

Source: 2009 Traffic Survey, JICA Study Team

Figure 2.2.5 Traffic Volume at OD Interview Locations

Table 2.2.8 Traffic Volume at OD Interview Locations

(Unit: vehicle)

Location Code	Survey Hours	Motorcycle	Rate (%)	Private Cars	Rate (%)	Bus	Rate (%)	Others	Rate (%)	Total
IC01	16	27,663	76.7	5,443	15.1	960	2.7	2,013	5.6	36,079
IC02	16	20,895	59.6	6,801	19.4	1,280	3.7	6,089	17.4	35,065
IC03	16	16,536	88.4	1,378	7.4	328	1.8	462	2.5	18,704
IC04	16	25,314	81.2	2,530	8.1	249	0.8	3,096	9.9	31,189
IC05	16	17,832	80.3	3,352	15.1	613	2.8	413	1.9	22,210
IC06	16	20,019	67.4	4,316	14.5	557	1.9	4,788	16.1	29,680
IC07	16	15,183	58.4	4,407	16.9	898	3.5	5,517	21.2	26,005
IC09	16	5,704	91.3	333	5.3	113	1.8	100	1.6	6,250
IC10	16	12,325	60.2	6,593	32.2	354	1.7	1,199	5.9	20,471
IC11	16	9,367	57.6	3,854	23.7	2,009	12.4	1,021	6.3	16,251
IC12	16	7,617	63.9	2,061	17.3	1,879	15.8	359	3.0	11,916
KB01	16	5,161	60.1	2,008	23.4	221	2.6	1,200	14.0	8,590
KB02	24	15,950	47.6	7,919	23.6	1,172	3.5	8,448	25.2	33,489
KB03	16	7,003	88.2	566	7.1	0	0.0	369	4.6	7,938
KB04	16	10,994	84.5	903	6.9	220	1.7	900	6.9	13,017
KB05	24	20,738	49.5	11,537	27.5	1,565	3.7	8,059	19.2	41,899
OC01	16	10,199	52.8	3,639	18.8	490	2.5	4,995	25.9	19,323
OC02	16	9,447	58.3	3,483	21.5	893	5.5	2,393	14.8	16,216
OC03	24	24,417	48.1	15,127	29.8	1,978	3.9	9,224	18.2	50,746
OC04	24	32,991	51.5	15,870	24.8	2,699	4.2	12,516	19.5	64,076
OC05	24	25,166	57.5	11,855	27.1	1,749	4.0	5,000	11.4	43,770

Source: 2009 Traffic Survey, JICA Study Team

The summary of traffic volume counted at Tanjung Perak Port is presented in Table 2.2.9. The highest volume of freight vehicles was observed at P3, Pintu Berlian, which is a pier where large trucks with four and more axles, and container cargoes arrive and leave. The traffic volume of freight vehicles at P2 was also large but the share of medium-size trucks is higher.

Table 2.2.9 Traffic Volume at Tg. Perak Port

Location Code	Location Name	Motorcycle	Passenger Car	Two-axle Truck	Three-axle Truck	Four-axle Truck and More	Container	Total
P1	Pintu Nilam Barat	3,544	563	186	63	151	6	4,513
P1	Pintu Nilam Timur	3,631	890	341	685	508	185	6,240
P2	Pintu Zamrud	8,720	2,351	622	1,469	842	82	14,086
P3	Pintu Berlian	213	809	64	1,404	1,478	1,328	5,296

Source: 2009 Traffic Survey, JICA Study Team

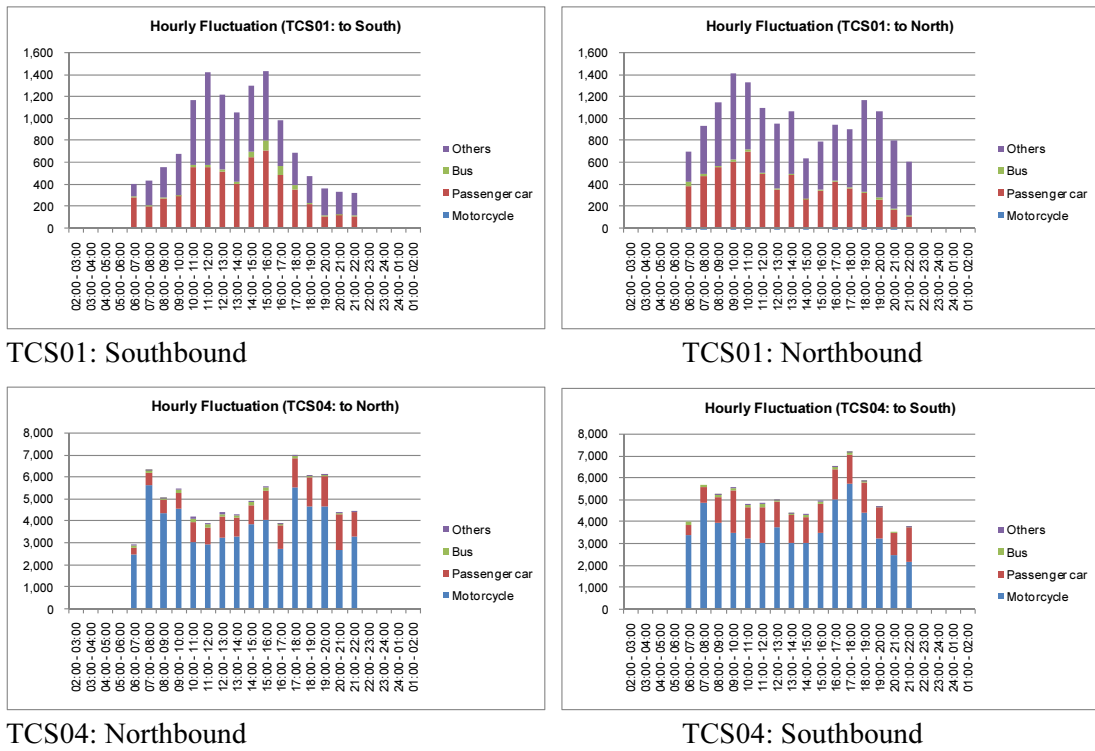
3) Hourly Fluctuation

Traffic characteristics at road sections vary according to the function of the road and its location. One of these characteristics is hourly fluctuation. Figure 2.2.6 shows the hourly fluctuation of typical survey locations in Kota Surabaya: TCS01, TCS04, TCS05, TCS07, TCS13, and TCS17.

TCS01, which is located on the Surabaya–Gempol toll road, has different patterns of peak hours for both directions. The peak traffic of the southbound lane is between 11:00 and 16:00 hrs, while the peak traffic of the northbound lane is in the morning. On the other hand, the fluctuation at TCS04 has no outstanding peak hours.

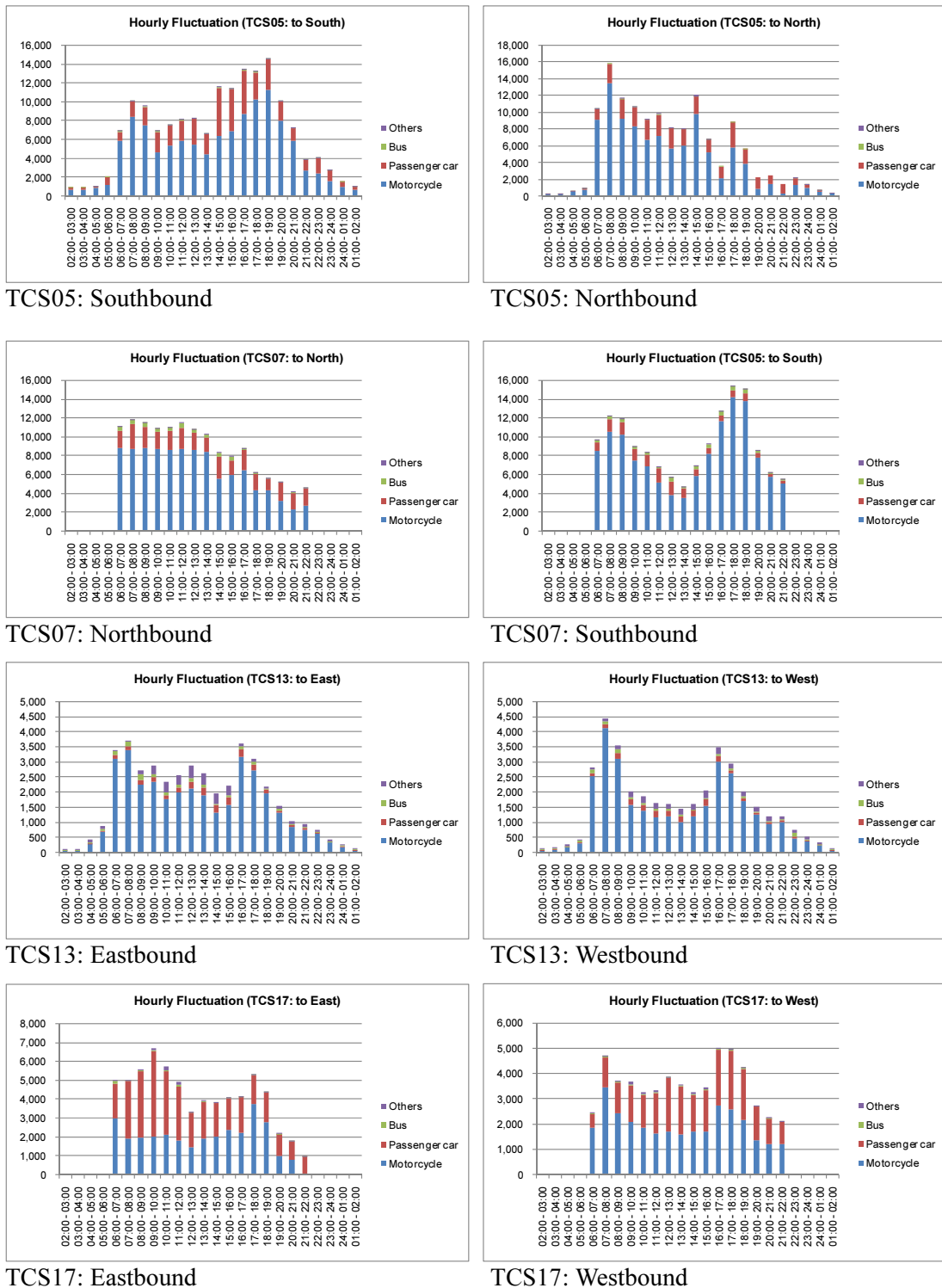
TCS05 is one of the 24-hour survey locations and is located on Jl. Urip Sumoharjo. The peak hours at this location are in the evening on the southbound lane and in the morning on the northbound lane. From these observations, it can be said that most commuting trips are from south to north in the morning and from north to south in the evening as people head home. The same characteristics can be seen at TCS07, making both locations a corridor.

Meanwhile, TCS13 and TCS17 are located on the east–west road. However, the characteristics of peak traffic at these locations are different. At TCS13, peak traffic is concentrated in the morning on the westbound lane but that at TCS17 occurs in the morning on the eastbound lane.



Source: 2009 Traffic Survey, JICA Study Team

Figure 2.2.6 Hourly Fluctuation of Traffic Volume in Kota Surabaya (part 1)



Source: 2009 Traffic Survey, JICA Study Team

Figure 2.2.7 Hourly Fluctuation of Traffic Volume in Kota Surabaya (part 2)

2.2.2 Travel Speed

1) Average Travel Speed

The average travel speed on each road section, measured by floating car data, was calculated based on the data obtained by the Travel Speed Survey conducted on in June to July 2009. For this survey, 50 selected taxis were equipped with a global positioning system (GPS) device, which automatically measured and collected the data on vehicle location, travel speed, direction of travel, and travel time. Collected data was transmitted to the data center every 20 seconds via general packet radio service, or GPRS for short.

The data was collected over a period of one month which enabled a better analysis of the travel speed of the 50 taxis regardless of whether they were empty or occupied. The stored travel speed data at each principal road section was grouped by time period and day: in the morning (8:00–9:00), afternoon (13:00–14:00), and evening (18:00–19:00) of weekdays.

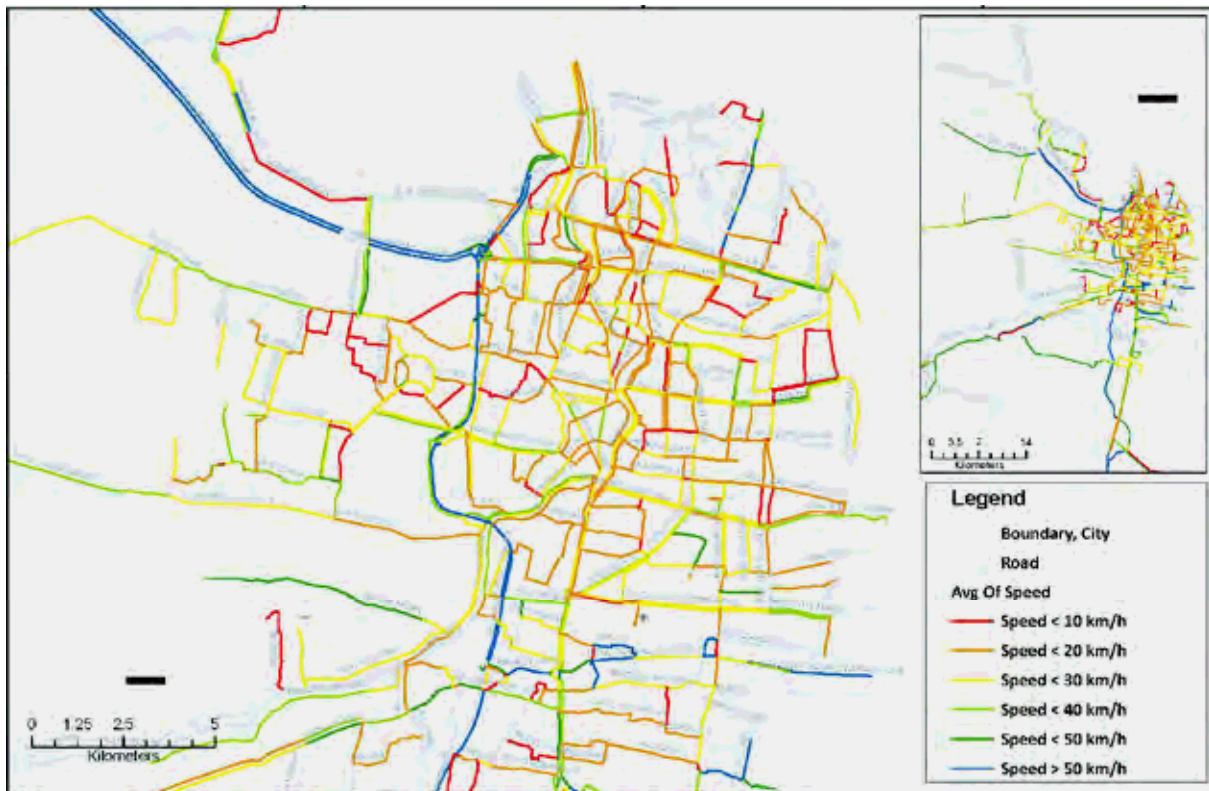
Based on these survey results, the following can be generally pointed out:

- With respect to the toll roads, especially the Surabaya–Gresik toll road, the travel speed of inflows to Surabaya slightly decreased in the mornings and that of outflows became slow in the evenings. This implies road congestion for commuting travels.
- On the other hand, the travel speed of inflows from Sidoarjo to Surabaya on the Surabaya–Gempol toll road was always slower than that of outflows. There was a considerable difference in the characteristics of peak traffic between inflows and outflows, in that inflows had a peak in traffic in the mornings and outflows in the evenings.
- In Kota Surabaya, the average travel speed on almost all road sections was very slow, at about 30 km/h in the daytime. This is probably due to the mixture of transportation modes and the use of motorcycles and passenger cars
- Outside Kota Surabaya, travel speeds differ according to time period. The average travel speed decreases in the daytime but increases in the nighttime. This can be obviously seen in road sections such as Jl. Gajah Mada in Sidoarjo and Jl. Raya Kletek.



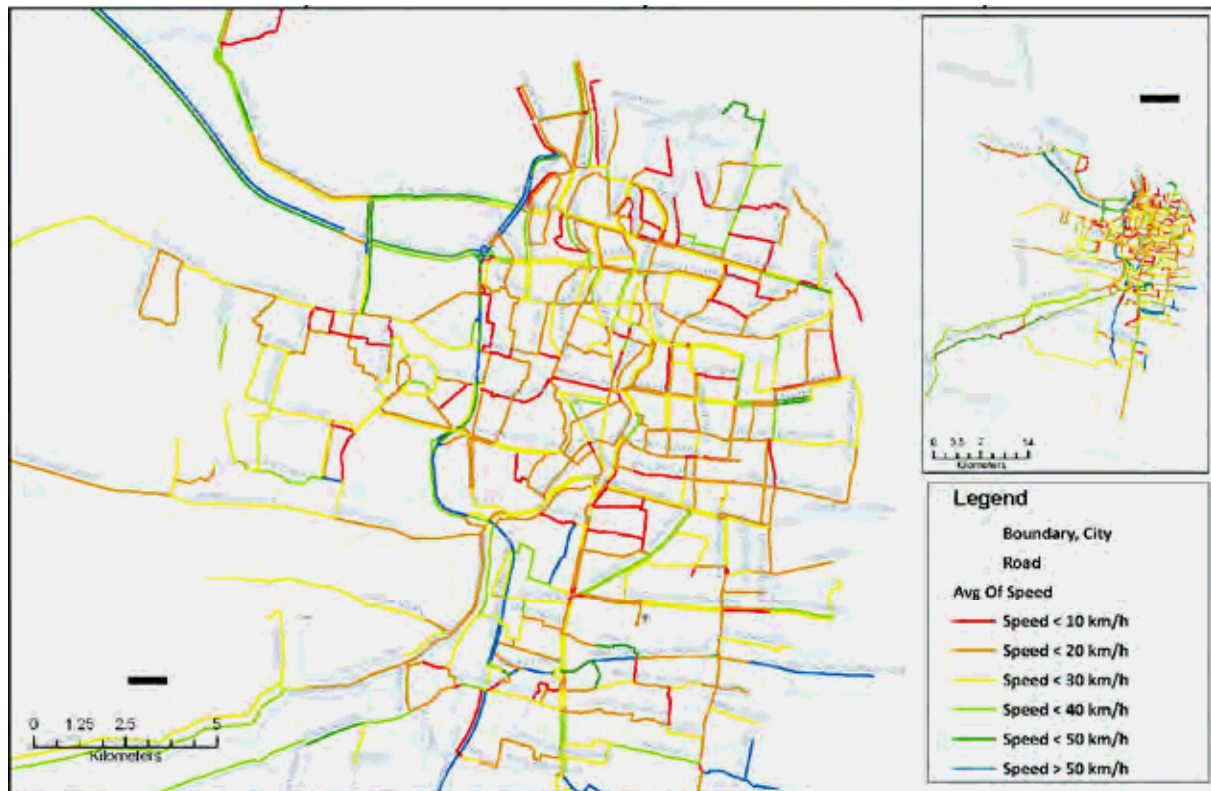
Source: 2009 Travel Speed Survey, JICA Study Team

Figure 2.2.8 Average Travel Speeds on Weekdays at 8:00–9:00 Hrs



Source: 2009 Travel Speed Survey, JICA Study Team

Figure 2.2.9 Average Travel Speeds on Weekdays at 13:00–14:00 Hrs.



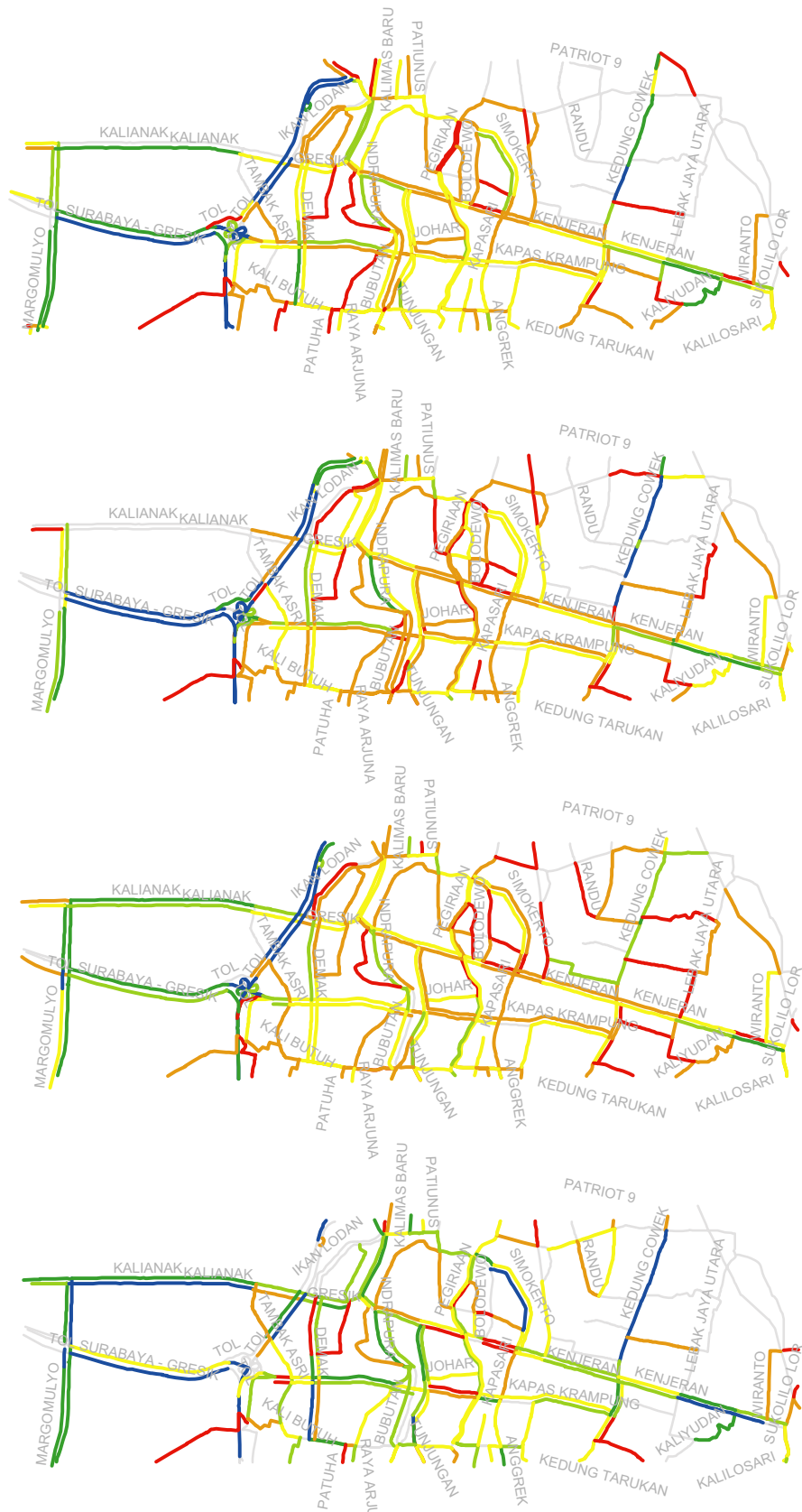
Source: 2009 Travel Speed Survey, JICA Study Team

Figure 2.2.10 Average Travel Speeds on Weekdays at 18:00–19:00 Hrs

2) Bottleneck of Corridor

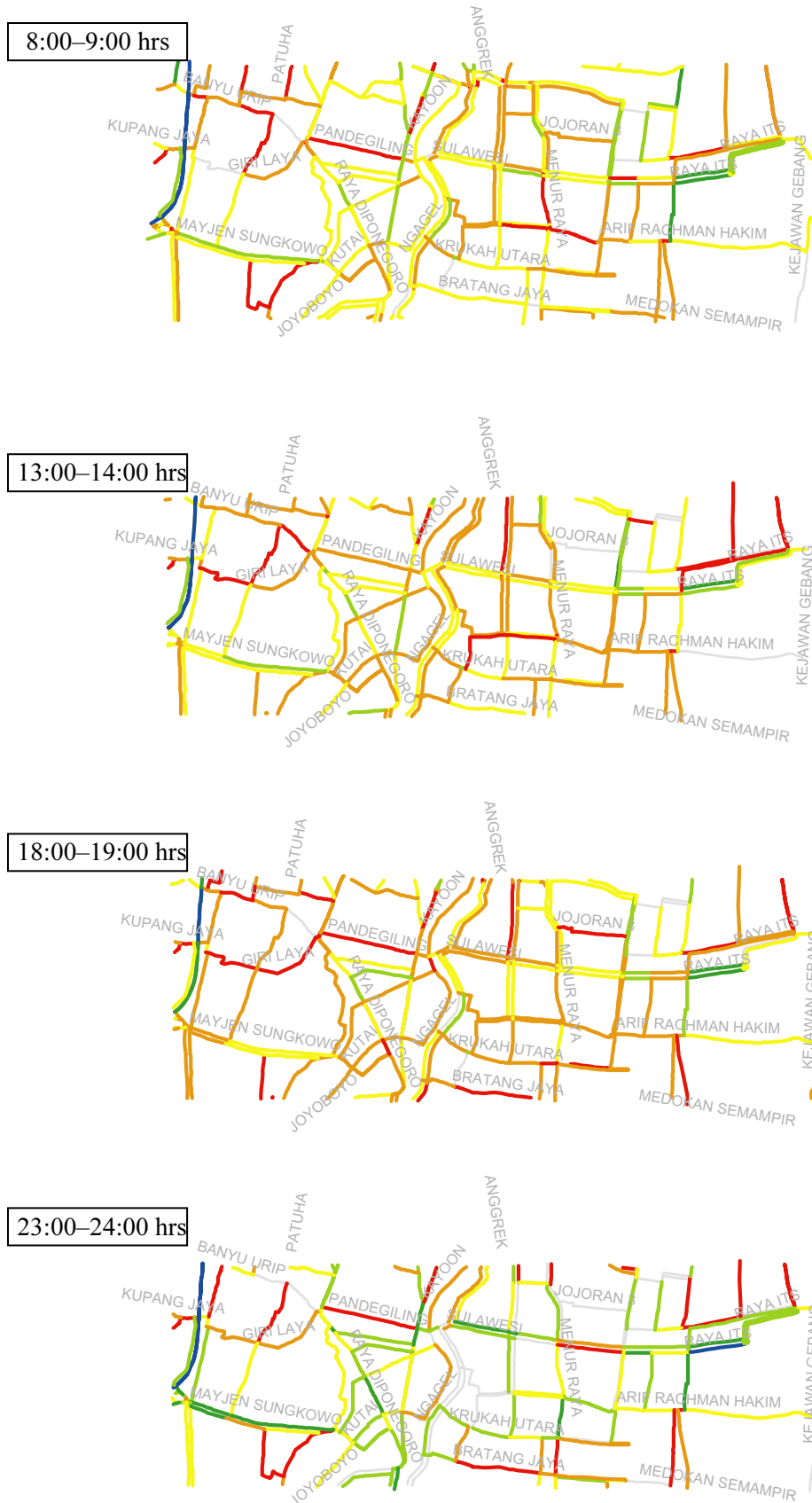
In this section, the change in travel speed on specific corridors in Kota Surabaya will be discussed. The following three corridors were selected for this analysis:

- i) **Corridor 1:** Jl. Greges–Jl. Kalianak–Jl. Gresik–Jl. Rajawali–Jl. Kembang Jepun–Jl. Kapasan–Jl. Kenjeran
 - Vehicles could cruise at a steady pace on Jl. Greges and Kalianak in the western part of the corridor. However, the travel speed at the central part of the corridor, from Jl. Gresik to Jl. Kenjeran, decreased very much in the daytime.
 - An obvious bottleneck is Jl. Kapasan, which showed a speed of less than 10 km/h even at midnight.
 - The average travel speed on the feeder road that intersects this corridor was also very low.
- ii) **Corridor 2:** Jl. Mayjen. Sungkono–Jl. Indragiri–Jl. Raya Dr. Sutomo–Jl. Sulawesi–Jl. Manyar Kertoarjo Raya–Jl. Raya Kertajaya Indah
 - The travel speed between Jl. Mayjen. Sungkono and Jl. Manyar Kertoarjo Raya decreased during the daytime even though these road sections are multilane highways with more than four lanes and clear shoulders and seem to have enough large capacity.
 - The east part of this corridor, such as Jl. Raya Kertajaya Indah, had no obvious problem about travel speed.
- iii) **Corridor 3:** Jl. Tunjungan (Jl. Embong Malang) –Jl. Jend. Basuki Rachmat (Jl. Jend. Sudirman) –Jl. Urip Sumoharjo–Jl. Raya Darmo–Jl. Raya Wonokromo–Jl. Raya Jend. A. Yani–Jl. Letjen. S. Parman
 - In the southern part of Jl. Achmad Yani, there was no remarkable reduction on the average travel speed. That in the rest of the corridor decreased in the daytime.
 - Several bottlenecks could be seen in this corridor, namely Jl. Jend. Sudirman and Jl. Achmad Yani near Gayungan in the evening. Furthermore, there were several congested road sections in the access road to this corridor.



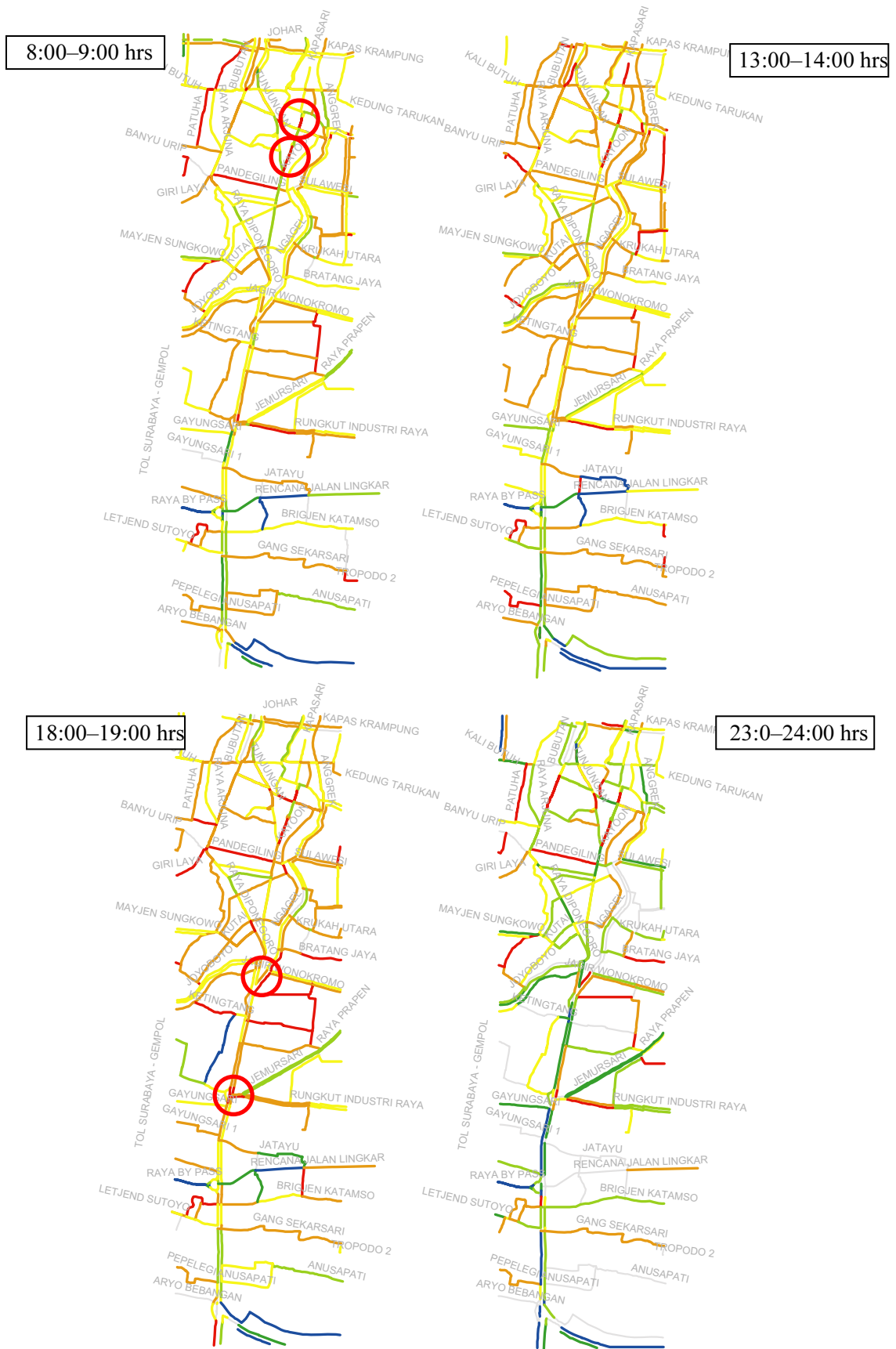
Source: 2009 Travel Speed Survey, JICA Study Team

Figure 2.2.11 Travel Speeds on Corridor 1



Source: 2009 Travel Speed Survey, JICA Study Team

Figure 2.2.12 Travel Speeds on Corridor 2



Source: 2009 Travel Speed Survey, JICA Study Team

Figure 2.2.13 Travel Speeds on Corridor 3

2.2.3 Traffic Accidents

1) Traffic Accidents in Indonesia

According to the National Police of Indonesia, the number of traffic accidents all over the country, excluding East Timor, increased from 1999 to 2005. During this period 18,116 traffic accidents were reported, which resulted in 11,451 fatalities and 20,421 injuries (refer to Table 2.2.10). Material losses from these accidents in monetary terms reached Rp. 51,355 million in 2005, which was 3.4 times the losses in 1992.

Table 2.2.10 Traffic Accidents in Indonesia, 1992–2005

Year	Number of Accidents	Fatality	Serious Injury	Slight Injury	Material Losses (Million Rp)
1992	19,920	9,819	13,363	14,846	15,077
1993	17,323	10,038	11,453	13,037	14,714
1994	17,469	11,004	11,055	12,215	16,544
1995	16,510	10,990	9,952	11,873	17,745
1996	15,291	10,869	8,968	10,374	18,411
1997	17,101	12,308	9,913	12,699	20,848
1998	14,858	11,694	8,878	10,609	26,941
1999*)	12,675	9,917	7,329	9,385	32,755
2000	12,649	9,536	7,100	9,518	36,281
2001	12,791	9,522	6,656	9,181	37,617
2002	12,267	8,762	6,012	8,929	41,030
2003	13,399	9,856	6,142	8,694	45,778
2004	17,732	11,204	8,983	12,084	53,044
2005	18,116	11,451	9,253	11,168	51,355

Source: National Police of Indonesia

*) Since 1999, the figures exclude East Timor

2) Traffic Accidents in East Java Province

Based on 2007 and 2008 data obtained from the Traffic Police in East Java province, as shown in Table 2.2.1, about 10,000 traffic accidents occurred in the province which resulted in more than 3,000 fatalities. The total number of traffic accidents in this area is unreasonably big compared with that for the whole country. This is especially so in the area of Malang. Total losses from these traffic accidents in 2008 were Rp. 11,172 million, which was one-fifth that of the whole country.

Table 2.2.11 Traffic Accidents in East Java Province, 2007–2008

Jurisdiction	2007					2008				
	Number of Accidents	Fatality	Serious Injury	Slight Injury	Material Losses (million Rp.)	Number of Accidents	Fatality	Serious Injury	Slight Injury	Material Losses (million Rp.)
Wil Tabes SBY	1,225	554	250	1,018	1,336	1251	600	253	1020	1,168
Wil Malang	2,676	546	269	3,292	1,765	2434	644	247	3139	2,217
Wil Besuki	1,106	421	295	1,217	1,015	1040	567	350	891	1,494
Wil Kediri	1,601	520	572	1,603	928	1527	480	434	1709	965
Wil Madiun	1,493	379	548	1,721	1,445	2042	437	687	2519	2,108
Wil BJ.Negoro	1,602	596	601	1,527	1,229	1529	569	586	1436	2,449
Wil Madura	345	250	200	232	646	491	259	249	339	770
Total	10,048	3,266	2,735	10,610	8,364	10,314	3,556	2,806	11,053	11,172

Source: Traffic Directory of Indonesian Police (Direktorat Lalu-Lintas, Kepolisian Negara Republik Indonesia)

3) Existing Traffic Accident Reporting System

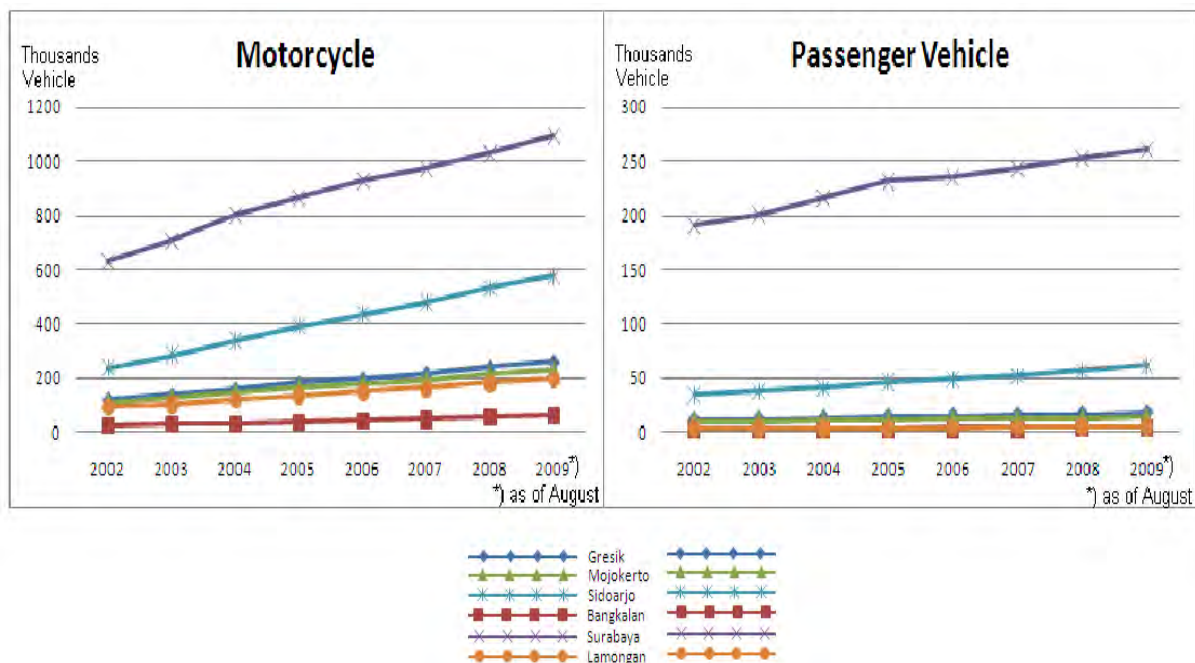
The traffic accident reporting system of the provincial police department generally follows several steps of hierarchical procedures. The first step is the filing of a police report consisting of summary testimonies from witnesses, suspects, and victims. This report is usually taken at the accident site. After summing up this report, an expert official statement is needed from a doctor and an investigator. This report comes with a sketch of the accident site and some attachments of photos which are used to make an adjustment based on the official regulation so that the procedures for claims (e.g., insurance and loss expenses), punishment, and so on could be fairly applied.

4) Traffic Safety Campaign

Implementing a traffic safety campaign is one of the methods for reducing the number of traffic accidents. This campaign has been an annual program of the police department since the late 1990s and targets teenagers and workers. It can consist of an educational seminar or meeting (at schools and offices), and advertisement in the media (including TV, radio, and printed media such as newspaper, poster, and booklet). Among many annual safety campaign programs of the police department are “Satabhayangkara” and “Santun Berlalulintas” (good traffic manners). “Satabhayangkara” is a program which involves educating the public, through role playing, to obey traffic regulations. “Santun Berlalulintas” is a traffic safety campaign on the road which is supervised by the police. It may include giving away free helmets to motorcycle drivers and warning them to turn on their headlights in the daytime.

2.3 Traffic Control and Management

In the GKS, as in other parts of Indonesia, road is the dominant land transportation. With motorization, the number of automobiles has been rapidly increasing except during the economic crisis. Recent trends in the number of registered vehicles in each kabupaten and kota are summarized in Figure 2.3.1. The number of registered vehicles in Kota Surabaya is by far the largest, especially for passenger cars. Among the surrounding kabupaten, Sidoarjo has the largest number of registered vehicles. On average, the annual growth rate of vehicles is nearly 10% in recent years. The growth in the number of motorcycles, at over 10% per annum, is especially remarkable and the share of motorcycles to all vehicles is 74%.



Source: Regional revenue agency (Dispenda) of East Java province.

Note: Passenger vehicle=sum of "sedan," "jeep," and "ST wagon" in the original category.

Figure 2.3.1 Number of Registered Vehicles by Kabupaten/Kota

In terms of occupying limited urban road space, the increasing popularity of motorcycles does not cause as much traffic congestion as passenger vehicles. However, the shift to motorcycles results in a decline in public transportation usage, which in turn affects the profitability of public transportation projects. It is also a problem in the sense that it increases the potential of larger-vehicle usage in the future as these motorcycle users may switch eventually to automobiles.

This rapid motorization has brought the Surabaya Metropolitan Area (SMA) many urban problems such as traffic congestion and environmental pollution. Traffic congestion on the city roads and on roads connecting with suburban cities is becoming worse year by year. Take, for example, the current situation on Jl. Ahmad Yani, a major radial road extending south from Surabaya, as shown in Figure 2.3.2. Since the number of roads available to

commute from south of SMA to Surabaya is very limited, there is serious traffic congestion on Jl. Achmad Yani especially during morning and evening peak hours. The existence of railway crossings beside this road makes the traffic situation even worse.



Figure 2.3.2 Current Situation of Jl. Achmad Yani

While additional roads as well as reliable public transportation may have to be developed to essentially solve these traffic congestion problems, there are several traffic control and management measures currently being implemented in Surabaya and its vicinity.

2.3.1 Traffic Signal Control System

There are 131 intersections in Kota Surabaya. Of these, 40 intersections are signalized with area traffic control systems (ATCSs) installed in the 1990s, 41 are signalized without ATCS, and 50 are not signalized. The old-type closed circuit television (CCTV) cameras that were installed along with ATCS at the 40 locations are no longer functioning. However, traffic lights on major roads were replaced with new ones from Austria (SWARCO) in 2005, and countdown traffic timers were also added (refer to Figure 2.3.3). The settings can still be changed manually and locally.



Figure 2.3.3 Countdown Traffic Timers in Surabaya

In addition, for area-wide traffic management and monitoring, digital CCTV cameras are being installed at major intersections in Surabaya as part of an intelligent transportation system (ITS). Now the work is under way to connect those intersections with fiber-optic cables. Dinas Perhubungan (Transportation Department) plans to apply the ATCS at more than 100 intersections with 22 sub-areas in Kota Surabaya by 2010 (Figure 2.3.5). So far,

digital CCTV cameras have already been installed at 10 intersections, and the traffic situation can be monitored at the traffic control center in Dinas Komunikasi dan Informasi (Communication and Information Department). When this is completed, real-time information such as traffic congestion will be available through some media, including variable message signboard (VMS) which is now being installed on several roads. At present, there are two VMS units installed: one on Jl. Urip Sumoharjo (Figure 2.3.4) and the other in Waru rotary. Aside from the above-mentioned project, a study on the ITS master plan for Surabaya is in progress.



Figure 2.3.4 Variable Message Signboard on Jl. Urip Sumoharjo

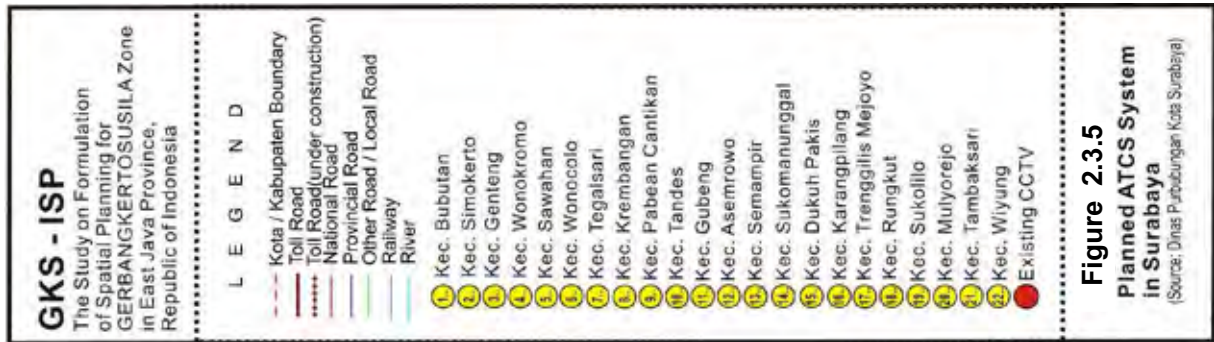
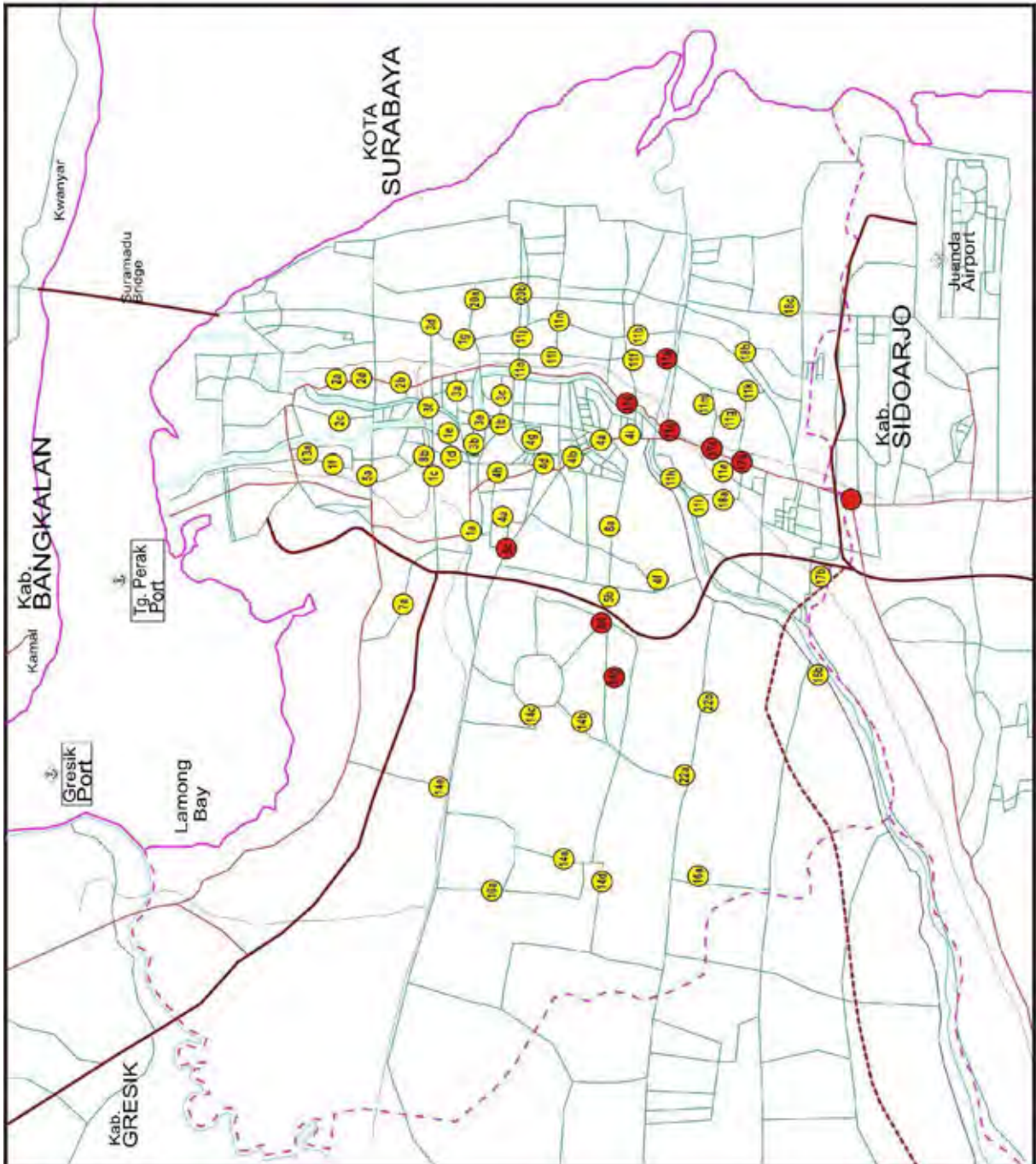


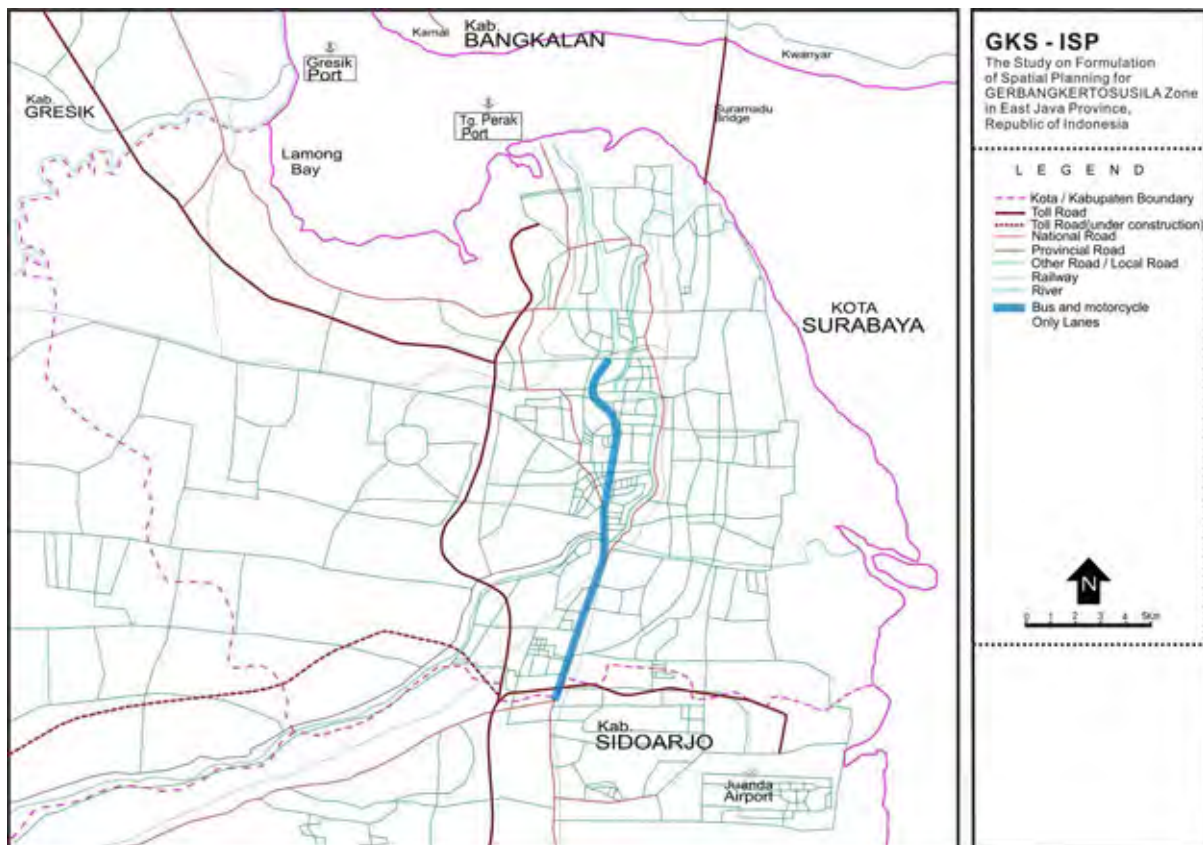
Figure 2.3.5

Planned ATCS System in Surabaya
 (Source: Dinas Purbangunan Kota Surabaya)



2.3.2 Bus Priority Lanes and Separation of Motorcycles

As a unique traffic management rule in Surabaya, on some trunk roads, left lanes are dedicated to public transportation vehicles and motorcycles, and other automobiles are prohibited to use the left lanes except when they turn left. Motorcycles are prohibited to use the right lanes except when they turn right. This traffic rule was first implemented in 2007 to promote safety driving by separating motorcycle and automobile traffic, thereby achieving a reduction in traffic accidents. While the same traffic management rule has also been adopted in Gresik, the longest continuously operated section (approximately 17 km) is in Surabaya: Jl. Jendral Achmad Yani–Jl. Wonokromo–Jl. Raya Darmo–Jl. Ul. Urip Sumoharjo–Jl. Basuki Rachmat–Jl. Embong Malang–Jl. Bubutan–Jl. Tugu Pahlawan–Jl. Kramat Gantung (refer to Figure 5.1.11). The southern section (Waru–Wonokromo) is still in the trial stage and the enforcement of this rule has not started yet.



Source: Transport Agency (Dinas Perhubungan), Kota Surabaya

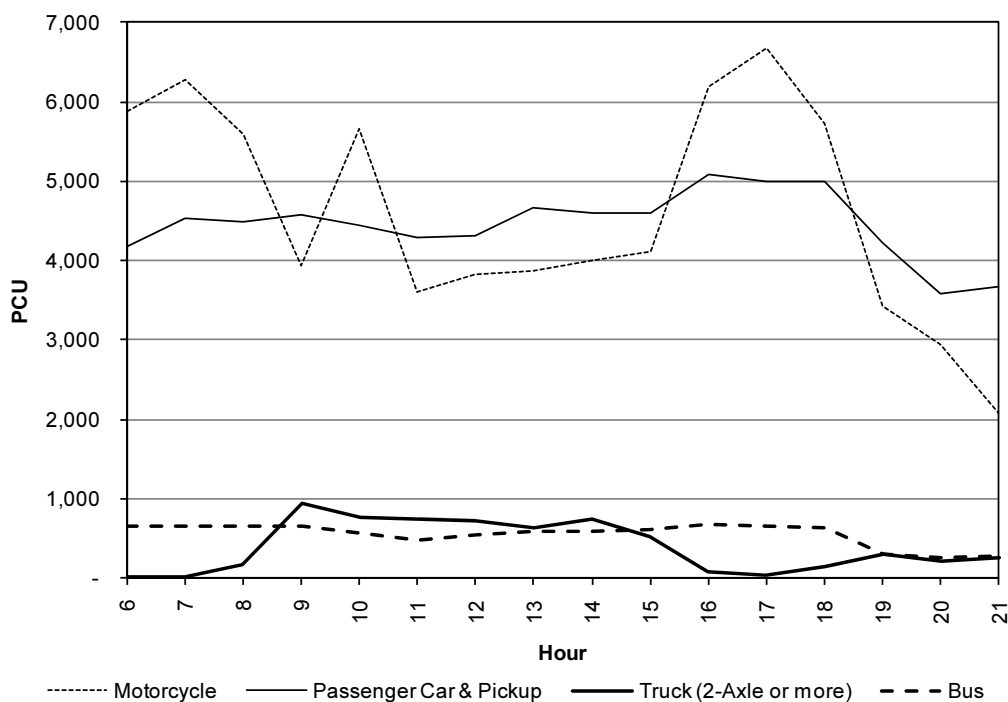
Figure 2.3.6 Bus- and Motorcycle-only Lanes

The Traffic Police in Surabaya now suggests that one more lane should be added as a bus- and motorcycle-only lane because, if only one lane is available for buses and motorcycles, there are often traffic conflicts between motorcycles and buses which make frequent stops in this lane and disrupt the traffic flow. While adding one more lane for buses and motorcycles will realize a smoother, safer traffic, it should be noted that it might in turn worsen the congestion of automobile traffic.

2.3.3 Truck Regulation

In Surabaya, two-axle or larger trucks are banned from passing two specific road corridors (i.e., Jl. Achmad Yani and Jl. Mastrip) during peak hours, that is, 6:00–9:00 and 16:00–19:00, as these roads serve as important gateways to Surabaya from the south and southwest directions, respectively. Articulated trucks, in particular, are allowed to pass these roads only in the nighttime from 22:00 to 5:00. Trucks could take toll roads that are located close to their places of origin/destination without taking the banned routes. However, trucks are mostly owner-driven, and there are many truck drivers who would rather wait until the banned hours are over and take these non-toll roads to save on transportation cost.

As a result, many trucks come into these roads after 9:00 in the morning, as shown in the example of two-way traffic volume on Jl. Achmad Yani (survey location code: TCS11) in Figure 2.3.7. Although the volume of trucks is still small compared to passenger cars or motorcycles, the influence of the trucks may be significant because they tend to block several lanes when they turn into these roads from the nearby industrial areas such as Rungkut, causing traffic congestion during the daytime off-peak hours.



Source: 2009 Traffic Survey, JICA Study Team

Figure 2.3.7 Hourly Fluctuation of Traffic by Vehicle Type on Jl. Achmad Yani (TCS11)

For container (40 ft.) trucks, roads used for transportation are limited to primary arterial roads as well as toll roads all the time (refer to section 5.1.1 for the freight traffic policy of East Java province).

2.3.4 Parking System

According to National Government Law No. 22 Year 2009, on-street parking is prohibited on all national and provincial roads. Thus, it is only allowed on kabupaten and kota roads. Public parking, including on-street parking, has a flat tariff system, namely Rp. 1,500 for automobiles and Rp. 500 for motorcycles per entry (Municipal Regulation of Kota Surabaya No. 1 Year 2009). The tariff for private parking facilities can be determined by private operators, but it is generally Rp. 2,500 for automobiles and Rp. 1,000 for motorcycles per entry in the case of a flat tariff system in Surabaya. If a progressive tariff system is applied for automobiles, it is generally Rp. 2,000 for the first two hours and Rp. 1,000 for each additional hour.

2.3.5 Pedestrian Facilities

Pedestrian overpasses generally need to be installed on wide streets that have roadside urban facilities which generate many walk trips, such as schools, stations, and large bus stops. At present, pedestrian overpasses are installed at 268 locations along major streets in Surabaya, as shown in Table 2.3.1. However, the total number of pedestrian overpasses in Surabaya's central business district (CBD) is only 25. The average interval between these pedestrian bridges on the north-south corridor of Waru-Jl. Achmad Yani-Jl. Wonokromo-Jl. Raya Darmo-Jl. Urip Sumoharjo-Jl. Basuki Rachmat-Jl. Tunjungan-Jl. Blauran-Pahlawan, for example, was observed as around 600 m. It is obvious that the number of pedestrian bridges is insufficient to ensure traffic safety and convenience of pedestrians.

Table 2.3.1 Number of Pedestrian Overpasses in Surabaya

Section	Number of Pedestrian Overpasses
Central Surabaya	25
Northern Surabaya	69
Eastern Surabaya	89
Southern Surabaya	60
Western Surabaya	25
Total	268

Source: Road Division (Bina Marga), Kota Surabaya

As for sidewalks, they are generally available on streets with many pedestrians. However, most sidewalks are not very friendly to pedestrians due to their narrow width and excessive height. Often the pavement is not well maintained and it is not safe enough to walk. Moreover, sidewalks are sometimes occupied by street vendors and are difficult to pass through. Such conditions are observed especially along the major streets in the CBD.

2.3.6 Drivers' Behavior

As with other cities in Indonesia or other Asian countries, people's driving manners in Surabaya are far from good. Some drivers do not observe traffic laws on the roads. For example, they sometimes ignore the red light, make sudden and frequent lane changes

without giving turning signals, squeeze in queues, ignore lane marks, and block intersections. Minibus (*angkot*) drivers make frequent stops anywhere to pick up and drop off passengers. Motorcycle drivers also often drive too close between vehicles without staying in one lane.

Therefore, effective traffic education programs and campaigns should be promoted to improve drivers' compliance with traffic laws and regulations. Safety driving/traffic campaign programs called "Santun Berlalulintas" (good traffic manners) have been done in many sectors of workplaces (e.g., governmental and private offices) and educational places (e.g., high schools, colleges, and boy scouts' program) as well as on the streets.

Regarding the fine for traffic violations, National Government Law No. 22 Year 2009 (Chapter 20) has reduced the charge from a range of up to Rp 6,000,000 to a range of up to Rp. 500,000 for automobiles and Rp. 250,000 for motorcycles per violation because it was too expensive.

2.4 Bus Transportation System

2.4.1 Intercity Bus Transportation

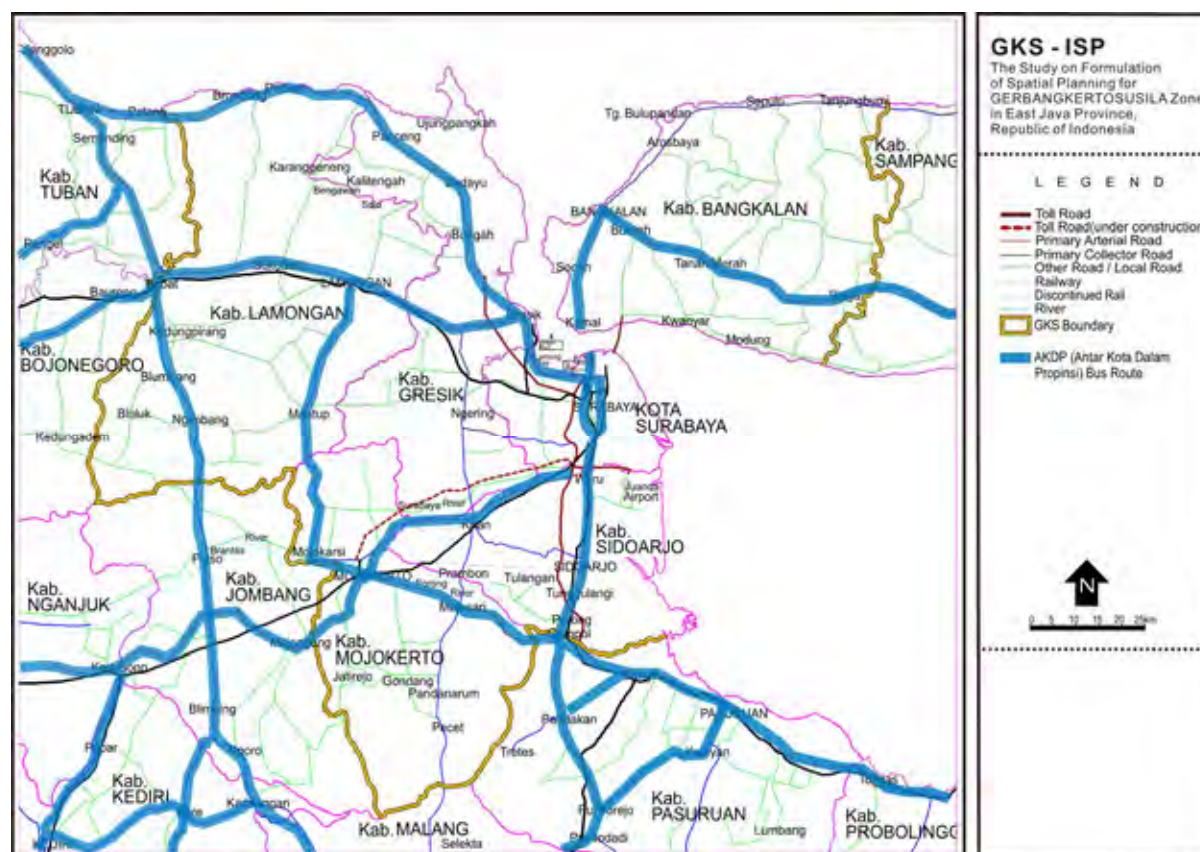
While interprovincial, inter-city (AKDP) bus services are for interprovincial travel only, intraprovincial, inter-city bus services are used for travel within the GKS or East Java province. Each kabupaten/kota has inter-city bus terminal(s) from which bus services connecting with major cities in and outside the GKS are operated. Existing inter-city bus terminals in the GKS, by type of terminal, are listed in Table 2.4.1. While Type A terminals are for both inter- and intraprovincial, inter-city bus services, Type B terminals are mainly for intraprovincial, inter-city bus services as well as local transportation services.

Table 2.4.1 Inter-city Bus Terminals in GKS

Kota/Kabupaten	Terminal Name	Type
Kota Surabaya	Purabaya (Bungur Asih)	A
	Tambak Oso Wilangun	A
	Joyoboyo	B
Kabupaten Sidoarjo	Larangan	B
Kabupaten Mojokerto Kota Mojokerto	Kertojoyo	B
Kabupaten Mojokerto	Mojosari	B
Kabupaten Lamongan	Lamongan	B
	Babat	B
Kabupaten Gresik	Bunder	B
	Sembayat	B
Kabupaten Bangkalan	Bangkalan	B
	Kamal	B

Source: Transportation Agency (Dinas Perhubungan), East Java Province

In the GKS, most intraprovincial, inter-city bus routes connect Surabaya and the surrounding cities. Both the two terminals of Type A, namely Purabaya and Tambak Oso Wilangun, are located close to the toll road, so most of the inter-city and interprovincial buses do not or will not need to go through other arterial roads. Usually, several bus companies are operating bus services on the same route, which often leads to bus conductors scrambling for passengers at bus terminals. For the operation of intraprovincial, inter-city bus services, routes must be approved by the provincial traffic and road transportation agency (DLLAJ). Roads to be used for intraprovincial, inter-city bus services in the GKS are national and provincial roads, as presented in Figure 2.4.1.



Source: Dinas Perhubungan, East Java Province

Figure 2.4.1 Intraprovincial, Inter-city Bus Route Network in GKS

The number of large and medium intraprovincial, inter-city buses that operate daily in four major directions from the two main bus terminals in Surabaya was counted based on the departure data obtained at the terminals (see Table 2.4.2). Every day, there were about 4,000 AKDP bus services, most of which were bound for destinations outside GKS (and within East Java province). While two major directions, Surabaya–Malang and Surabaya–Pasuruan, overlap in Kabupaten Sidoarjo, the direction from Surabaya to Mojokerto and westward has the greatest number of inter-city bus services.

Table 2.4.2 Number of Daily Intraprovincial, Inter-city Bus Services from Surabaya

Bus Terminal	Gresik/ Lamongan	Mojokerto	Sidoarjo/ Malang	Sidoarjo/ Pasuruan	All Directions
Purabaya	282	1,414	897	873	3,466
Oso Wilangun	465	0	36	25	526
Total	747	1,414	933	898	3,992

Source: Transportation Agency (Dinas Perhubungan), East Java Province
 Note: Data do not include small buses (MPU).

The volume of arriving and departing passengers by terminal is shown in Table 2.4.3. Among Type A bus terminals, Purabaya Terminal in Surabaya had by far the largest number of passengers. As for Type B terminals, Joyoboyo Terminal in Surabaya and Kertojoyo Terminal in Mojokerto had relatively large passenger volumes.

Table 2.4.3 Annual Bus Passenger Volumes of Major Terminals in GKS

(Unit: 1,000 passengers/year)

Terminal	2003		2004		2005		2006		2007	
	Arr.	Dep.	Arr.	Dep.	Arr.	Dep.	Arr.	Dep.	Arr.	Dep.
Purabaya	23,771	24,548	21,451	23,354	15,864	21,290	11,506	9,664	6,478	14,602
Oso Wilangun	4,799	4,981	5,006	5,376	4,181	4,671	3,628	4,730	2,562	3,169
Joyoboyo			5,931	12,248	6,071	12,474	10,302	16,474	10,223	17,039
Bratang	2,783	6,657	2,888	6,792	1,051	2,968	2,213	2,574	1,405	2,433
Larangan					2,255	2,742	2,100	2,651	2,001	2,601
Kertojoyo	30,224	30,796	30,317	30,890	3,182	3,140	2,022	1,981	21,167	23,659
Lamongan	4,595	4,499	1,421	1,456	2,584	1,437	808	780	179	184
Babat	4,919	4,912	1,451	1,449	1,483	1,478	806	772	1,168	1,934
Bunder									6,348	6,348
Bangkalan							3,296	3,191	3,405	3,191

Source: Transportation Agency (Dinas Perhubungan) of each kota/kabupaten.

2.4.2 Intracity Bus Transportation

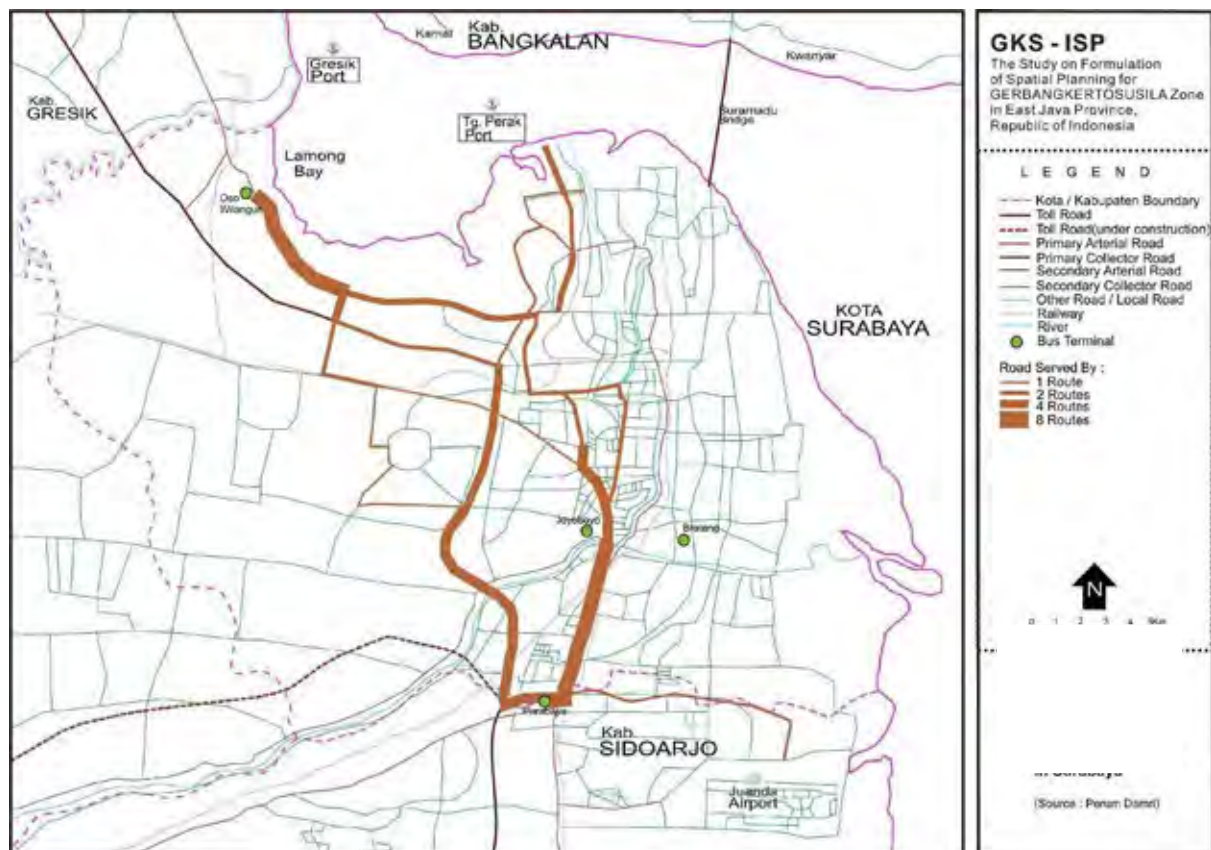
As shown in Table 2.4.3, in Kota Surabaya there is one more bus terminal, Bratang, which is categorized as Type C (for local transportation services). In addition, there are five subterminals in Surabaya: Menanggal, Benowo, Petekan, Manukan Kulon, and Darmo Permai. Furthermore, there are eight city minibus (angkot) stations in Surabaya which are managed by the local government.

As of 2007, there were 22 city bus routes in Surabaya, i.e., 11 local, six non-air-conditioned (AC) express, and five AC express routes, served by 426 conventional buses (including the reserves) with a capacity of 50 persons each. PT. Damri, which is a public corporation, is the largest operator of these city bus routes, and its major bus routes are listed in Table 2.4.4 along with the passenger volumes. Roads that are served by conventional buses are also presented by the number of routes in Figure 2.4.2. The greatest number of passengers is observed in the express (Patas) bus routes connecting Purabaya–Darmo–Indrapura–Perak, namely, P1 (non-AC) and PAC1 (AC). The express bus route connecting Purabaya and Perak via the toll road (P4) also has a high passenger volume. It should also be noted that the roads served by conventional large buses are limited. This may be due in part to the lack of arterial roads that are suitable for the operation of large buses. Insufficient coverage of conventional services seems to be the problem in Surabaya.

Table 2.4.4 Damri City Bus Routes and Annual Passenger Volumes in Kota Surabaya

Line	Route	Passenger Volume
E	Purabaya–Darmo–Tambak Oso Wilangun	196,957
E1	Purabaya–Joyoboyo	290,303
P1	Purabaya–Darmo–Indrapura–Perak/ Patas	2,584,762
P2	Purabaya–Darmo–Indrapura–Tambak Oso Wilangun	261,800
P3	Sidoarjo–Tol Larangan, Dupak–Rajawali–Semut/ Patas	536,424
P4	Purabaya–Tol Waru, Dupak, Perak/ Patas	1,139,450
P5	Purabaya–Tol Waru, Dupak–Rajawali–Semut/ Patas	154,652
P7	Purabaya–Tol Mayjen Sungkono, Dupak –T O Wilangun/ Patas	8,552
P8	Purabaya–Tol Waru, Dupak–Tambak Oso Wilangun/ Patas	769,716
JND	Juanda–Darmo–Indrapura–Perak/ Patas AC	529,764
PAC1	Purabaya –Darmo–Indrapura–Perak/ Patas AC	1,882,425
PAC4	Purabaya–Tol Waru, Dupak–Perak/ Patas AC	13,732
Total		8,368,537

Source: Public Bus Company Damri (Perum Damri)



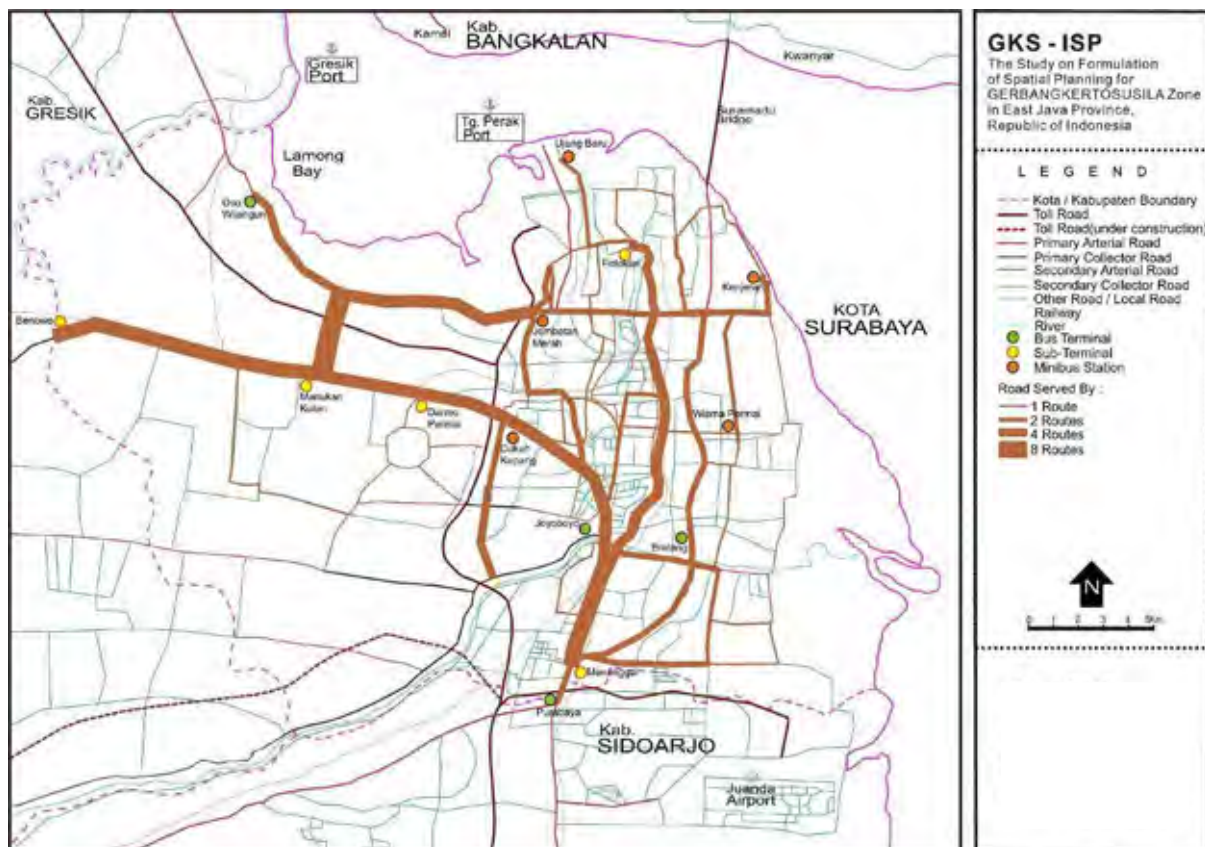
Source: Public Bus Company Damri (Perum Damri)

Figure 2.4.2 Roads in Surabaya Served by Conventional Buses

Meanwhile, there are 58 city minibus (*angkot*) service routes served by 5,258 minibuses with a capacity of 12 persons each, as listed in Table 2.4.5. Roads that are served by city minibuses are presented by the number of routes in Figure 2.4.3. Although *angkot* services more densely cover the roads in Surabaya compared to conventional bus services, many *angkot* routes run in limited arterial or collector roads from/to the CBD having similar route structures with the same corridor. This results in an excessive number of similar bus routes operated in the central area.

The fare on the city minibus is Rp. 2,600 per person with additional Rp. 100 charged for every kilometer exceeding 15 km. City minibuses are owned by individuals, and drivers pay the vehicle owner a rental fee of Rp. 60,000 to Rp. 70,000 per day. Since passenger demand is not so high, competition among the minibus drivers is severe. In fact, only around 60% of the minibuses are currently in operation.

Furthermore, as in the case of conventional bus services, the existing bus service structure which concentrates in the city center makes it difficult to travel from one part of Surabaya to another part outside the CBD with just one bus ride. With regard to this issue, the existing bus route structure should be further examined in light of the passenger OD patterns.



Source: Transportation Agency (Dinas Perhubungan), Kota Surabaya

Figure 2.4.3 Roads in Surabaya Served by City Minibuses

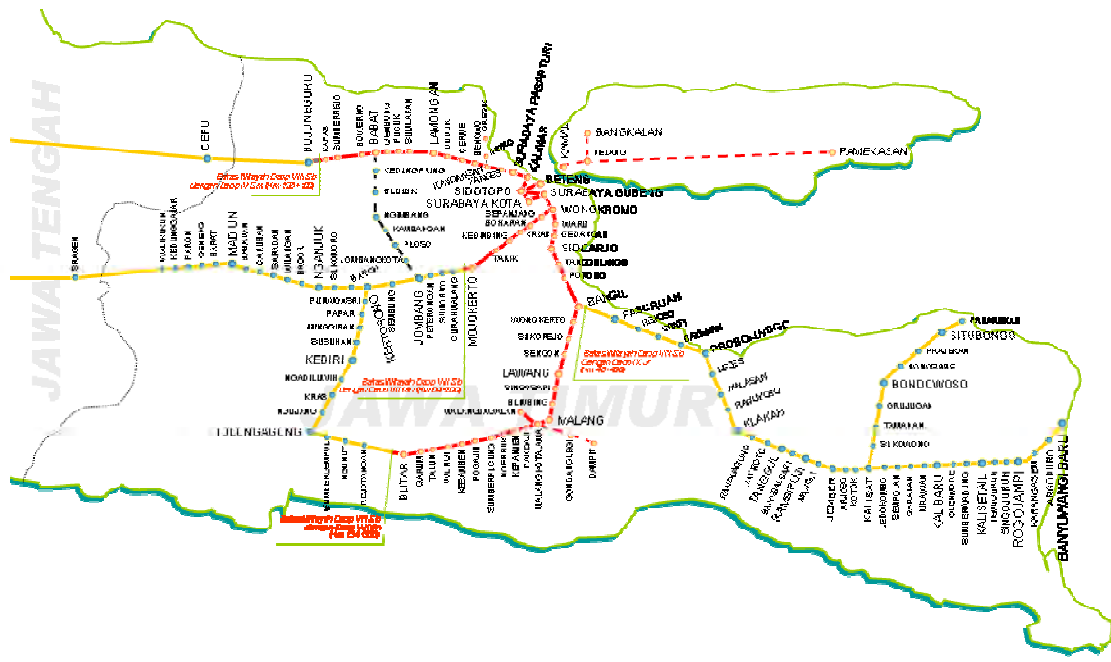
Table 2.4.5 City Minibus Routes and Number of Vehicles in Kota Surabaya

No	Line	Route	Fleet	No	Line	Route	Fleet
1	C	Pasar Loak–Sedayu–Karang Menjangan PP	107	30	J	Joyoboyo–Kalianak PP	100
2	D	Joyoboyo–Pasar Turi–Sidorame PP	150	31	BK	Bangkingan–Karang Pilang PP	15
3	E	Petojo–Tanjungsari–Balongsari PP	100	32	DA	Kalimas Barat–Citra Raya PP	106
4	F	Joyoboyo–Pegirian–Endroso PP	139	33	JTK	Joyoboyo–Tambak Klangri PP	75
5	G	Joyoboyo–Kr Menjangan/L Santri/K Pilang PP	308	34	JTK2	Joyoboyo–Medokan Ayu PP	52
6	H2	Pasar Wonokromo–Pagesangan PP	45	35	R1	Kalimas Barat Nambangan–Kenjeran PP	50
7	H2P	Pasar Wonokromo–Terminal Menanggal PP	53	36	WLD	Wonoarum–Pasar Loak–Dukuh Kupang PP	100
8	I	Kupang–Benowo PP	109	37	WLD2	Bulak Banteng–Dukuh Kupang PP	50
9	K	Ujung Baru–Kalimas Barat/ Pasar Loak PP	88	38	RT	Rungkut–Pasar Turi PP	75
10	L2	Ujung Baru–Sasak–Petojo PP	60	39	LMJ	Lakarsantri–Manukan Kulon–Kalimas Barat PP	109
11	M	Joyoboyo–Dinoyo–Kayun–Kalimas Barat PP	139	40	BM	Bratang–Perumnas Menanggal PP	41
12	N	Kalimas Barat–Menur–Bratang PP	107	41	JBMN	Joyoboyo–Gunung Anyar PP	78
13	O	Tambak Wedi–Petojo–Keputih PP	50	42	LK	Manukan Kulon–Pasar Loak–Kenjeran PP	100
14	O1	Kalimas Barat–Keputih PP	134	43	GL	Pasar Loak–Gadung PP	50
15	O2 (WK)	Tambak Oso Wilangun (Depan SPBU) –Petojo PP/Keputih–PP	100	44	JK	Joyoboyo–Kalijudan– Kenjeran PP	60
16	P	Joyoboyo–Gebang Putih–Kenjeran/ Petojo–Ketintang/ Joyoboyo–Karang Menjangan–Kenjeran PP	163	45	IM	Benowo–Simokerto PP	87
17	Q	Kalimas Barat –Bratang PP	113	46	WB	Wonosari–Bratang PP	75
18	R	Kalimas Barat –Kapas –Kenjeran PP	81	47	DKM	Dukuh Kupang–Menanggal PP	51
19	S	Joyoboyo –Bratang –Kenjeran PP	85	48	DKB	Dukuh Kupang–Benowo PP	27
20	T1	Margorejo–Joyoboyo–Sawah –Pasar Loak PP	81	49	BJ	Benowo–Kalimas Barat PP	156
21	T2	Joyoboyo–Mulyosari–Kenjeran PP	82	50	RDK	Dukuh Kupang–Benowo PP	100
22	U	Joyoboyo–Rungkut–Wonorejo/ Joyobekti PP	115	51	UBB	Ujung Baru–Bratang PP	43
23	V	Joyoboyo–Tambakrejo PP	114	52	UBK	Ujung Baru–Kenjeran PP	71
24	W	Dukuh Kupang–Kapas Krampung–Kenjeran PP	119	53	JMK	Kenjeran–Kalimas Barat PP	70
25	Y	Joyoboyo–Demak PP	127	54	KIP1	Kutisari Indah–Petojo PP (Lewat Tengah) PP	51
26	Z	Kalimas Barat–Benowo PP	107	55	KIP2	Kutisari Indah–Petojo PP (Lewat Timu) PP	50
27	TV	Joyoboyo–Citra Raya/ Manukan Kulon/ Banjar Sugihan PP	177	56	GS	Gunung Anyar–Sidorame PP	63
28	DP	Kalimas Barat/ Petekan–Manukan Kulon PP	99	57	KBK	Rungkut–Barata–Kenjeran PP	57
29	Z1	Benowo–Ujung Baru PP	112	58	DWM	Balongsari–Pangkalan Karah PP	28
Total							5258

Source: Transportation Agency (Dinas Perhubungan) of Kota Surabaya

2.5 Railway Transportation System

The railway network within East Java province is presented in Figure 2.5.1. For railway operation, the province is divided into three railway management bureaus (DAOP or Daerah Operasi) which are under the control of PT. Kereta Api (Persero). Railways in the GKS are all operated by DAOP VIII. As of 2009, about 316 km of railway are currently in service and managed by DAOP VIII (see Table 2.5.1).



Source: PT. Kereta Api (Persero)

Figure 2.5.1 Railway Network in East Java Province

Table 2.5.1 Railway Track Length in GKS

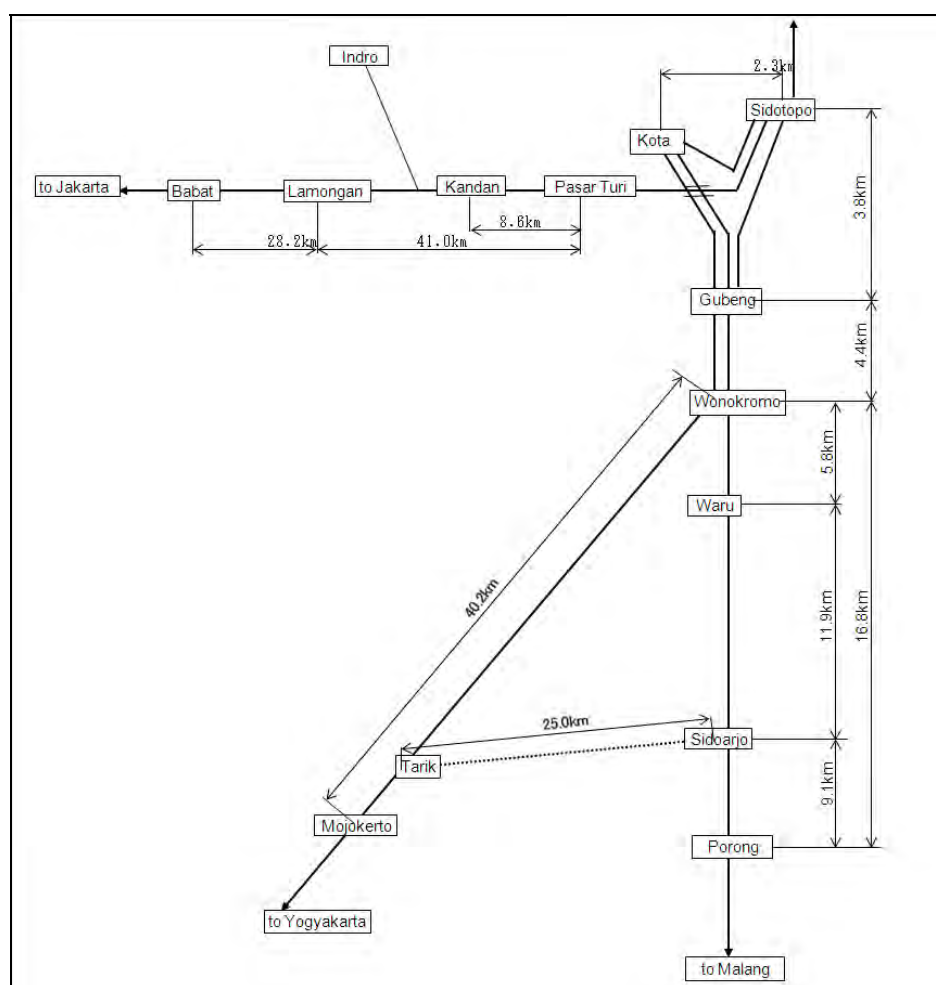
Route in Service	Length (km)
Surabaya Pasar Turi–Lamongan–Bojonegoro	104.80
Surabaya Kota–Mojokerto	47.76
Wonokromo–Sidoarjo–Blitar	163.21
Total Track Length in Service	316

Source: PT. Kereta Api (Persero), DAOP VIII

As indicated in the map, the railway network under DAOP VIII comprises part of the northern Java trunk line (Surabaya–Lamongan–Babat–Bojonegoro), part of the southern Java trunk line (Surabaya–Mojokerto), the line extending south to Malang (Surabaya–Sidoarjo–Bangil–Malang–Blitar), as well as branch lines (Surabaya–Gresik, Surabaya–Kalimas) that are used only for freight transportation and a branch line (Surabaya–Sidotopo) that is used for locomotive maintenance at Sidotopo depot and for freight transportation. In addition, there are some railway lines that have discontinued their service, including those on Madura Island.

2.5.1 Terminal Station

Railway alignment is depicted in Figure 2.5.2. Each railway trunk line terminates at different stations in Surabaya. The northern Java trunk line terminates at Pasar Turi station, while the southern Java trunk line and its southern extension line to Malang terminates at Gubeng or Surabaya Kota station. It means that though Gubeng and Kota Surabaya stations are on the same line, the northern and southern railway lines are not continuous in Surabaya. Passenger trains are not operated at Sidotopo station. Therefore, no direct passenger services are available connecting these stations, that is, connecting the western and southern/southwestern service areas.



Source: JICA Study Team

Figure 2.5.2 Railway Alignment in GKS

2.5.2 Current Railway Status and Problems

The estimated 152-km railway network in the Surabaya metropolitan area (SMA) is mostly single track except for an 8-km double-track section between Kota Surabaya and Wonokromo stations. This means that railway services are limited in terms of travel time

and frequency and do not reflect the character of a mass transportation. Since there are few train stations where two trains can pass or cross, it makes the situation even worse, causing extra route times. Moreover, the current state of track conditions and the existence of many grade crossings and intrusions into the right of way (ROW) make train operation slow, weak, and unsafe.

The rolling stock is deteriorating. Due to the aged engines and maintenance equipment, the operating speed is less than the maximum potential speed. The number of operable trains is also limited. Conditions in the stations aggravate the problem. All pedestrian crossings are at grade, the height of platforms is not adequate to give passengers accessibility to the trains, and the length of platforms is less than the length of the trains.

The lack of linkage between bus and railway services is causing inconvenience for users and residents who wish for good quality door-to-door transportation services. Besides, there is no common tariff system for railway and other modes of transportation. Thus, the present railway network in SMA is not attractive, and it is not yet an effective means to relieve the traffic congestion in Surabaya.

2.5.3 Current Operation in GKS

Train operation frequencies in GKS are shown in Table 2.5.2 (Surabaya–Lamongan), Table 2.5.3 (Surabaya–Mojokerto), Table 2.5.4 (Surabaya–Sidoarjo), and Table 2.5.5 (branch lines).

Table 2.5.2 Number of Train Services Operated between Surabaya and Lamongan

Total	Freight Train	Passenger train	Station		Passenger train	Freight Train	Total	Grand Total
11	3	8		Babat	8	3	11	22
11	3	8		Cupuk	8	3	11	22
13	3	10	↓	Lamongan	↑	10	3	26
13	3	10		Duduk		10	3	26
13	3	10		Cerme		10	3	26
13	3	10		Benomo		10	3	26
13	3	10		Kandangan		10	3	26
13	3	10		Tandes		10	3	26
13	3	10		Pasar Turi		10	3	26
5	5	0		Kalimas	0	5	5	10

Source: JICA Study Team (based on train diagrams)

Table 2.5.3 Number of Train Services Operated between Surabaya and Mojokerto

Grand Total	Total	Freight Train	Passenger Train	Station		Passenger Train	Freight Train	Total	
24	12	3	9		Kota	9	3	12	
36	18	3	15		Gubeng	15	3	18	
36	18	3	15	↓	Ngagel	↑	15	3	18
36	18	3	15		Wonokromo		15	3	18
36	18	3	15		Sepanjang		15	3	18
36	18	3	15		Boharen		15	3	18
36	18	3	15		Krian		15	3	18
36	18	3	15		Kedingding		15	3	18
36	18	3	15		Tarik		15	3	18
36	18	3	15		Mojokerto		15	3	18

Source: JICA Study Team (based on train diagrams)

Table 2.5.4 Number of Train Services Operated between Surabaya and Sidoarjo

Total	Freight Train	Passenger Train	Station		Passenger Train	Freight Train	Total	Grand Total	Grand Total 2	
21	4	17		Kota	17	4	21	42	66	
24	4	20		Gubeng	20	4	24	48	84	
24	4	20	↓	Ngagel	↑	20	4	24	84	
24	4	20		Wonokromo		20	4	24	48	84
24	4	20		Waru		20	4	24	48	
24	4	20		Gedangan		20	4	24	48	
24	4	20		Sidoarjo		20	4	24	48	
22	4	18		Porong		18	4	4	26	

Source: JICA Study Team (based on train diagrams)

Table 2.5.5 Number of Train Services Operated on Branch Lines

Freight Train+DL	Passenger Train	Station		Passenger Train	Freight Train+DL	Total
10	0	↓	Sidotopo Depot Gubeng	↑	0 8	18
2	0	↑	Indro Kandangan	↓	0 2	4
13	0	↑	Benteng	↓	0	13
32	0		Sidotopo Depot Kota		0	32

Source: JICA Study Team (based on train diagrams)

On the northern trunk line between Babat and Pasar Turi stations, there are eight to 10 passenger train services and three freight train services per direction per day. On the southern trunk line between Mojokerto and Kota Surabaya stations, there are 15 passenger train services and three freight train services per direction per day. The Malang Line between Porong and Kota Surabaya stations has more train services: 20 passenger train services (including seven commuter train services) and four freight services per direction per day.

As for branch lines, there are only two freight train services between Indro (Gresik) and Kandangan stations. Sidotopo station is currently used as a depot for diesel locomotive maintenance and as a yard for commuter trains and freight trains; it is not used for passenger service.

The average operation speed is estimated by train service type from the train diagrams of PT. KA, as shown in Table 2.5.6. Due to the aforementioned problems, current travel times of commuter trains are very long; it takes 41 minutes to more than one hour for SULAM to travel 41 km between Pasar Turi and Lamongan stations, and it takes more than one hour for SUSI to travel 31 km between Gubeng and Porong stations with the current commuter train.

Table 2.5.6 Average Train Operating Speeds by Service Type
 (Unit: km/h)

Train Service Type	Average Speed
Long-distance Express	60
Local Express	45
Local	35
Commuter	25

Source: JICA Study Team (based on train diagrams)

2.5.4 Route Alignment

Whole route alignment plans and profiles are available from PT. KA. Route information, such as position of stations, distance between stations, current state of the tracks and stations, and ROW, are presented in Table 2.5.7 (Lamongan–Surabaya–Sidoarjo), Table 2.5.8 (Surabaya–Mojokerto), and Table 2.5.9 (branch lines). The average ROW width for railway is estimated to be about 20 m. ROWs at stations vary from 300 m to 1,100 m in length and from 30 m to 200 m in width.

A few stations have a station plaza between the station building and the access road. However, most stations are neither connected with enough wide-access roads nor linked with feeder transportation modes such as buses and minibuses.

Table 2.5.7 Current State of Railway and Stations on the Lamongan–Sidoarjo Line

I	Name	Position (km)	Distance (km)	Existing State	Right of Way
	Babat	160.373		single track + 5 sidings	
			11.318	single track	20m width
	Cupuk	171.691		single track +2 sidings	
			16.883	single track	20m width
1	Lamongan	188.574		single track + 2 sidings	500*84m square
			12.223	single track	20m
2	Duduk	200.797		single track + one siding	400x30m
			9.767	single track	20m
3	Cerme	210.564		single track + one siding	300x70~90m
			5.246	single track	16m
4	Benowo	215.81		single track + one siding	500x20m
			5.13	single track	20m
5	Kandangan	220.94		double track + one siding	500X30~40
			3.288	single track	18m
6	Tandes	224.228			
			5.345	single track	16m
7	Pasar Turi	229.573		terminal station	700x200m square
8	Kota	231.206		terminal station	700x100~150m square
		0.299			
			3.176	double track	20m width
9	Gubeng	3.475		double track + 4 sidings	800x110m square
				double track	
10	Ngagel		4.406	double track	20m
				double track	
11	Wonokromo	7.881		double track + 3 sidings	600x70m
			5.771	single track	20m
12	Waru	13.652		single track + one siding	400x30m
			4.028	single track	14.5~11.3m
13	Gedangan	17.68		single track + one siding	500x25m
			7.83	single track	16.5m
14	Sidoarjo	25.51		single track + 3 sidings	300x90m
			9.141	single track	20m
15	Porong	34.651		single track + 2 sidings	360.110m

Source: JICA Study Team (based on route alignment plans and profiles)

Table 2.5.8 Current State of Railway and Stations on the Surabaya–Mojokerto Line

II	Name	Position (km)	Distance (km)	Existing State	Right of Way
11	Wonokromo	17.361			
			6.806	single track	16.5m width
18	Sepanjang	24.167		single track + 3 sidings	500x75m square
			9.698	single track	16.5m
19	Boharen	33.865		single track +2 sidings	400^700x70m
			4.465	single track	20m
20	Krian	38.33		single track + 2 sidings	300x110m
			4.728	single track	20m
21	Kedingding	43.058		single track + 2 sidings	500x55m
			4.599	single track	20m
22	Tarik	47.657		single track + 3 sidings	450x90
			9.701	single track	27m
23	Mojokerto	57.358		single track + 2 sidings	500x140m

Source: JICA Study Team (based on route alignment plans and profiles)

Table 2.5.9 Current State of Railway and Stations on Branch Lines

III	Name	Position (km)	Distance (km)	Existing State	Right of Way
16	Sidotopo	0			1100x115~200m
			2.339	Single track	25m
8	Kota	2.339			
IV	Name	Position	Distance	Existing State	Right of Way
16	Sidotopo	0			1100x115~200m
			3.78		20m
9	Gubeng	3.78			
V	Name	Position	Distance	Existing State	Right of Way
14	Sidoarjo	25.51			
			7.554	under reconstruction	18m width
24	Tulangan	33.064		under reconstruction	300x70m square
			9.569	under reconstruction	18m
25	Prambon	42.633		under reconstruction	400x78m
				under reconstruction	18m
22	Tarik				
VI	Name	Position	Distance	Existing State	Right of Way
5	Kandagan	0			
			9.719	single track	17m
26	Indro	9.719		single track + 2 sidings	400x30m
			2.906	demolished	17m
27	Gresik	12.625		demolished	400x60m

Source: JICA Study Team (based on route alignment plans and profiles)

2.5.5 Railway Line Capacity

Table 2.5.10 shows the line capacity and actual number of operating trains. The number of trains in operation is more than 70% of the line capacity on all the lines, even though the capacity is derived based on conservative assumptions except for the double-track line between Wonokromo and Kota Surabaya stations. Therefore, it can be concluded that the train operation in the GKS is nearly reaching the maximum line capacity. However, the capacity can be increased by improving train operating systems such as tracks, signaling/telecommunication, rolling stocks, structures, and grade crossings.

Table 2.5.10 Railway Line Capacity in 2008

(Unit: trains/both directions)

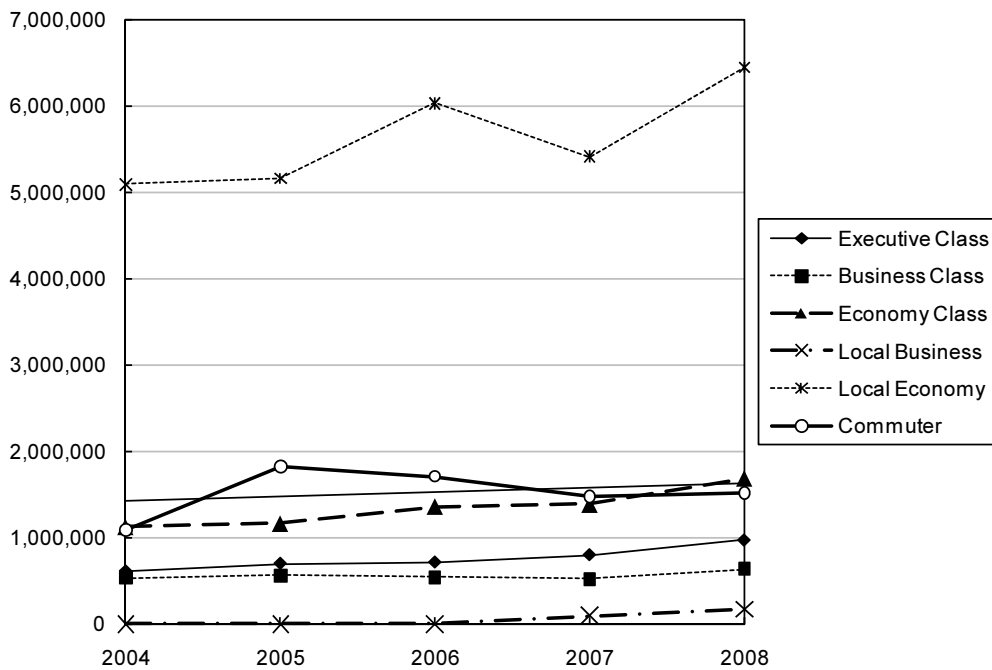
Line	Capacity	No. of Trains	Allowance
Northern Trunk Line (Babat–Pasar Turi)	37	26	11
Southern Trunk Line (Mojokerto–Wonokromo)	44	36	8
Malang line (Porong–Wonokromo)	53	48	5
South trunk line (Wonokromo–Kota)	200	84	116

Source: JICA Study Team

Note: Capacity was derived based on the assumption of a commercial operating speed of 35 km/h.

2.5.6 Passenger Volume

The trend in the growth of annual total volume of passengers by train service type based on ticket sales data from DAOP VIII is presented in Figure 2.5.3. While a slight decrease in ridership was observed in some years, the latest trend is generally an upward growth. However, the recent trend in the number of commuters including SUSI (Surabaya–Sidoarjo–Porong) and SULAM (Surabaya–Lamongan) is stagnant or even slightly decreasing in spite of the fact that there are additional passengers for SULAM, which started the service in February 2006.



Source: PT. KERETA API (Persero), DAOP VIII
 Note: Local economy trains exclude commuter trains.

Figure 2.5.3 Annual Railway Passengers in the GKS by Service Type

The number of boarding passengers at major stations in the GKS is presented in Table 2.5.11. Stations in Surabaya, which are served by most types of trains, have a very large number of passengers compared to other stations. At suburban main stations, such as Sidoarjo, Mojokerto, Lamongan, and Babat, relatively high passenger volumes are observed. Stations on the Waru–Sidoarjo–Prong corridor, which is served by SUSI commuter railway service, have high passenger volumes as well. The recent trend of passenger volumes at main stations is generally upward.

Table 2.5.11 Number of Boarding Passengers at Major Stations in GKS

(Unit: pax/year)

	Station	Code	2004	2005	2006	2007	2008	Daily Average (2008)
Surabaya – Sidoarjo	1	Bangil	647,252	222,437	316,526	293,356	350,303	960
	2	Porong		210,713	278,457	210,132	225,119	617
	3	Tanggulangin		156,809	208,369	140,342	137,223	376
	4	Sidoarjo		743,124	621,877	550,962	612,948	1,679
	5	Gedangan		217,055	182,240	155,155	175,733	481
	6	Waru		70,731	83,277	74,758	81,764	224
Sub total				1,620,869	1,690,746	1,424,705	1,583,090	4,337
Surabaya – Mojokerto	7	Sepanjang		92,248	107,287	103,423	121,709	333
	8	Boharan		2,277	2,073	2,519	3,618	10
	9	Krian		41,136	52,555	58,801	67,870	186
	10	Kedinding		7,387	9,020	8,771	9,268	25
	11	Tarik		32,172	38,219	36,281	38,580	106
	12	Mojokerto		180,576	211,195	218,469	256,857	704
Sub total				355,796	420,349	428,264	497,902	1,364
Surabaya	13	Wonokromo	675,879	860,375	933,321	824,170	947,543	2,596
	14	Surabaya Gubeng	1,394,546	1,661,922	1,736,863	1,642,208	1,887,753	5,172
	15	Surabaya Kota	728,099	879,920	967,826	910,192	1,059,488	2,903
	16	Surabaya Pasar Turi	969,453	1,045,480	1,087,050	1,303,647	1,202,502	3,295
Sub total			3,767,977	4,447,697	4,725,060	4,680,217	5,097,286	13,965
Surabaya – Lamongan	17	Babat		250,718	247,190	223,388	212,879	583
	18	Gembong		50,917	53,709	50,626	52,993	145
	19	Pucuk		57,228	53,686	50,596	68,755	188
	20	Sumlaran		77,029	77,241	70,714	68,504	188
	21	Lamongan		83,507	214,295	232,425	247,341	678
	22	Duduk		24,283	32,053	30,914	33,255	91
	23	Cerme		26,926	27,154	26,243	41,400	113
	24	Benowo		52,357	53,917	45,510	49,977	137
	25	Kandangan		48,863	49,446	49,261	49,668	136
	26	Tandes		106,740	121,180	119,579	118,582	325
Sub total				778,568	929,871	899,256	943,354	2,585
Total in GKS				6,531,102	6,957,335	6,652,765	7,296,860	19,991
Total in DAOP VIII				9,412,739	10,359,607	9,697,037	11,425,221	31,302

Source: PT.Kereta Api (Persero), DAOP VIII

The number of boarding passengers of the SUSI and SULAM commuter trains is presented along with the daily average number of passengers in Table 2.5.12 (SUSI, northbound), Table 2.5.13 (SUSI southbound), and Table 2.5.14 (SULAM, both directions). In terms of passenger volume, SUSI commuter trains, which provide seven round-trip services per day, have a greater passenger volume (i.e., approximately 3,300 passengers per day) than that of SULAM commuter trains (i.e., approximately 900 passengers per day), which provide only two round trips per day. However, the passenger volume of SUSI commuter trains is slightly decreasing, whereas the ridership of the newer SULAM commuter is relatively upward.

Table 2.5.12 Number of Boarding Passengers on Northbound SUSI Commuter Trains by Station

(Unit: pax/year)

Station	2004		2005		2006		2007		2008	
	Total	pax /day	Total	pax /day	Total	pax /day	Total	pax /day	Total	pax /day
Porong	18,159	56	137,844	378	173,408	475	151,598	415	139,066	381
Tanggulangin	9,631	30	114,130	313	99,209	272	101,294	277	84,913	233
Sidotopo	265,033	818	287,922	789	173,185	475	167,648	459	166,373	456
Papenwojo	77,007	238	102,013	279	56,733	156	54,919	150	52,619	144
Buduran	64,270	198	77,756	213	44,789	122	43,357	119	44,545	122
Banjar Kemantren	2,965	9	27,724	76	23,888	66	23,125	63	23,360	64
Gedangan	44,945	138	65,422	179	37,809	104	32,842	90	44,735	123
Sawotratap	48,378	149	59,686	164	33,527	92	29,124	80	23,884	65
Waru	18,195	56	19,040	52	12,963	35	9,500	26	11,578	32
Kerto Menanggal	632	2	5,426	15	3,446	9	2,526	8	3,283	9
Jemursari	8,189	25	6,864	19	7,123	19	1,132	3	3,964	11
Margorejo	2,223	7	17,445	48	18,234	50	2,989	9	5,725	16
Wonokromo	1,815	6	2,934	8	3,133	8	499	1	1,417	4
Ngagel	-	-	48	0	-	-	-	-	-	-
Surabaya Gubeng	-	-	-	-	-	-	-	-	-	-
Surabaya Kota	-	-	-	-	-	-	-	-	-	-
Total	561,442	1,732	924,254	2,533	687,447	1,883	620,553	1,700	605,462	1,660

Source: PT.Kereta Api (Persero), DAOP VIII

Table 2.5.13 Number of Boarding Passengers on Southbound SUSI Commuter Trains by Station

Station	2004		2005		2006		2007		2008	
	Total	pax /day	Total	pax /day	Total	pax /day	Total	pax /day	Total	pax /day
Surabaya Kota	183,364	566	241,772	662	194,278	532	139,900	383	160,850	441
Surabaya Gubeng	230,073	710	353,988	970	267,055	732	208,469	572	223,525	612
Ngagel	-	-	39,245	83	26,412	72	20,618	56	20,871	57
Wonokromo	61,367	189	120,403	330	98,126	268	88,016	241	89,096	244
Margorejo	9,449	29	78,516	215	46,568	128	41,770	114	31,587	87
Jemursari	23,503	73	24,324	67	21,622	59	19,395	54	16,848	46
Kerto Menanggal	869	3	8,082	22	8,546	24	6,329	18	5,352	15
Waru	9,725	30	14,016	38	17,352	48	12,849	35	11,596	32
Sawotratap	7,402	23	9,459	26	19,361	53	9,471	26	6,998	19
Gedangan	2,332	7	4,653	13	10,890	30	5,328	14	11,243	31
Banjar Kemantren	140	0	1,029	3	6,332	17	1,438	4	2,944	8
Buduran	481	1	480	1	3,072	9	704	2	2,104	6
Papenwojo	363	1	416	1	3,006	8	674	2	1,365	4
Sidotopo	1,101	3	1,723	5	12,917	35	2,928	8	4,174	11
Tanggulangin	-	-	-	-	24,560	67	3,075	8	-	-
Porong	-	-	-	-	-	-	-	-	-	-
Total	530,169	1,635	898,106	2,436	760,097	2,082	560,964	1,537	588,553	1,613

Source: PT.Kereta Api (Persero), DAOP VIII

Table 2.5.14 Number of Boarding Passengers of SULAM Commuter Trains by Station

Station	2006		2007		2008	
	Total	pax/day	Total	pax/day	Total	pax/day
Surabaya Pasarturi	69,970	219	78,281	215	83,758	229
Tandes	23,466	73	27,238	75	33,828	95
Kandangan	7,293	23	7,273	20	7,535	21
Benowo	6,078	19	5,467	15	6,037	17
Cerme	7,599	24	9,852	27	10,198	28
Duduk	11,676	36	13,104	36	13,592	37
Lamongan	135,687	424	149,202	409	169,136	463
Total	261,769	818	290,417	797	324,084	890

Source: PT.Kereta Api (Persero), DAOP VIII

Note: SULAM started its operations on 16 February 2006.

2.6 Freight Distribution

2.6.1 Freight Volume Transported by Trucks

A Weighbridge Survey on freight volume was conducted from July to August 2009 at eight weighbridge stations within the GKS and its surrounding area. Weighbridges are located on major roads along kabupaten boundaries to identify overloaded trucks. Table 2.6.1 shows the estimated freight volumes by commodity transported by trucks from/to GKS. Freight volumes were estimated by utilizing the results of the weighbridge survey and by expanding the data from the sampled trucks.

Table 2.6.1 Freight Volume around the GKS Zone by Commodity Type

Ranking	Commodity	Freight Volume (kg/day)	Ranking	Commodity	Freight Volume (kg/day)
1	Others	74,005,689	21	Furniture	1,904,417
2	Sand	18,918,916	22	Cooking Oil	1,889,226
3	Animal Feed	14,504,976	23	Sugarcane	1,436,393
4	Rice	9,410,994	24	Corn	1,330,988
5	Fertilizer	9,209,862	25	Milk	1,263,930
6	Miscellaneous goods	8,784,001	26	Cattle	1,007,662
7	Steel	7,928,013	27	Salt	848,038
8	Refined Sugar	7,901,837	28	Egg	794,111
9	Paper	7,439,185	29	Textile	769,012
10	Cement	6,076,637	30	Chicken	757,734
11	Wood	5,615,795	31	Salted Fish	489,072
12	Wheat	5,522,385	32	Coal	451,708
13	Vegetable	3,978,578	33	Medicine	313,150
14	Stone	3,677,541	34	Steel (shredded)	270,401
15	Fruits	3,450,280	35	Pesticide	165,414
16	Soap	3,396,730	36	Goat	79,394
17	Ceramics	2,913,518	37	Brown Sugar	34,258
18	Cement (processing)	2,715,539	38	Refined fuel oil	26,719
19	Scrap	2,042,952			
20	Split Stone	1,930,709		Total	199,424,136

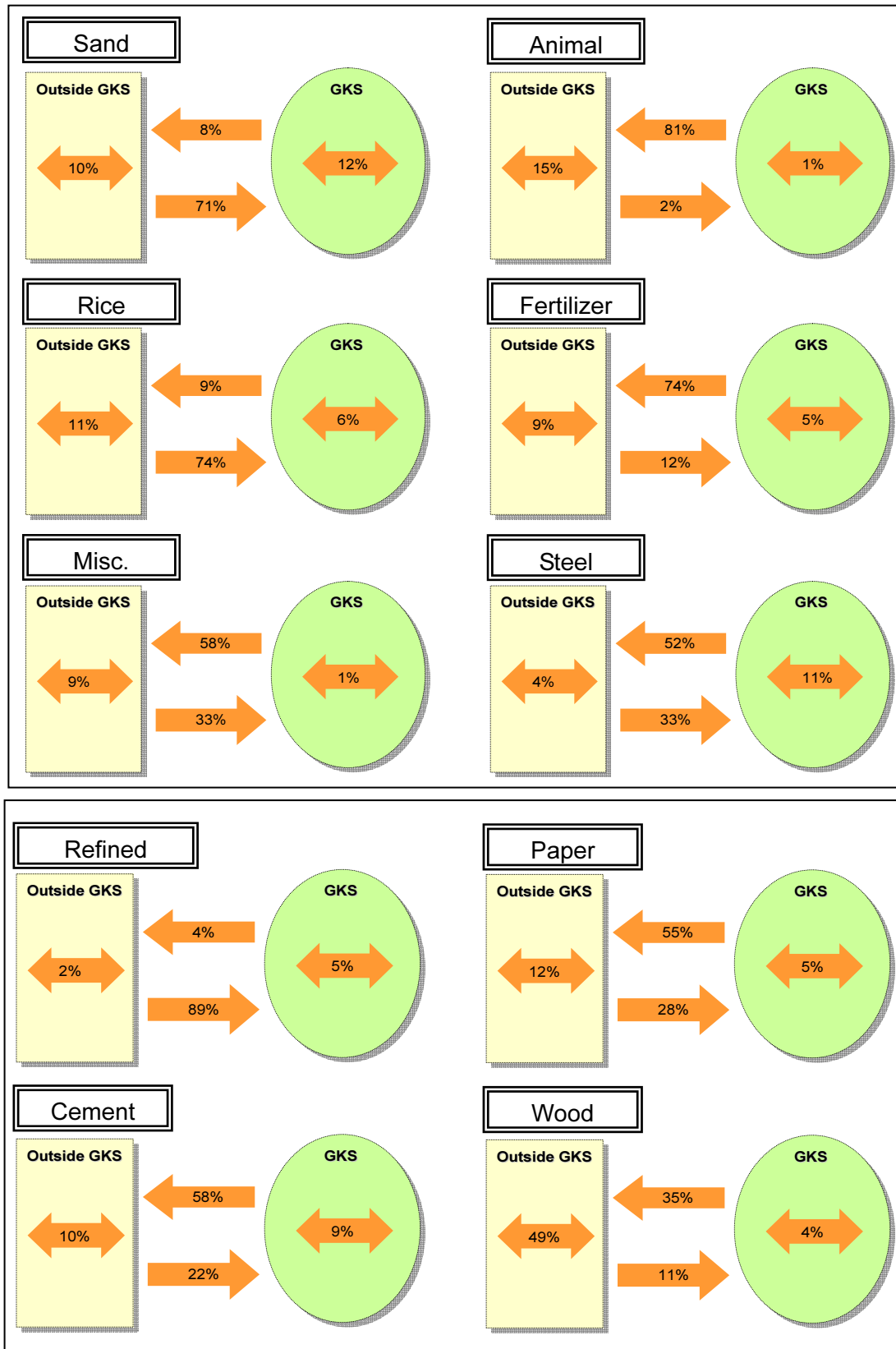
Source: 2009 Weighbridge Survey, JICA Study Team

Cargoes with a total weight of approximately 200,000 tons were transported through the roads within the GKS Zone. Among the loaded commodities, “Others” occupied the largest share with 37% of the total freight volume, followed by “Sand” (9.5%), “Animal Feed” (7.3%), “Rice” (4.7%), “Fertilizer” (4.6%), and “Miscellaneous Goods” (4.4%).

2.6.2 Freight Volume Transported by Trucks by Area

Figure 2.6.1 summarizes commodity movements between the GKS and areas outside it which include other kota/kabupaten not only in Java but also in other islands like Bali. After characterizing the freight movement of the 10 largest commodities in terms of volume, they were grouped into four types as follows:

- Type 1 (where inflow is dominant): sand, rice and refined sugar;
- Type 2 (where outflow is dominant): animal feed and fertilizer;
- Type 3 (where inflow and outflow are balanced): miscellaneous goods, steel, paper, and cement; and
- Type 4 (where flow outside the GKS is dominant): wood.



Source: 2009 Weighbridge Survey, JICA Study Team

Figure 2.6.1 Freight Movement of the 10 Largest Commodities

2.6.3 Freight Movement between Kota/Kabupaten

It was discussed in the previous section that freight movement between areas for the 10 largest commodities varies depending on the commodity. A detailed analysis of inter-kota/kabupaten movement is summarized as follows:

1) Sand

Sand is one of the major commodities transported through arterial roads in the GKS. Based on the weighbridge survey results, the major origins for transporting sand were dominated by Kabupaten Kediri and Mojokerto, and 23% of all sand commodity flow was concentrated between Kediri and Sidoarjo. Moreover, sand transport was mainly attracted to the SMA.

Table 2.6.2 Major Freight Flows of Sand

Ranking	Origin	Destination	Freight Volume (kg/day)	% Share
1	Kab. Kediri	Sidoarjo	4,381,762	23%
2	Kab. Mojokerto	Surabaya	1,756,652	9%
3	Kab. Kediri	Surabaya	1,713,251	9%
4	Kab. Kediri	Gresik	1,479,986	8%
5	Jombang	Kab. Mojokerto	769,884	4%
6	Kab. Mojokerto	Nganjuk	636,717	3%
7	Jombang	Surabaya	601,847	3%
8	Kab. Kediri	Kab. Mojokerto	512,858	3%
9	Ngawi	Surabaya	468,247	2%
10	Jombang	Sidoarjo	415,447	2%
-	Others	Others	6,182,265	33%
Total			18,918,916	100%

Source: 2009 Weighbridge Survey, JICA Study Team

2) Animal Feed

Major freight flows of animal feed originated in the SMA, specifically in Kota Surabaya and transported to East Java (Kabupaten Madiun, Banyuwangi, and Probolinggo), Central Java (Kabupaten Sleman, Sragen, and Karanganyar), and Bali Island. This means that animal feed was transported by truck for middle distances, that is, between 100 km and 300 km.

Table 2.6.3 Major Freight Flows of Animal Feed

Ranking	Origin	Destination	Freight Volume (kg/day)	% Share
1	Surabaya	Sleman	1,232,460	8%
2	Sidoarjo	Bali	1,137,460	8%
3	Surabaya	Sragen	1,048,015	7%
4	Gresik	Sleman	801,734	6%
5	Surabaya	Kab. Madiun	738,439	5%
6	Sidoarjo	Banyuwangi	682,536	5%
7	Surabaya	Karanganyar	667,290	5%
8	Surabaya	Bali	572,030	4%
9	Surabaya	Kab. Kediri	508,453	4%
10	Jombang	Kab. Probolinggo	430,981	3%
-	Others	Others	6,685,579	46%
Total			14,504,976	100%

Source: 2009 Weighbridge Survey, JICA Study Team

3) Rice

As shown in Table 2.6.4, the major destination of rice was within the GKS, though this commodity is transported from various parts of Java Island. As the transport flow of rice depends on the harvest seasons, it was hard to estimate the actual freight movement from the weighbridge survey which was conducted for only one day.

Table 2.6.4 Major Freight Flows of Rice

Ranking	Origin	Destination	Freight Volume (kg/day)	% Share
1	Kab. Blitar	Surabaya	1,603,391	17%
2	Kab. Kediri	Surabaya	1,115,025	12%
3	Jakarta Timur	Surabaya	934,650	10%
4	Jombang	Kab. Mojokerto	439,066	5%
5	Nganjuk	Sidoarjo	425,500	5%
6	Nganjuk	Kab. Mojokerto	343,350	4%
7	Indramayu	Surabaya	318,450	3%
8	Jombang	Surabaya	306,205	3%
9	Kab. Mojokerto	Surabaya	274,377	3%
10	Surabaya	Kab. Malang	261,354	3%
-	Others	Others	3,389,626	36%
Total			9,410,994	100%

Source: 2009 Weighbridge Survey, JICA Study Team

4) Fertilizer

Kabupaten Gresik, where PT. Petrokimia Gresik is located, was the major origin of fertilizer, accounting for 57% of all fertilizer transport or 5,260 tons per day (refer to Table 2.6.5). Fertilizer was mainly distributed to the GKS, East Java, Central Java, and Jakarta.

Table 2.6.5 Major Freight Flows of Fertilizer

Ranking	Origin	Destination	Freight Volume (kg/day)	% Share
1	Gresik	Semarang	951,167	10%
2	Gresik	Sragen	697,117	8%
3	Pati	Surabaya	668,236	7%
4	Kab. Mojokerto	Kab. Kediri	596,023	6%
5	Gresik	Banyuwangi	565,617	6%
6	Gresik	Kudus	445,226	5%
7	Gresik	Pati	439,227	5%
8	Gresik	Jakarta Timur	424,893	5%
9	Gresik	Karanganyar	324,700	4%
10	Gresik	Lamongan	302,133	3%
-	Others	Others	3,795,523	41%
Total			9,209,862	100%

Source: 2009 Weighbridge Survey, JICA Study Team

5) Miscellaneous Goods

Miscellaneous goods were transported actively among the three major cities of Jakarta, Surabaya, and Bali (Denpasar), as shown in Table 5.1.43.

Table 2.6.6 Major Freight Flows of Miscellaneous Goods

Ranking	Origin	Destination	Freight Volume (kg/day)	% Share
1	Jakarta Pusat	Surabaya	1,329,170	15%
2	Surabaya	Bali	1,135,741	13%
3	Surabaya	Other	991,283	11%
4	Surabaya	Jakarta Timur	880,824	10%
5	Jakarta Pusat	Sidoarjo	339,306	4%
6	Surabaya	Sragen	333,375	4%
7	Surabaya	Jember	319,884	4%
8	Surabaya	Jakarta Pusat	305,933	3%
9	Sumatra	Surabaya	298,083	3%
10	Surabaya	Banyuwangi	254,100	3%
-	Others	Others	2,596,301	30%
Total			8,784,001	100%

Source: 2009 Weighbridge Survey, JICA Study Team

6) Steel

Steel flow showed an interregional movement, that is, among East Java, Central Java, Jakarta, and Bali. It is noteworthy that approximately 1,100 tons of steel was transported for more than 300 km daily.

Table 2.6.7 Major Freight Flows of Steel

Ranking	Origin	Destination	Freight Volume (kg/day)	% Share
1	Semarang	Surabaya	1,109,600	14%
2	Bogor	Surabaya	851,400	11%
3	Surabaya	Bali	790,600	10%
4	Sidoarjo	Karanganyar	712,156	9%
5	Kab. Mojokerto	Surabaya	497,403	6%
6	Surabaya	Jakarta Timur	394,362	5%
7	Kab. Malang	Surabaya	355,710	4%
8	Sidoarjo	Bali	352,867	4%
9	Sidoarjo	Tulungagung	245,400	3%
10	Sidoarjo	Kab. Kediri	190,478	2%
-	Others	Others	2,428,038	31%
Total			7,928,013	100%

Source: 2009 Weighbridge Survey, JICA Study Team

7) Refined Sugar

As shown in Table 2.6.8, most (53%) sugar transport happened from Kabupaten Kediri to Surabaya. Approximately 93% of total freight volume of sugar found its way to the GKS.

Table 2.6.8 Major Freight Flows of Sugar

Ranking	Origin	Destination	Freight Volume (kg/day)	% Share
1	Kab. Kediri	Surabaya	4,173,759	53%
2	Jakarta Barat	Sidoarjo	797,117	10%
3	Jombang	Kab. Mojokerto	745,274	9%
4	Jakarta Selatan	Sidoarjo	305,133	4%
5	Kab. Kediri	Kota Mojokerto	215,692	3%
6	Jombang	Surabaya	200,334	3%
7	Tulungagung	Surabaya	190,747	2%
8	Lamongan	Surabaya	190,418	2%
9	Kota Mojokerto	Surabaya	172,142	2%
10	Surabaya	Jombang	124,525	2%
-	Others	Others	786,696	10%
Total			7,901,837	100%

Source: 2009 Weighbridge Survey, JICA Study Team

8) Paper

Approximately 2,100 tons per day of paper was transported from Surabaya to Jakarta. Paper was transported by trucks for distances of over 400 km, such as the Surabaya–Jakarta and Semarang–Probolinggo routes.

Table 2.6.9 Major Freight Flows of Paper

Ranking	Origin	Destination	Freight Volume (kg/day)	% Share
1	Surabaya	Jakarta Timur	2,101,200	28%
2	Semarang	Kab. Probolinggo	623,200	8%
3	Surabaya	Bali	590,750	8%
4	Jakarta Timur	Surabaya	574,000	8%
5	Cirebon	Surabaya	473,360	6%
6	Surabaya	Kudus	337,050	5%
7	Kab. Kediri	Surabaya	280,997	4%
8	Kab. Mojokerto	Surabaya	203,976	3%
9	Surabaya	Ponorogo	181,393	2%
10	Bandung	Surabaya	176,928	2%
-	Others	Others	1,896,331	25%
Total			7,439,185	100%

Source: 2009 Weighbridge Survey, JICA Study Team

9) Cement

Cement flows originated in cities where major cement plants are located such as Gresik and Tuban. These cities' share of transported cement in total cement flows was about 60%.

Table 2.6.10 Major Freight Flows of Cement

Ranking	Origin	Destination	Freight Volume (kg/day)	% Share
1	Tuban	Surabaya	1,363,552	22%
2	Gresik	Bali	569,520	9%
3	Surabaya	Banyuwangi	483,290	8%
4	Gresik	Jepara	421,457	7%
5	Surabaya	Magetan	310,742	5%
6	Surabaya	Ponorogo	304,867	5%
7	Gresik	Semarang	297,985	5%
8	Tuban	Bali	258,500	4%
9	Gresik	Tuban	246,250	4%
10	Surabaya	Kab. Madiun	234,600	4%
-	Others	Others	1,585,874	26%
Total			6,076,637	100%

Source: 2009 Weighbridge Survey, JICA Study Team

10) Wood

Based on the results of the weighbridge survey, Bali and Pasuruan were the major destinations of wood. Furthermore, its movement was mainly observed in the suburban area, not in a mega cities such as Surabaya and Jakarta.

Table 2.6.11 Major Freight Flows of Wood

Ranking	Origin	Destination	Freight Volume (kg/day)	% Share
1	Surabaya	Bali	793,792	14%
2	Kab. Malang	Kab. Pasuruan	531,653	9%
3	Kab. Pasuruan	Bali	419,648	7%
4	Kota Blitar	Kab. Pasuruan	385,095	7%
5	Gresik	Bali	316,098	6%
6	Kab. Pasuruan	Kab. Malang	217,900	4%
7	Kab. Malang	Gresik	202,210	4%
8	Surabaya	Jombang	195,016	3%
9	Kab. Pasuruan	Kota Blitar	193,280	3%
10	Kab. Malang	Bali	190,450	3%
-	Others	Others	2,170,653	39%
Total			5,615,795	100%

Source: 2009 Weighbridge Survey, JICA Study Team

2.7 Analysis of Transportation Sector in GKS

Based on the discussion of the current condition of the transportation sector in the GKS, a SWOT analysis was done. The SWOT analysis model was conducted to determine how the GKS positioned its transportation sector. The SWOT analysis model hopes to provide policy makers the opportunity to maintain, build and leverage its strengths, prioritize and optimize its opportunities, remedy its weaknesses and counter its threats in order to achieve a more robust transportation network. The result of the analysis is shown in Figure 2.7.1.

		Helpful In achieving progress	Harmful In achieving progress
Internal in Origin		Strengths <ul style="list-style-type: none"> ● Existence of efficient airport operator (Angkasa Pura I) for future development ● Existence of efficient port operator (Pelindo III) for future development ● Availability of ROW of railway tracks ● Existence of commuter trains ● Development of bus terminals (Purabaya, Mojosari, etc) ● Operation of bus and public transportation lane for safety ● Development of ITS (Intelligent Transport System) including Area Traffic Control System (ATCS) and CCTV Cameras and Count Down Traffic Timers and VMS (Variable Message Sign board) installed on several roads / intersections ● Truck regulation applied on Jalan A. Yani and Jalan Mastrip ● Reactivation of Tarik-Sidoarjo railway line 	Weaknesses <ul style="list-style-type: none"> ● Too many public transport drivers and decreasing ridership ● Traffic congestion in Surabaya ● At-grade railway crossings causing traffic congestion ● Existence of many at-grade intersections ● Existence of narrow / under-developed roads ● Shallow seabed and sedimentation in the Madura Strait ● Increasing container demand exceeding the capacity of Tg. Perak Port ● Increasing number of traffic accidents ● Increasing number of air passengers exceeding the capacity of terminal building at Juanda Airport ● Many trucks going through the central of Surabaya ● Warehouses located in the center of Surabaya ● Non existence of railway tracks connecting Pasar Turi and Kota Stations ● Stagnant number of local train passengers ● Many heavy commodities transported by trucks
External in Origin		Opportunities <ul style="list-style-type: none"> ● Second metropolitan region in Indonesia including GKS as a national strategic zone ● Suramadu bridge is opened to traffic ● Development of new port in Madura ● Development of Cepu Oil field ● Development of new industrial estates ● Development of Lamong Bay Traffic safety campaign such as "Sata Bhayangkara" and Santun Berlalu Lintas (Good Traffic Manner) 	Threats <ul style="list-style-type: none"> ● Mudflow in Sidoarjo ● Disobedient drivers not observing traffic laws on the road ● Economic stagnation in local region ● Deterioration of natural environment and dwelling environment ● Increasing number of passenger cars and motorcycles in accordance with increase of household income ● Difficulty in land acquisition

Source: JICA Study Team

Figure 2.7.1 SWOT Analysis of Transportation Sector in GKS