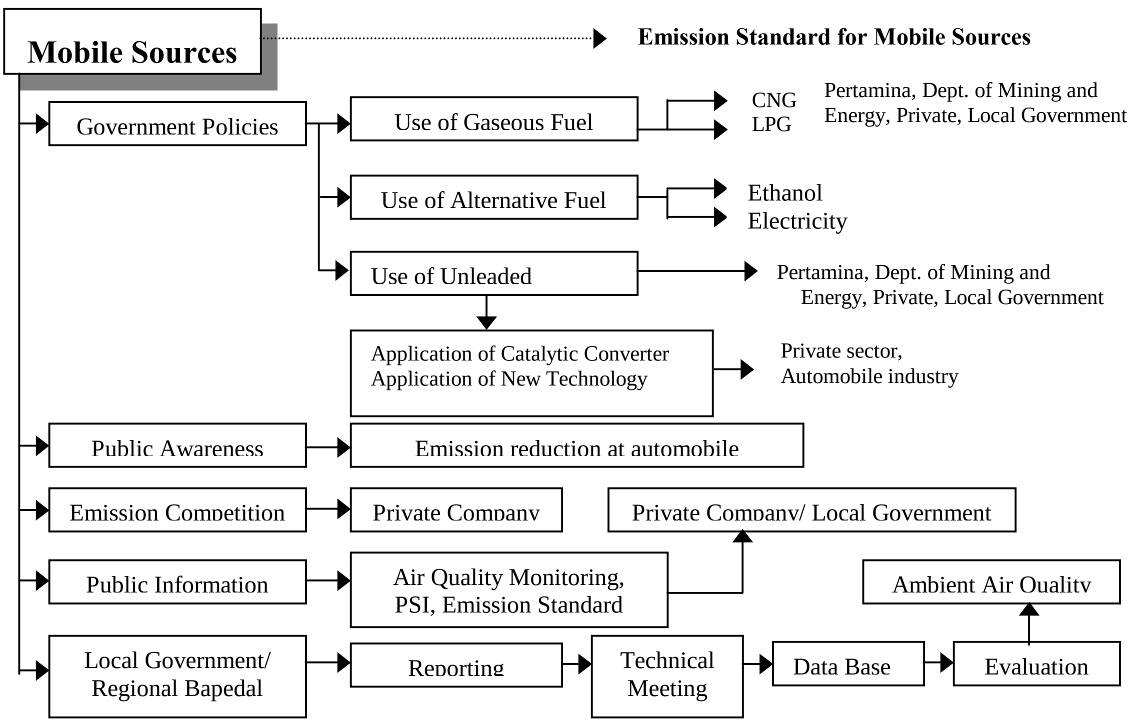
Source: The Study on the Integrated Air Quality Management for Jakarta Metropolitan Area, JICA, 1997

5.9.2 Environmental Management Practice in Jabotabek

(1) Outline of Blue Sky Program for Mobile Sources

The Blue Sky Program (*Langit Biru*) has been organized by the Ministry of State for the Environment (KLH) and the Environmental Impact Management Agency (BAPEDAL). The program started in 1992. The general objectives of the program, in order to protect public health, ecosystems and the living environment are: to reduce source emissions so that they comply with the appropriate emission standards, and to encourage the adoption of less polluting fuels, technologies, processes and procedures.

The Blue Sky Program is composed of two phases. Phase-I (1992-1996) was completed with the introduction of new regulations related to the program, improvement of institutional capacity, preparation of the contents of the environmental impact assessment related to air pollution, establishment of an air quality monitoring program and a social awareness development program. Phase-II, which has commenced recently, deals with two major targets for the management of air pollution, mobile sources and stationary sources. Figure 5.9.2 shows the conceptual control diagram of the Blue Sky Program for mobile sources:



(Source : Blue Sky Program, BAPEDAL)

Figure 5.9.2 Control Diagram of Mobile Emission Source Program (Blue Sky)

(2) Major Practice of Blue Sky Program

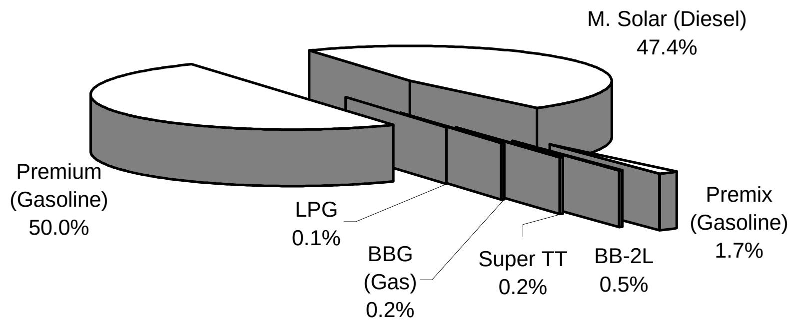
The major practice of the Blue Sky Program Phase-II for mobile sources which has been conducted by BAPEDAL recently are;

- fuel improvement (leaded gasoline phase-out),
- vehicle inspection/ maintenance improvement in connection with the establishment of new emission standards for motor vehicles, and
- an introduction of a nationwide air quality monitoring system.

Each practice is described in the following sections.

(a) Fuel Improvement

Based on the Decree of the Ministry of Mining and Energy No. 1585K/32/MPE/1999, a deadline for the nationwide introduction of un-leaded gasoline has been set for January 1st 2003. In accordance with the Blue Sky Program, *Pertamina* (State-owned Company for Oil and Gas Production) prepared the action plan for the improvement of fuels in Indonesia including an introduction of un-leaded gasoline, in coordination with MIGAS (Directorate of Oil and Gas, Ministry of Mining and Energy). Based on this plan, an un-leaded gasoline called "Super TT" has been produced since 1995 and "BB-2L" since 1997. The ratio of un-leaded gasoline (Super TT and BB-2L) however is still low at merely 0.7 percent of the total fuel production in 1999/2000 as shown in Figure 5.9.3.



Source: Pertamina in 1999/2000

Figure 5.9.3 Fuel Occupancy Ratio in Indonesia (1999/2000)

(b) Vehicle Inspection

Vehicle inspection in Indonesia is regulated by the Presidential Decree No.14 of 1992 "Road Traffic and Transportation Act" and Government Regulation No.44 of 1993 "Vehicle and Driver". According to the regulations, vehicle inspection is composed of two major items; one is an inspection for the approval of new model/ type vehicles before they enter the market and the other is a regular inspection (roadworthy test called *PKB*) of in-use vehicles. It should be noted that, based on the regulation No.44 of 1993, a regular inspection (once every 6 months) is targeted only for commercial vehicles including public transport but not for private vehicles.

Based on the Blue Sky Program, in order to improve the framework conditions for the reduction of air pollution caused by motorized vehicles in Jabotabek, mainly DKI Jakarta, the Clean Air Project (CAP) was started in 1997 with Swiss aid, in coordination with BAPEDAL and BAPEDALDA. The project enters its 2nd Phase recently and it is composed of the introduction of I&M system (Inspection and Maintenance) for each vehicle category as follows;

- Commercial Vehicles Component: Clean bus and clean transportation program with I&M system
- Private Cars Component: Introduction of a compulsory I&M system for private cars
- Motorcycles Component: Improvement of fuelling and maintenance of motorcycles

Recently, BAPEDAL prepared a new emission standard (draft) for new type vehicles compatibility with international standards, and it may come into force a until the end of 2000.

Bapedalda DKI Jakarta carried out a roadside vehicle emission test with random sampling of every kind of vehicle in 1999. In the test, 245 gasoline vehicles and 302 diesel vehicles were checked. The emission load of 172 vehicles (31.4% of the total vehicles) was found to exceed the standard value.

In contrast, the results of regular vehicle inspection of commercial vehicles (including public transport) in DKI Jakarta and in Botabek carried out by the DLLAJ of each local government in 1999 are shown in Tables 5.9.6 and 5.9.7. The ratio of vehicles that did not pass the inspection was a merely 1.06 percent in DKI Jakarta, 1.20 percent in Bekasi and 0.20 percent in Bogor.

Therefore, practically, taking into account the poor conditions of buses, carriage vehicles etc. exhausting much amount of visible emission smokes/ gases at the roadsides, it can be said that the current vehicle inspection system (regular inspection) in Jabotabek is not running well.

(c) Ambient Air Monitoring

Based on the Blue Sky Program, an air quality monitoring system (AQMS) has been introduced in Indonesia recently through Austrian aid. The purpose of AQMS is;

- to collect air quality data from geographically diverse areas of Indonesia (10 local governments),
- to transfer the collected data to a national air quality database, and
- to disseminate the data to the public.

Based on this project, one calibration center (in Bapedalda DKI Jakarta), five fixed monitoring stations (in each district of DKI), five public data displays (in each district of DKI) and one mobile monitoring station have been established/procured for DKI Jakarta by the middle of year 2000.

Table 5.9.6 Vehicle Inspection in DKI Jakarta

Vehicle Type	Public Workshop (PKB)					Total (vehicles)
	P. Gadung	U. Menteng	Jagakarsa	K. Angke	Cilincing	
Carriage Vehicles	4,653	101,520	47,682	69,092	0	222,947
Buses	21,829	0	0	0	0	21,829
Public Vehicles	26,585	33,200	17,088	3,106	20,111	100,090
Total	53,067	134,720	64,770	72,198	20,111	344,866
No/ not pass inspection	704	985	341	1,504	120	3,654
Ratio (%)	0.2%	0.29%	0.1%	0.44%	0.03%	1.06%

Source: Dinas LLAJ, DKI Jakarta, 1999

Table 5.9.7 Vehicle Inspection in Botabek

Item	Vehicle Type		Total	Vehicles not pass inspection	
	Gasoline	Diesel		Number	Ratio (%)
< Kab. Bekasi >					
1. Carriage Vehicles	12,217	11,448	23,665	156	0.66%
2. Buses	12,473	2,667	15,140	325	2.15%
3. Public Vehicles	1,283	0	1,283	0	0%
Total	25,973	14,115	40,088	481	1.20%
< Kab. Bogor >					
1. Carriage Vehicles	--	--	2,127	11	0.52%
2. Buses	--	--	315	16	5.08%
3. Public Vehicles	--	--	10,865	0	0%
Total	--	--	13,307	27	0.20%
< Kab. Tangerang >					
1. Carriage Vehicles	--	--	1,345	--	--
2. Buses	--	--	9,392	--	--
3. Public Vehicles	--	--	14,634	--	--
Total	--	--	25,371	--	--
G. Total	--	--	78,760	--	--

Note; “Carriage Vehicle”: Truck, Trailer, Boxcar, Pick-up etc., “Public Vehicles”: Taxi, Mikrolet etc.
Source: Dinas LLAJ of Kabupaten Bekasi, Bogor and Tangerang in 1999

Moreover, a training program for ambient air quality monitoring is planned at the end of year 2000 as a joint project between BAPEDAL and US-EPA. This training program is targeted not only at the central government officials but also at the local governments, industrial sectors and private sectors.

However, it should be noted that it has some difficulty to obtain the reliable data of ambient air quality in Jabotabek currently, even various donors (JICA, GTZ, UNEP, World Bank etc.) have studied in this field in the last ten years and the measurement equipment for air were provided. This may be because of the lack of maintenance/ adjustment (calibration) of measurement equipment due to a shortage of budget, and personnel.

5.10 Social Factors Affecting Urban Transport

Social aspects with regard to urban transport have two-folds; one is social problem caused by transport system development and the other social factors affecting transport system.

5.10.1 Social Problems Caused by Transport System Development

(1) Division of Community

Transport infrastructure development often divides areas into two parts and it a causes division of the community. At present the frequency of the Bogor line has been increased significantly, and it has become difficult to cross the railway line and it takes a longer time to do so. Similarly toll road developments often result in a division of the community since it is difficult for residents along the toll road to cross the road, especially if supplemental over-bridges have not been built.

(2) Land Acquisition Problem

During the implementation of a transportation project, land acquisition has at time become social issue and sometimes the project has had to be postponed or canceled. Taking into account the recent democratization process in Indonesia, and based on discussions with government officials, WALHI (non-governmental organization in Indonesia) and so on and also some reference documents, the following issues on land acquisition in Jabotabek are clarified.

(a) Lack of Transparency in Land Acquisition

The land acquisition process carried out by the Government is not clear from the point of view of the community/land owners/ affected people, and some necessary steps are not always. In the past, the community consultation process (*musyawarah*) was conducted properly and the Government handled claims from the community poorly.

The *musyawarah* was conducted in some cases only between the Government officers and the community representatives, such as Camat, Lurah and/or RT/RW. Land owners/ affected people were often left out of the process. Also, sometimes only the cooperative land owners/ affected people side were invited to join the consultation process.

The tendency for land acquisition to be carried out through a “top down” approach, especially with the low-income people: i.e. the Government sometimes takes forcible measures (*korban penggusuran*) against the affected people in order to achieve an agreement on land prices/ compensation.

The project is not transparent both in terms of the planning process and the land acquisition process. It sometimes leads to an intervention by brokers and land speculators and it causes social unrest among the affected local community.

(b) Unclear Land Tenure

The land tenure documents of the people are not clear and it is thus difficult to determine the status of the land. In some cases, the land is found to be owned by more than one party each with a legal document/certificate of the land; or the owner of the land is unknown. The preparation of a trace map usually takes a long time, because of the uncertainty of the land status, and this leads to a delay in the process of land acquisition.

In general, the time between the determination of the ROW (right of way) and land acquisition is long. Therefore, illegal occupancy by people occurs even on land already acquitted by the Government; i.e. construction of semi-permanent and/or permanent structures and performance of some economic activities.

The renter and the owner of the land may disagree on how to share of the compensation.

(c) Lower Compensation Price than Market Price

In the *musyawarah* process, no agreement can be reached on the amount of compensation for the land/buildings/crops settled by the Government, because the local society (land owners and/or affected people) tends to demand a higher price than the price set by the Government.

Brokers/ speculators may take part in the land acquisition process. They sometimes generate social unrest in the local community regarding the land/building values, and they demand an unreasonable price for compensation.

In general, the time period between the determination of compensation and actual payment is long (a year or two). During this period, developers often come in and buy the land behind the ROW and that may significantly increase the land value, due to the development. However, the compensation price settled with the Government remains at a much lower rate. Thus, people, who had already agreed with the government on the compensation amount feel the unfairness and social unrest occurs among the local community.

5.10.2 Social Factors Affecting Transport System Development and Performance

(1) Lack of Cultural Climate to Obey Laws and Regulations

Many laws and regulations have been drafted and although some are effective, others have been ignored by the citizens or the parties concerned.

- Compulsory use of a helmet
- Compulsory use of a seat belt
- Progressive vehicle tax
- Ticket system for bus transport
- Timetable for bus operation
- 2 in 1 policy for bus fleets

The reason why people do not adhere to the laws and regulation is because they are unaware of these laws and regulations due to poor public relations and enforcement.

(2) Distrust of Politics

In the era of democracy people easily oppose to government policies out of distrust of the policies. Whatever the government proposes, people tend to refuse the proposed policies.

(3) Undisciplined Drivers

The drivers' poor adherence to road/traffic regulations is apparent on the street. The followings are the driving practices often observed and it is not merely the ordinary drivers but also professional drivers of buses and taxis who do not obey the rules.

- Drivers do not always pay heed to pedestrians crossing the street and do not stop for them.
- Drivers often enter intersections before the vehicle in front has cleared the intersection.
- Drivers often change lanes, especially in front of the stop line at intersections.
- Drivers do not give priority to the vehicle going straight than turning right.
- Drivers do not stop in front of railway level crossings and often enter before the vehicle in front has cleared the level crossing.
- Drivers do not merge one by one from both sides at an intersecting point.