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2 **Urban Transportation in Yangon, Myanmar: Evidence from Large-Scale Surveys**

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**1 Abstract.**

2 This paper reports on the current traffic conditions and discusses the issues regarding the future direction of the  
3 urban transportation system in Yangon, Myanmar. Traffic data were collected through eleven local surveys covering  
4 the city of Yangon and a part of six adjacent townships. These surveys were implemented by the Japan International  
5 Cooperation Agency from February 2013 to August 2013. The Person Trip Survey, one of the eleven surveys  
6 conducted, collected the daily travel diaries of 11,330 households in the survey area. The surveys revealed the  
7 similarity and uniqueness in the urban transportation problems and policies in Yangon. Yangon has suffered from  
8 traffic congestion, long travel time, poor public transportation service, mobility gap between high and low income  
9 individuals, and serious traffic accidents, which are typical problems in developing cities. On the other hand,  
10 Yangon has introduced unique transportation policies: a motorcycle and bicycle ban and regulation on the import  
11 of vehicles, which contributed to a reduction in car usage in Yangon. However, the effectiveness of these unique  
12 policies may be questionable in the future due to the recent rapid changes in socio-economics and socio-  
13 demographics in the city. Therefore, further issues are presented including the establishment of an institutional  
14 system for better implementation, and an introduction of a financial scheme for the feasible funding of transportation  
15 infrastructure investment.

16  
17 **Keywords.** Yangon, urban transportation, person trip survey  
18

## 1 INTRODUCTION

2 Yangon, with a population of about 5.7 million as of 2013 (1), is the largest economic center in the Republic of the  
 3 Union of Myanmar. It has experienced rapid urbanization and motorization along with the nation's economic  
 4 growth. The annual growth rate in Myanmar is 6.7 percent as of 2013 while the population in Yangon City has  
 5 grown at an annual rate of 2.58% from 1998 to 2011 (1).

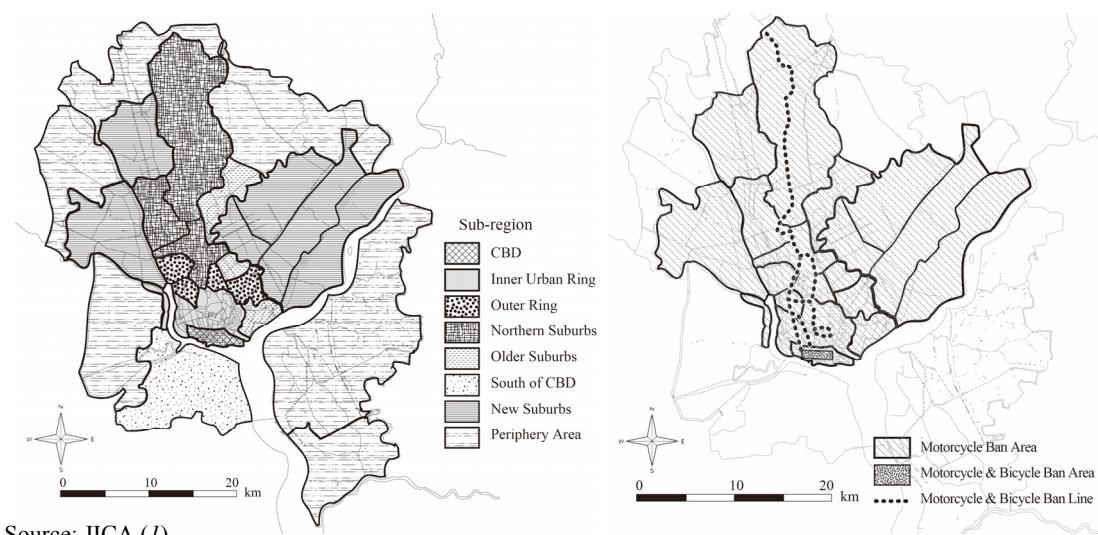
6 The central business district (CBD) of Yangon City is located at the City's southern part, adjacent to where  
 7 the Yangon River and Bago River meet. The CBD was developed during the British colonial period where the grid-  
 8 based road network was first developed. As the urban population increased, the urban area was extended from the  
 9 CBD to the north due to geographical constraints, mainly the two rivers running at the southern part of the City. In  
 10 addition, transportation infrastructure including highway and rail networks had also been developed to connect the  
 11 CBD with the northern part of Yangon City. The main residential areas are located in the northeastern part of the  
 12 City from which many commuters travel to their workplaces in the CBD. The five main types of transportation  
 13 modes that are available in Yangon are the private car, rail, taxi, rickshaw, and bus. The so-called truck bus is one  
 14 of the most popular public transportation options for commuters in Yangon. (2)

15 The government has introduced two unique transportation policies in Yangon City: one is the motorcycle  
 16 ban and the other is the regulation of importing foreign second-hand motorized vehicles. The motorcycle ban was  
 17 introduced to Yangon City (31 townships only and areas south of the CBD, namely Dala and Seik Gyi Ka Naung  
 18 Toe, were not included) in 2003 for reducing the number of traffic accidents in the City (3). Moreover, in addition  
 19 to motorcycles, bicycles and any slow moving vehicles are prohibited in a part of the CBD and on some main roads  
 20 such as Pyay Road, Kabaaye Pagoda Road, University Avenue Road, Uwizara Road and around Kandawgyi Road.

21 The regulation of importing foreign motorized vehicles in Myanmar was introduced a few decades ago  
 22 and this has led to lower vehicle ownership per capita in Myanmar (4). However, the government relaxed the  
 23 regulation in 2010 in order to promote the replacement of the old motorized vehicles. First, importing new  
 24 motorcycles from other countries has been allowed since 2010. Next, the regulation of importing second-hand  
 25 automobiles from other countries has also been relaxed since September 2011. The deregulation of importing  
 26 motorized vehicles has recently increased the number of registered passenger cars in the Yangon Region  
 27 significantly from approximately 160,000 cars in 2011-12 to approximately 200,000 cars in 2012-13.

28 The recent sharp increase of automobiles with higher levels of economic development has caused serious  
 29 traffic congestion in Yangon City. The deteriorating urban transportation situation has become a serious concern in  
 30 Yangon, socially, politically, and environmentally. The Project for the Strategic Urban Development Plan of Greater  
 31 Yangon (4) reported that the local people have complained about the serious traffic congestion, air pollution, and  
 32 poor safety in the City.

33 How should the urban transportation system in Yangon City be planned to ensure mobility and accessibility  
 34 to urban services for Yangon's people and society? Although urban transportation may be one of the most critical  
 35 issues in Yangon City, it has rarely been reported or analyzed except in some challenging studies (2, 5, 6). This is  
 36 mainly because of the difficulty in the collection of data. In our research, we surveyed urban transportation and  
 37 person trips in Yangon as a part of the Project for Comprehensive Urban Transport Plan of Greater Yangon  
 38 (YUTRA, 1) by the Japan International Cooperation Agency (JICA), 2013.



Source: JICA (1)

**FIGURE 1: Map of the Study Area of the YUTRA Project and Motorcycle/Bicycle Ban Area**

This paper reports the current problems of urban transportation in Yangon and discusses the future direction of transportation policy using the results from the large transportation surveys in YUTRA. This paper is organized as follows: The next section introduces the outline of transportation surveys to collect the transportation data. Afterwards, the results from the transportation surveys are presented and the problem structure of the Yangon urban transportation system is discussed using the survey data. Finally further issues are summarized. Note that this paper does not intend to develop a new method with regards to transportation surveys. It shows new evidence from Yangon by applying a conventional approach rather than the development of a state-of-the-art approach.

## DATA COLLECTION

First, the YUTRA project team including the authors implemented eleven transportation/traffic surveys from February 2013 to August 2013 that included a large-scale person trip survey which had never been conducted in Yangon so far. The surveys cover the Greater Yangon area as shown in FIGURE 1 and TABLE 1, including Yangon City and a part of the six adjacent townships: Thalayin, Hmawbi, Helgu, Htantabin, Twantay, and Kyauktan. The total survey area is approximately 1,500 km<sup>2</sup> and the total population is about 5.7 million as of 2013. The outline of the eleven surveys is summarized in TABLE 2. The surveys intend to capture the travel patterns of local people, level of transportation services such as travel speed, traffic volume by transportation mode and the socio-economic attributes of trip makers including age, gender, occupation, car ownership, and income.

**TABLE 1: Area and Population of the YUTRA Study Area**

Sub-region	Area (km <sup>2</sup> )	Population (2013)
CBD	6.9	252,535
Inner Urban Ring	37.8	852,441
Outer Ring	34.2	598,284
Northern Suburbs	185.2	841,061
Older Suburbs	49.4	784,018
South of CBD	110.5	172,976
New Suburbs	404.9	1,738,823
Periphery Area	705.8	475,961
Yangon City Total	828.9	5,240,137
Study Area Total	1,534.8	5,716,098

Note: The survey area covers some parts of Dala and the Periphery Areas where the populations were originally estimated.

Source: JICA ([1](#))

**TABLE 2: Outline of Transportation/Traffic Surveys in the YUTRA Project**

Survey	Collected Data	Survey Coverage
Person Trip Survey	Individuals' daily travel diary, socio-economics/demographics of households, opinions about transportation policies	Sample number: 11,330 households Sample rate: 1.0 - 2.0% of households
Cordon Line Survey	Origin-destination (OD) of trips, number of passengers, and traffic volume on roads across the survey area border	Traffic Count Survey - 17 locations; Duration: 24h (major road) and 16h OD Interview Survey - Sample rate: 10% of trip makers
Screen Line Survey	Traffic volume and number of passengers in vehicles running on roads across specific screen lines inside the survey area	- 10 locations on the eastern screen line - 3 locations on the western screen line - Duration: 24h (Major road) and 16h
Intersection Survey	Traffic volume by direction and by vehicle type, intersection queue length, signal cycles and intersection design survey	- 19 intersections; Duration: 16h
Parking Survey	Number of parked vehicles by vehicle type and by hour, parking space design survey	- 8 locations (On-street or off-street) - Duration: 16h
Travel Speed Survey	Travel time of going through a specified road section, travel time of crossing intersections on the road sections	- 10 major routes - 2 times by 3 periods (1) Morning peak hours (6:00-7:30, 7:30-9:00) (2) Daytime hours (11:00-12:30, 12:30-13:30) (3) Evening peak hours (16:00-17:30, 18:00-19:30)

Note: Other surveys are the Ferry Passenger OD Survey collecting OD patterns of approximately 400 ferry users through interviews, Railway Passenger OD Survey collecting OD patterns of approximately 5,400 rail users through interviews, Bus Passenger OD Survey collecting OD patterns of approximately 2,000 bus users through interviews, Truck OD Survey collecting OD patterns and goods transported from approximately 5,900 trucks through interviews, and Traffic Count Survey collecting the traffic volume during 16 hours at major intersections through on-site traffic counting.

Source: JICA ([1](#))

Second, the YUTRA project team collected necessary data and information regarding the existing transportation network, fare structure, institutions , financial system, etc., from local governments.

Third, the YUTRA project team interviewed the traffic police agency to collect the traffic accident data in November 2013. This covers the annual traffic accidents by township, annual fatalities, and injuries by township, and the type of vehicles involved in the traffic accidents by township.

## SURVEY RESULTS

### Modal Share, Travel Time, Trip Distance, Trip Distribution, and Departure Time

TABLE 3 shows the modal share, travel time, and vehicle occupancy from the Person Trip Survey, Screen Line Survey, and Cordon Line Survey. The total trips are approximately 11 million on a weekday. The daily trip rate, which is defined as the daily trips divided by population, is 2.04 on a weekday. The average daily trip rate of males is 2.20 while that of females is 1.90. Travel time is estimated to be about 31.6 minutes on average. Note this was estimated using a weighted average of observed travel times by travel mode collected from the sample-based Origin-Destination (OD) interview survey with the modal share collected from the person trip survey. This may be longer than other developing cities in East Asia (4).

First, the distribution of modal share demonstrates that Yangon is a public transportation oriented city. Especially, the bus is a dominant transportation mode. The modal share of public transportation is 34.9% and is composed of bus (28.5%), taxi (4.4%), rail (0.6%), and water ferry (1.4%), while the mode share of private transportation are 4.7% for cars/vans and 4.2% for motorcycles. It is highly distinctive that rail, one of the mass transit systems in Yangon, accounts for the lowest share among all of the modes. It should be also noted that the modal share of motorcycles in Yangon may be lower than other typical developing cities in East Asia because the motorcycle has been prohibited in Yangon City (7, 8).

**TABLE 3: Travel Time, Modal Share, and Vehicle Occupancy by Travel Mode**

Mode	Vehicle Occupancy (Passenger/Car)		Travel Time (min)	Modal Share (%)								
				All				Male (%)				
	SLS	CLS		5-18	19-59	60+	Total	5-18	19-59	60+	Total	
Walk	-	-	12.7	42.2	56.6	22.0	42.9	33.0	58.9	47.8	62.6	51.6
Bicycle	1.14	1.71	16.2	13.0	18.0	16.8	12.6	16.6	12.2	8.5	7.8	9.4
Motorcycle	1.45	1.94	15.2	4.2	3.1	7.4	2.9	5.8	2.6	2.5	2.9	2.6
Car	Passenger Car	2.22	2.86	36.8	4.7	2.4	7.2	8.7	6.2	2.1	3.4	4.3
/Van	Van	2.89	5.48									3.1
Taxi		2.30	5.10	39.4	4.4	0.5	7.6	6.0	5.6	0.9	3.7	6.4
	Passenger Truck	18.60	12.84									
Bus	Small Bus	24.09	19.27	39.7	28.5	17.9	34.4	23.6	29.0	22.1	31.6	14.6
	Large Bus	43.03	25.34									
	Pick Up	2.41	3.52									
Truck	Med. Truck	4.31	3.19	34.5	0.8	0.3	1.4	1.3	1.1	0.3	0.5	0.4
	Large Truck	2.42	2.60									
	Trailer	2.38	2.57									
Railway	-	-	33.5	0.6	0.3	0.8	1.1	0.7	0.2	0.7	0.5	0.6
Water Ferry	-	-	45.8	1.4	0.9	2.3	0.9	1.8	0.8	1.2	0.5	1.1
Others	-	-	40.9	0.1	0.1	0.2	0.1	0.2	0.0	0.1	0.1	0.1
Total	-	-	31.6	100	100	100	100	100	100	100	100	100

Note: SLS denotes the Screen Line Survey and CLS denotes the Cordon Line Survey. “-” denotes no results.

Source: JICA (1)

Second, the average trip length of males is 6.44 km/trip and that of females is 5.65 km/trip. Note that they exclude short trips within zones whose lengths do not vary much between males and females. The modal share of the bus are about 30% for both male and female travelers. 51.6% of female travelers walk while 33.0% and 16.6% of male travelers walk and ride bicycles, respectively. The modal share of walking by female travelers aged between 19-59 is 47.8%, which is much higher than that of male travelers (22.0%). This is probably because fewer female workers commute to workplaces mainly located at the CBD and/or less females are involved in economic activities (4, 11). Note that male and female workers in Yangon are 1,140,000 and 460,000, respectively as of 1990 (11); and

1 male and female driving license holders are 620,383 and 55,999, respectively according to our interview with the  
2 Traffic Police in 2014.

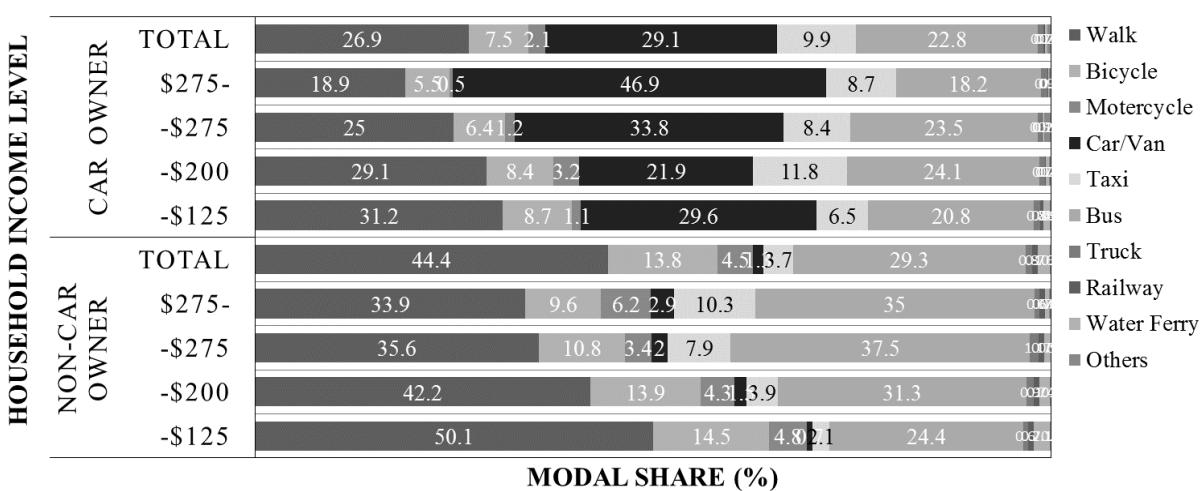
3 Third, the non-motorized modes account for over 70% out of total trips for the individuals in the 5–18 age  
4 subgroups of both males and females, which is much higher than the average modal share of the non-motorized  
5 transportation mode (55.2%). This is because the driving license for cars and motorcycles is not available for those  
6 who are under 18 years old.

7 Finally, the Cordon Line Survey, which collected the traffic data at the survey area borders, shows that the  
8 average vehicle occupancy of passenger cars/vans is 2.30 and that of taxis is 5.10 while the screen line survey,  
9 which collected the traffic data inside the survey area, shows that the average vehicle occupancy of passenger  
10 cars/vans is 2.22 and that of taxis is 2.86. High vehicle occupancy of taxis at the cordon line is probably because  
11 the public transportation service is so poor that individuals commuting from the suburbs to the CBD share the taxi  
12 service in the suburbs but they can change to using public transportation inside the City.

13 FIGURE 2 shows that the modal share by car ownership and by monthly household income. First, the  
14 modal share of walking is the highest in the household whose monthly household income is less than 200 US\$. This  
15 is first because the workplaces of low-income individuals are located near their settlements and second because the  
16 lower-income individuals participate less in leisure activities at places farther away.

17 Next, the modal share of buses in the middle income class (200–275 US\$) is higher than that in other  
18 income classes for both car owners and non-car owners. The higher income car owning households use cars and the  
19 higher income non-car owning households use taxis while the lower income households tend to walk.

20 Finally, the modal share of buses in the car owner subgroup is 22.8%. They use public transportation  
21 services even though they own cars firstly because they use their cars not only for personal use but for commercial  
22 use such as commercial taxi services, and secondly because few household members have their own car licenses,  
23 and finally because they often do not like to spend money fueling up.  
24

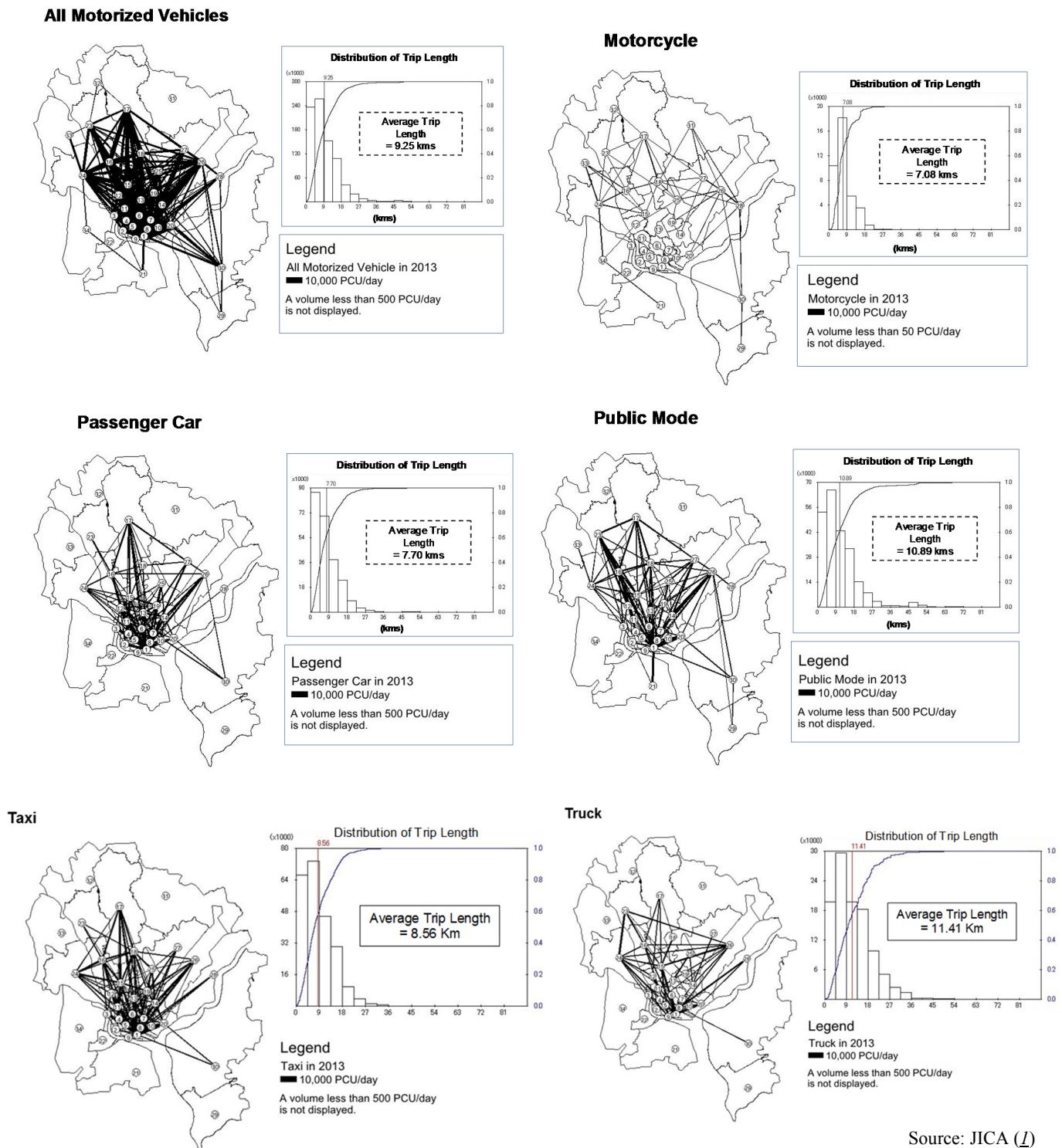


Source: JICA ([1](#))

**FIGURE 2: Modal Share by Vehicle Ownership and Household Income Level**

25 FIGURE 3 shows the trip distance and distribution by travel mode from the Person Trip Survey. The  
26 average trip distances of all motorized vehicles, motorcycles, passenger cars, public transportation, and taxis are  
27 9.25 km, 7.08 km, 7.70 km, 10.89 km, and 8.56 km, respectively. The trip distance of public transportation is longer  
28 than others because public transportation is used mainly for commuting from suburban areas to the CBD.  
29

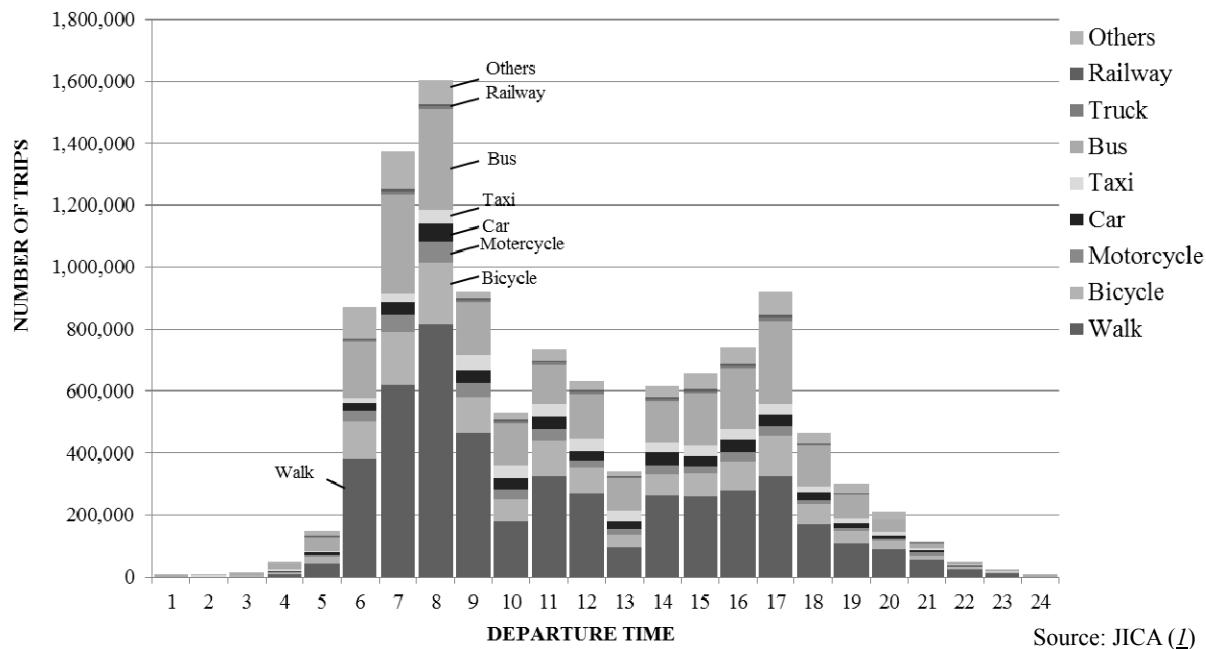
30 The trip distributions illustrate that the motorcycle is used for traveling from one outskirt area not to the  
31 CBD but to other outskirt areas. This is mainly because the motorcycle is prohibited from entering the CBD due to  
32 the government's regulation. Some motorcycle use trips are observed even in the regulated area. This is probably  
33 because regulation of motorcycles inside the CBD is not strictly enforced. The trip distribution of passenger cars  
34 and public transportation show that many car users and public transportation users travel from outskirt areas in the  
35 northern part of the city to the CBD. The trip distribution of taxis is similar to that of the passenger car and public  
36 transportation. This may mean that the taxi is used instead of the private car rather than as a complement to public  
37 transportation. This could suggest that the motorcycle ban encourages lower income households to use public  
38 transportation while it also promotes higher income households to use their own cars.



Source: JICA (1)

**FIGURE 3: Trip Distance and Distribution by Travel Mode**

1  
2 FIGURE 4 shows the hourly distribution of departure times by travel mode. It reveals two peaks at around  
3 7:00 am to 8:00 am and at around 5:00 pm. In addition, the number of trips starting decreases once at 10:00 am but  
4 once again increases slightly at 11:00 am. This is because most local schools have two courses during a day in  
5 Yangon where the second course starts at 11:00 am. Buses are used almost constantly throughout the day while  
6 other transportation modes are used mainly at peak hours. This proves that travelers use bus services from the early  
7 morning to the late evening.  
8



**FIGURE 4: Distribution of Departure Time by Travel Mode**

## 1 Traffic Congestion

### 2 Travel speed

3 The Travel Speed Survey revealed that the average travel speed along major roads connecting suburbs with the  
 4 CBD varies from 20 to 40 km/h. For example, the average travel speed from the CBD to the suburbs along Pyay  
 5 Road, Land Thit Road, and Bogyoke Aung San Road at 7:30 am–9:00 am, 12:30 am–1:30 pm, and 6:00 pm–7:30  
 6 pm are 15.3 km/h, 25.2 km/h, and 17.8 km/h, respectively whereas the average speed from the CBD to the suburbs  
 7 along the above roads at 7:30 am–9:00 am, 12:30 am–1:30 pm, and 6:00 pm–7:30 pm are 32.9 km/h, 30.9 km/h,  
 8 and 17.7 km/h, respectively. The outbound traffic from the CBD suffers from serious traffic congestion during  
 9 evening peak hours while the inbound traffic to the CBD suffers from traffic congestion both during morning and  
 10 evening peak hours. The inbound traffic congestion during the evening peak hours may be due to the poor traffic  
 11 management and low capacity of intersections.

12

### 13 On-street Parking

14 The Parking Survey revealed that off-street parking spaces are not readily available except in the newly constructed  
 15 offices and commercial buildings. Although on-street parking is not allowed on 26 roads in Yangon City such as  
 16 Pyay Road, Kabar Aye Pagoda Road, Bayln Naung Road, Strand Road, Baho Road, and Insen Road, on-street  
 17 parking is often observed including the occupation of one lane, double parking by multiple parked cars, and on-  
 18 street parking adjacent to intersections. These types of on-street parking could cause serious traffic congestion and  
 19 traffic accidents.

20 On-street parking is observed typically at the following sites: (1) at schools where private cars and school  
 21 buses stop near the school gate for escorting and picking up the school children. There are two peak hours of on-  
 22 street parking demand at schools: in the morning and at noon, because most schools in Myanmar adopt a half-day  
 23 school schedule in which two courses are provided at the same school during a day; (2) at major hospitals where  
 24 the capacity of off-street parking spaces is insufficient. High-income car users typically access these major  
 25 hospitals; (3) at shopping centers and retailers where many taxis and pick-up cars access the poor parking spaces  
 26 near the entrances; (4) at auto dealers where many cars are displayed on the roadside; and (5) at religious facilities  
 27 such as pagodas and mosques where many taxis and passenger trucks are waiting for visitors on the roadside.

28

1 *Bottlenecked Intersections*

2 FIGURE 5 shows the congested intersections in the survey area based on data collected from the Intersection Survey.  
 3 First, this revealed that the intersections at the CBD and those along the north-south roads connecting with the CBD  
 4 suffer from serious traffic congestion. In particular, major roads where there are many running bus routes are  
 5 congested. Although alternative routes may be available, they are rarely used because they are poorly paved or  
 6 because they are not equipped with bridges to cross over the rivers. Second, two intersections near the bridges, No.  
 7 15 and 30 are also traffic bottlenecks. Both of them are located along roads connecting the suburban industrial areas  
 8 with the CBD. Additionally a logistics center is located at the area around intersection No. 30, from which much  
 9 traffic is generated and this causes the traffic congestion at this intersection. Third, the detailed investigations at 19

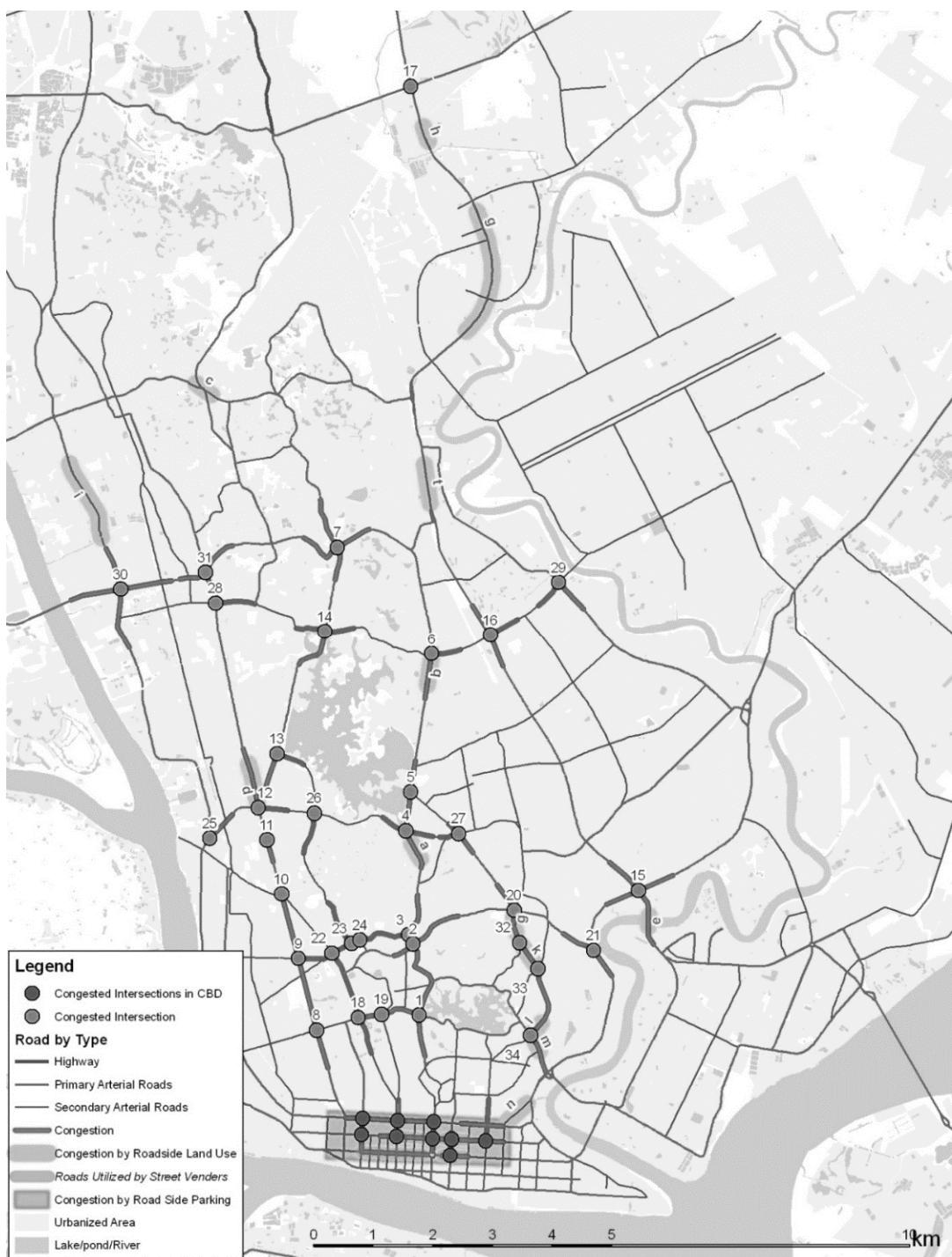


FIGURE 5: Congested Intersections and Road Sections

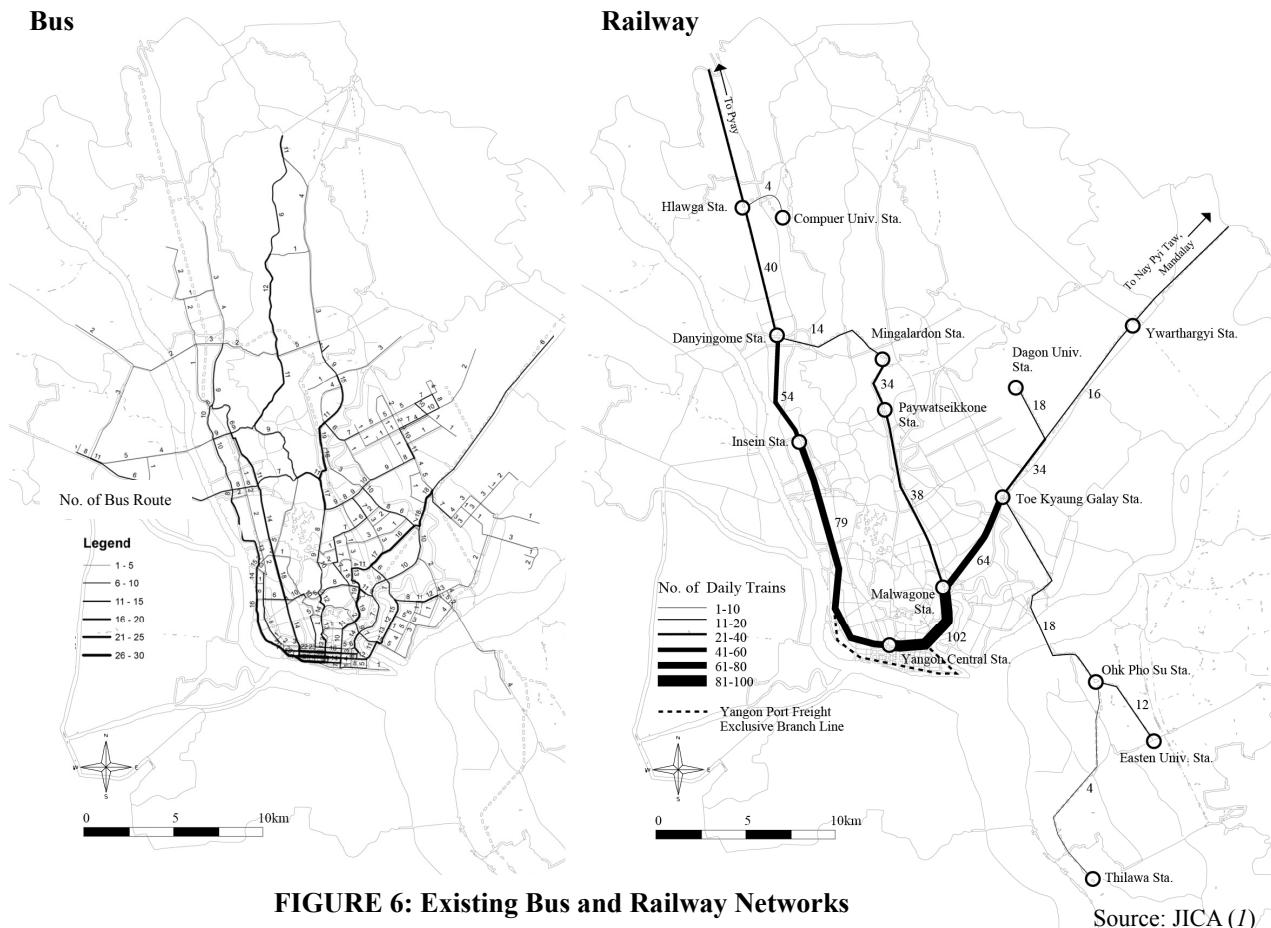
Source: JICA ([J](#))

major intersections in Yangon City revealed that the saturation rates of eight intersections are over 0.85 during peak hours, which means that those intersections are heavily congested. The observation results also showed that the main reasons for traffic congestion are jaywalking of pedestrians, road construction, boarding and alighting of buses, and on-street parking near intersections.

## Public Transportation

FIGURE 6 shows a map of existing bus routes in Yangon. They run mainly along main roads, such as No. 1 Main Road, No. 3 Main Road, Pyay Road, and Bayint Naung Road. 6,473 buses are running along 389 routes in Yangon, provided by both public and private operators as of January 2013. Various types of vehicles ranging from conventional buses to converted light trucks and pickups are used for bus services, namely (1) city bus (air-conditioned 50 passengers, non-air-conditioned 45-52 passengers), (2) dyna (truck) (30 passengers), (3) BM (old-style minibus) (25-35 passengers), (4) minibus (30 passengers), and (5) Hilux (12-20 passengers) (1). Every type of bus vehicle is old and they are imported from foreign second-hand bus markets. The major fleet types in the Yangon Region are the city bus (45%) and dyna (31%). Note that the converted light trucks bus fleets have been forbidden to run in the CBD since February 2010. Flat fare and distance-based fare system have been installed where the former ranges between 200 and 300 Myanmar Kyats (MMK) (approximately 0.20-0.30 US\$) and the latter starts from 50 MMK (approximately 0.05 US\$) and increases by 300 MMK (approximately 0.30 US\$).

FIGURE 6 also illustrates the current railway network and number of daily trains. It is composed of eight lines, which include three main lines: the Yangon Circular Railway, Yangon-Mandalay Main Line and the Yangon-Pyay Main Line, and five branch lines including one exclusive freight rail line. The total length is 138.4 km where 56 stations are for passenger usage. 200 services are operated daily by Myanmar Railways and the Ministry of Rail Transport. The fare used to be 20 MMK before November 2011 and it was raised to 100 MMK afterwards. The maximum travel speed is approximately 25-30 km/h even in the sections in relatively good track conditions, whereas the maximum travel speed is only 5-10 km/h in other suburban lines due to poor track conditions. Travel time to make a round trip on the Yangon Circular Railway (47.5 km) is approximately three hours (equivalent to 15 km/h). (1)



1    **Traffic Safety**

2    TABLE 4 shows the past trend of road accidents in 33 townships by vehicle type, which were collected from  
 3    interviews with the local police agency. This shows no significant tendency in the total number of accidents despite  
 4    the increase of car ownership.

5    Over 70% of the road traffic accidents with both fatalities and injuries were caused by buses and private  
 6    cars each year. Fatal traffic accidents from buses and private cars account for 29.3% and 43.3%, respectively while  
 7    injuries from traffic accidents from buses and private cars account for 45.0% and 37.1%, respectively as of 2011.  
 8    In 2011, buses caused 51.69 fatal accidents per 1,000 vehicles and 697.46 injuries from accidents per 1,000 vehicles,  
 9    which are approximately five times more than the average number of fatal accidents (9.72) and eight times more  
 10   than the average number of injuries from accidents (85.56).

11   Major reasons for the traffic accidents reported by the Traffic Police are the driver's carelessness (55.6%)  
 12   and violation of traffic regulations by pedestrians (14.9%) as of 2010 (*II*).

13   TABLE 5 shows the number of road traffic accidents by sub-region as of 2011. First, the highest accident  
 14   rate per 10,000 population is observed in the Northern Suburbs, followed by the Outer Ring Zone and by the CBD.  
 15   This is because major corridors connecting with the CBD are running through these sub-regions with large traffic  
 16   volumes. Next, the highest accident rate per square kilometer is observed in the CBD, followed by the Outer Ring  
 17   Zone and by the Inter Ring Zone. This is simply because the road network is so dense that traffic accidents often  
 18   occur in the area.

19   20   **TABLE 4: Number of Road Traffic Accidents and Those per 10,000 Vehicles by Vehicle Type from 2008 to 2011**

Vehicle Type	Fatal				Injured			
	2008	2009	2010	2011	2008	2009	2010	2011
No. of Accidents	Taxi	5 (3.3%)	8 (3.9%)	7 (4.0%)	12 (5.8%)	109 (9.2%)	112 (6.9%)	96 (7.7%)
	Bus	64 (41.8%)	63 (30.6%)	71 (40.6%)	61 (29.3%)	609 (51.4%)	778 (48.1%)	501 (40.0%)
	Private Car	58 (37.9%)	98 (47.6%)	65 (37.1%)	90 (43.4%)	358 (30.2%)	597 (36.9%)	504 (40.3%)
	Container	19 (12.4%)	26 (12.6%)	23 (13.1%)	35 (16.8%)	66 (5.6%)	99 (6.1%)	91 (7.3%)
	Others	7 (4.6%)	11 (5.3%)	9 (5.1%)	10 (4.8%)	43 (3.6%)	33 (2.0%)	59 (4.7%)
	<b>Total</b>	<b>153</b>	<b>206</b>	<b>175</b>	<b>208</b>	<b>1185</b>	<b>1619</b>	<b>1251</b>
No. of Accidents Per 1,000 Vehicle	Taxi	3.59	5.64	4.9	7.44	78.16	79	67.26
	Bus	59.53	59.12	63.22	51.69	566.46	730.04	446.09
	Private Car	4.58	7.39	4.6	6.1	28.26	45.03	35.69
	Container	8.05	10.67	8.59	13.02	27.95	40.62	33.98
	Others	7.04	10.7	7.98	8.76	43.25	32.1	52.3
	<b>Average</b>	<b>8.27</b>	<b>10.72</b>	<b>8.55</b>	<b>9.72</b>	<b>64.08</b>	<b>84.29</b>	<b>61.1</b>
<b>1830</b>								

21   Source: Interviews with the Traffic Police, Ministry of Home Affairs

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**TABLE 5: Number of Accidents by Sub-region (2011)**

Sub-region	Per 10,000 pop.	Per km <sup>2</sup>
CBD	5.11	18.0
Inner Urban Ring	4.35	6.0
South of CBD	n.a.	n.a.
Older Suburbs Zone	2.07	3.2
Outer Ring Zone	5.30	8.7
Northern Suburbs	6.68	3.1
New Suburbs Zone	3.20	1.2
<b>Total</b>	<b>3.96</b>	<b>2.6</b>

24   Note: n.a. denotes not available.

25   Source: Interviews with the Traffic Police, Ministry of Home Affairs

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1   **CURRENT PROBLEMS AND THE FUTURE DIRECTION OF YANGON'S TRANSPORTATION**

2   Urban transportation problems in Yangon identified from the above large-scale surveys consist of the components  
 3   typically observed in many other developing cities (9): traffic congestion, long travel time, poor public  
 4   transportation service, mobility gap between high and low income individuals and serious traffic accidents. Major  
 5   reasons for these problems can be summarized as follows: (1) the urban travel demand has been growing fast due  
 6   to the rapid economic development and population increase, (2) the capacity of road infrastructure is too low to  
 7   handle the rapid growth of urban travel demand, (3) the rapid sprawl of the urban area increases the travel distance  
 8   and travel time particularly for commuting to the CBD, (4) the public transportation service is not well organized  
 9   and the public transportation infrastructure has been poorly invested in, (5) motorized travel modes are not readily  
 10   available for low and middle income classes while they are highly available for the high income class, and (6) the  
 11   transportation related education/knowledge is not well known among drivers and pedestrians.

12   Although there are many similarities in the urban transportation problems of Yangon to other developing  
 13   cities, the following uniqueness of the recent history and transportation policy in Yangon should be noted: first the  
 14   motorcycle and bicycle ban policy has led to a public transportation oriented city where bus service was widely  
 15   used for accessing the CBD; second the regulation of vehicle imports has reduced the car ownership in Yangon and  
 16   this also contributed to a high modal share for public transportation; third the recent lift of economic sanctions from  
 17   the international community has started to boost Yangon's economy, which has escalated the traffic demand growth;  
 18   and finally the deregulation of vehicle import constraints has also stimulated car usage in Yangon.

19   The motorcycle and bicycle ban should be respected as a challenging transportation policy. If only  
 20   motorcycles had been prohibited, people would have used bicycles more as Deng *et al.* (10) suggested. The ban  
 21   used to work well for motivating the individuals who do not own cars to use public transportation. As shown in  
 22   TABLE 6, the ratio of registered motorcycles to registered vehicles in the Yangon Region is significantly lower  
 23   than other states/divisions in Myanmar. On the other hand, this may imply that motorcycles could be used more if  
 24   the motorcycle and bicycle ban was lifted in Yangon. More individuals may request a stoppage of the motorcycle  
 25   and bicycle ban policy. Interestingly, however, the local people still have a positive opinion for the current  
 26   motorcycle and bicycle ban policy. The Person Trip Survey requested the respondents to answer a question: "Do  
 27   you think the current limitation on the use of motorcycle in Yangon should be continued?" The results showed that  
 28   57.6% of the respondents support the regulation.

30   **TABLE 6: Number of Registered Vehicles by State/Division in Myanmar (2010)**

State/Division	Registered Vehicle	Registered Motorcycle	Registered Motorcycle/ Reg. Vehicle	Registered Vehicle/1000 Population
Mandalay Division	626,202	549,338	87.7%	75.0
Shan State	346,073	305,894	88.4%	61.2
Kachin State	80,953	70,016	86.5%	51.8
Kayah State	16,711	14,752	88.3%	48.0
Taninthayi Division	70,323	64,787	92.1%	41.6
Sagaing Division	252,986	237,225	93.8%	38.9
Yangon Division	253,904	50,401	19.8%	36.5
Mon State	103,119	92,586	89.8%	33.2
Myanmar Total	2,291,675	1,877,596	81.9%	38.5

31   Source: The Government of the Republic of the Union of Myanmar (11)

32   The effectiveness of the motorcycle and bicycle ban could be weaker under the current situation where the  
 33   vehicle import regulation has been relaxed. It is feared that this may give an incentive for high income individuals  
 34   to use private cars after relaxation of the vehicle import policy. The survey also requested the respondents to answer  
 35   a question: "Do you think the current limitation on the import of used vehicles should be continued?" The results  
 36   show that half of the respondents disagreed with the regulation. If the urban transportation policy is determined by  
 37   reflecting the opinions of local people, the motorcycle and bicycle ban should be continued while vehicle imports  
 38   should be further deregulated; and this should lead to more demand of car usage in Yangon City. Traffic congestion  
 39   will spread rapidly as dense cities such as Yangon motorizes even if car use per capita remains low. The regulation  
 40   of car ownership and usage plays a crucial role in order to slow down the pace of motorization and to develop the  
 41   public transportation system as pointed out by Barter (12).

42   Solutions to the urban transportation problems in Yangon may be challenging. One of the reasons is that  
 43   no government department is in charge of transportation planning. The government's capacity of implementing  
 44   appropriate transportation policies may also be poor in Myanmar. Unfortunately, the Yangon Region Government

1 and Yangon City Development Committee (YCDC) maintains roads and authorizes bus and taxi operations often  
2 on an ad-hoc basis. In addition, the Myanmar Government which allocates the public budget to the transportation  
3 sector has poor technical skills and knowledge about innovative financial methods for raising funds for  
4 infrastructure development.

## 7 CONCLUSION

8 This paper reported the current traffic conditions in Yangon and discussed the issues with the future direction of the  
9 urban transportation system. The achievements of the large-scale survey are so valuable that the traffic conditions  
10 have been successfully revealed for understanding the current problems and for planning the future transportation  
11 policy/network in Yangon. The evidence from these surveys are expected to contribute to the data based approach  
12 in the urban transportation planning and decision making process in Myanmar.

13 The surveys revealed the similarity and uniqueness in the urban transportation problems and policies.  
14 Yangon suffers from traffic congestion, long travel times, unsafe public transportation services, mobility gap  
15 between high and low income individuals, and serious traffic accidents, which are typical problems in developing  
16 cities. Yangon has introduced a unique transportation policy: motorcycle and bicycle ban and regulation of vehicle  
17 imports, which contributed to a reduction in car usage in Yangon. However, the effectiveness of those unique  
18 policies may be questionable due to the recent rapid changes in socio-economics and socio-demographics.

19 Further issues that should be discussed are summarized as follows: first an institutional system for  
20 implementing transportation investment and management should be established. This may include the introduction  
21 of a new organization who is responsible for the implementation; and second, a financial scheme for funding the  
22 transportation projects should be set up. This may include a new taxation system for transportation investment such  
23 as gas tax and a value capture system using the property tax of the real estate adjacent to the public transportation  
24 facilities.

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