

## **Characterization of Motorcycle Usage in Asia in aid of Motorcycle Road Safety Policy Framework Formulation: The Case of Metro Manila**

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**Abstract:** This study, commissioned by the Asian Development Bank, showed the characteristics of motorcycle usage in Southeast Asia, with Metro Manila as the case, in aid of transport policy framework. It noted the growing increase in motorcycle-related crashes and supported the notion that motorcycles are becoming to be significant modes of transport in urban areas for urban mobility, commuting and other trip purposes. Policy suggestions were introduced in this study in addressing proliferation of motorcycles, and further assessments were proposed to understand the travel behaviour of motorcycle users and their impacts on the transport system, environment and traffic safety.

*Keywords:* motorcycle usage, mobility, travel behaviour, easy access, road safety, 'habal-habal', policy framework

### **1. GROWTH OF MOTORCYCLE USE IN ASIA**

Over the years, the growth of motorcycles has increased worldwide; and many thoughts were suggested in their proliferation in Asia and notably in Southeast Asia. Noteworthy of mentioning are the following: mobility and easy access in going around the congested road network. Albeit this observation, the negative repercussion was the increase in road-related accidents attributed to motorcycle use. This paper attempts to look at this phenomenon of motorcycles in Southeast Asia and with Metro Manila in the Philippines as a case study with the intention characterizing motorcycle usage come up with measures on how to address the growing motorcycle use, especially in the context of road safety and mobility.

Figure 1 surmised that the increase in motorcycle use worldwide, and especially in Asia, is evident. As will be shown later, the phenomenal growth of motorcycles is attributed to people utilizing them for their daily trips and in evading traffic congestion, provide more flexibility in their mobility and growing increase in the delivery services. And, this also led to the increasing concern on motorcycle-related crashes/accidents that in instances are fatal.

Figure 2 showed the twenty countries with the highest number of motorcycles and out of these, six are in Asia and in particular from the ASEAN subregion. The same figure noted that most of the ASEAN countries have high motorcycle ownership. Further look at the figure would indicate that the motorcycle seemed to be the bulk of vehicles in most of the ASEAN nations.

Hanoi and Ho Chi Minh in Vietnam, Jakarta in Indonesia, Kuala Lumpur in Malaysia and in recent years, Metro Manila in the Philippines have reflected significant increase in motorcycle use not only for personal purpose but for commuting. In fact, one can observe in most of these cities, like in Jakarta, the proliferation of motorcycle taxis. Affordability of motorcycles is considered as one factor in this regard.

Table 1.1 Registered Motorcycles in the World, 2013

Continent/Area	Population	Registered No. of Vehicles	Registered Motorcycles	Percentage of	Percentage of	
				Total Motorcycles over World Total (%)	Motorcycles per 1000 Population	Motorcycles of all Vehicle by Continent (%)
Asia	4027874601	897958556	338868519	84.72%	84.13	37.74%
Southeast Asia	514569624	218233129	166499218	41.60%	323.57	76.29%
Middle East	97239449	20621541	300617	0.08%	3.09	1.46%
Europe	394153479	338552588	32849849	8.21%	83.34	9.70%
Africa	998473778	56973225	9018764	2.25%	9.03	15.83%
Central America*	194297539	47771820	5487620	1.37%	28.24	11.49%
South America	41923849	7706274	3512154	0.88%	83.77	45.58%
North America	355232420	287409632	9098954	2.27%	25.61	3.17%
Oceania	37460411	20729557	868793	0.22%	23.19	4.19%
<b>Total</b>	<b>6146655526</b>	<b>1677723193</b>	<b>400005270</b>	<b>100.00%</b>	<b>65.08</b>	<b>23.84%</b>

Source: WHO Global Road Safety Report, 2015

\*Including countries in Caribbean Islands

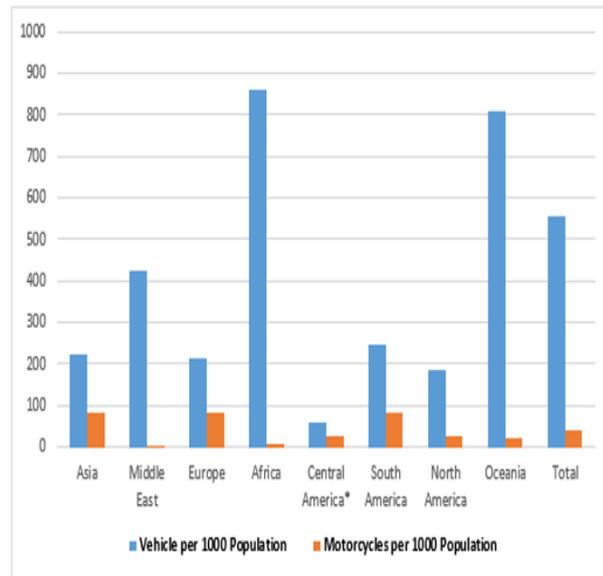


Figure 1.1 Vehicles and Motorcycles Per 1000 Population by Continent, 2013

Source: WHO Global Road Safety Report, 2015

Figure 1. Global Motorcycle Information, 2015

Though the Philippines may seem to indicate low motorcycle use, however, as will be discussed later, this is increasing, notably in Metro Manila, the national capital region of the country. The paper is organized in such a way that the relationship of motorcycle usage and socioeconomic characteristics is shown, followed by impacts of motorcycles on road safety and finally as a case study, a look at Metro Manila's motorcycle usage and mobility and road safety.

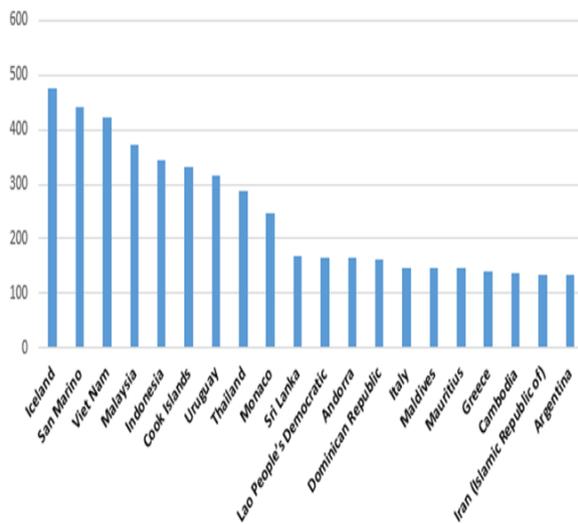


Figure 1.3 The 20 Countries with Highest Number of Motorcycles Per 1000 Population, 2013

Source: WHO Global Road Safety Report, 2015

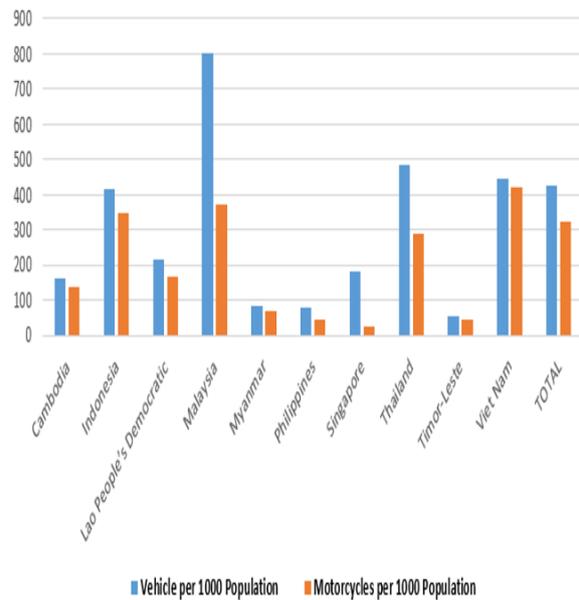


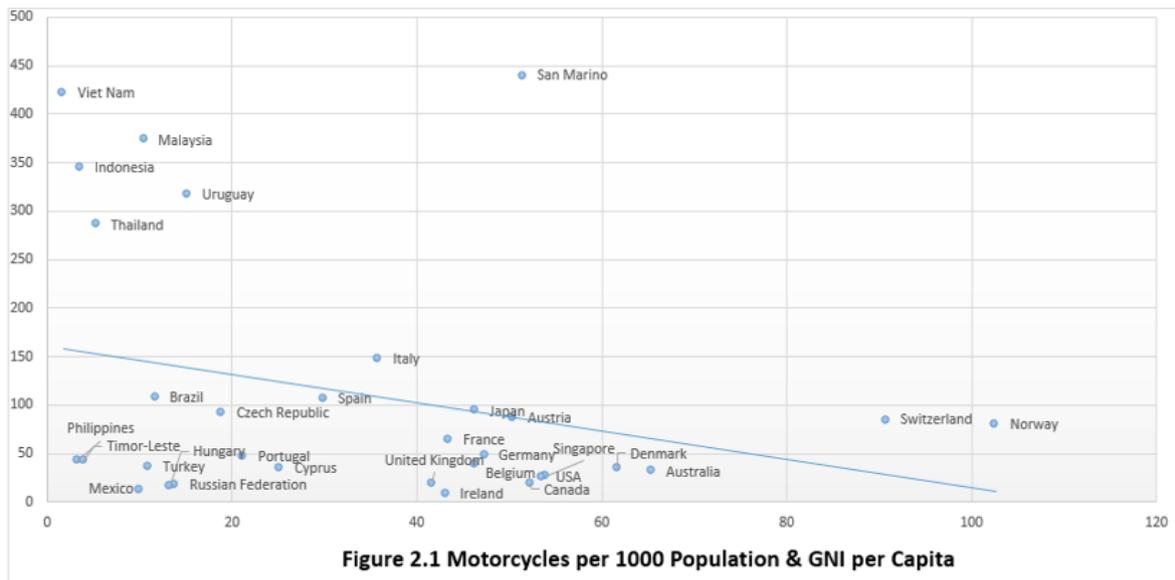
Figure 1.4 ASEAN Vehicle and Motorcycles, per 1000 Population, 2013

Source: WHO Global Road Safety Report, 2015

Figure 2. Number of Motorcycles by Country, 2015

## 2. MOTORCYCLE USE AND INCOME LEVELS OF COUNTRIES

The growing increase in motorcycle ownership has been attributed to a country's income levels. As reflected in Figure 3, equating motorcycle ownership and GNI per capita of a country indicated that there is a relationship. Most of the countries with low GNI per capita indicated high motorcycle ownership. This reflected the observation that people have motorcycles for their mobility, particularly in Southeast Asia. With the growing concern on the impact of traffic congestion on their day-to-day commuting, many people are now turning to motorcycles as their means in going to their offices or work places. This is notably true for those that cannot afford to hire drivers. Furthermore, as already mentioned earlier, affordability and low financing schemes in purchasing motorcycles made the more attractive.



Source: WHO Global Safety Report, 2015

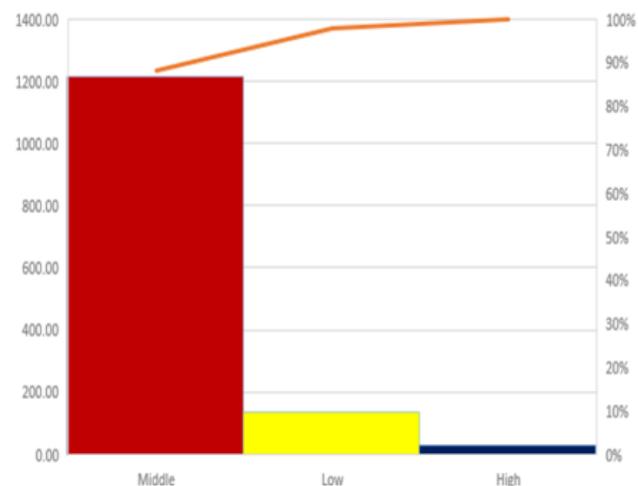
Figure 3. Motorcycle Ownership, per Capita, 2015

Figure 4 further highlighted that most of those with motorcycles belong to the lower- and middle-income levels, especially in Southeast Asia. This would imply that people in the ASEAN have motorcycle mainly for their mobility and out of necessity apart from being affordable. The low financing schemes of motorcycle companies is another factor to consider. Furthermore, for those familiar with the traffic situations in most ASEAN nations, they know that the proliferation of motorcycles can also be attributed to the need to evade congestion given the flexibility of movements on the roads. Likewise, the increasing popularity of motorcycle taxis, such as those in Jakarta and gradually now in Metro Manila, is evident of such observation.

Table 1, illustrating the relationship between motorcycle ownership and GNI for two consecutive years in Metro Manila, validated Figure 4; it showed that the Metro Manila situation is considerably higher than that at the national level. Figure 4 further showed that the increase in motorcycle ownership is positively correlated with the increase in GNI per capita.

Region/Country	Motorized 2-and 3 wheelers Per 1000 Population	GNI per capita, '000 USD	Income level
Cambodia	136.70	0.95	Low
Indonesia	345.20	3.58	Middle
Lao People's Democratic	165.54	1.45	Middle
Malaysia	373.12	10.43	Middle
Philippines	43.20	3.27	Middle
Singapore	26.78	54.04	High
Thailand	286.07	5.34	Middle

Income Level:  
 Low income: \$1 045 or less  
 Middle income: \$1 046 - \$12 745  
 High income: \$12 745 or more  
 (Based on World Development Indicators database)



Source: WHO Global Safety Report, 2015

Figure 4. No. of Motorcycles in Relation to GNI Per Capita, ASEAN, 2015

Utilizing information from the MUCEP (MMUTIS Update and Enhancement Project), 2015, under the Project for Capacity Development on Transport Planning and Database Management in the Republic of the Philippines, Table 2 was constructed to show the relationship between monthly household income and number of motorcycles owned in Metro Manila. The MUCEP, thus far, is the most comprehensive HIS (household interview survey) conducted in Metro Manila and its surrounding areas with households of more than 40,000.

Table 1. No. of Motorcycles and GNI, Philippines and Metro Manila, 2015

Year	GNI, '000 USD (constant prices)	Registered Motorized 2-3 wheelers/1000 population	
		Philippines	Metro Manila
2013	3.18	44	60
2014	3.42	46	66

Source: Philippine Statistical Yearbook, 2015

Table 2 indeed validated earlier discussion on the link between income and motorcycle ownership. It showed that households with lower income have more motorcycles than those with higher incomes. This also supported Table 1.

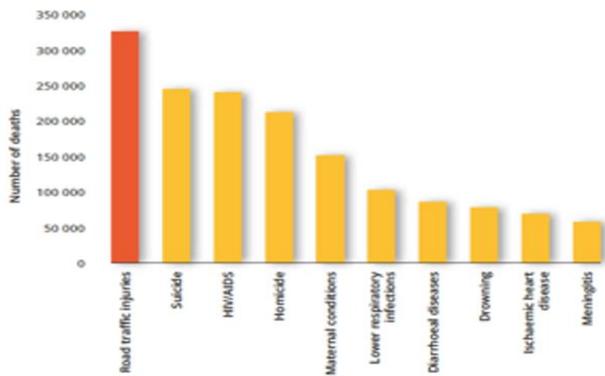
Table 2. Motorcycle Ownership by Monthly Household Income

		Below 15K	15K- 34999	35K- 59999	60K- 149999	150K- 299999	300K & Above	Total
No. of Motorcycles Owned	1	2832	1530	264	54	5	23	4708
	2	187	171	31	7	0	21	417
	3	43	29	8	2	0	21	103
	4	2	10	2	0	0	21	35
	5	4	0	1	0	0	21	26
	More than 5	6	3	0	2	0	124	135
Total		3074	1743	306	65	5	231	5424

Source: MUCEP Report, 2015

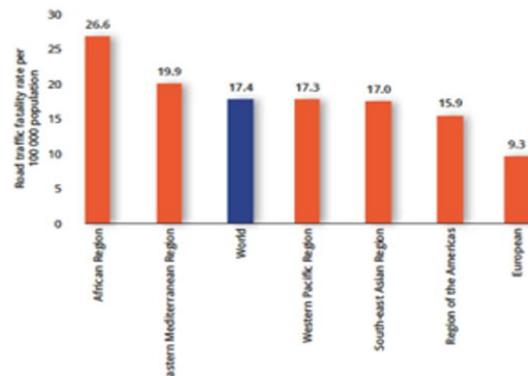
### 3. MOTORCYCLES AND ROAD SAFETY

The previous sections looked at the growth of motorcycles, especially in Southeast Asia and its link to income levels. Though it is perceived that motorcycles can ease mobility and movements of people, they are still considered as dangerous and more likely to be involved in crashes on the road.



Top Ten Causes of Death Among People Aged 15-29, 2012

Source: WHO, 2015



Road Traffic Fatality Rates per 100,000 Population

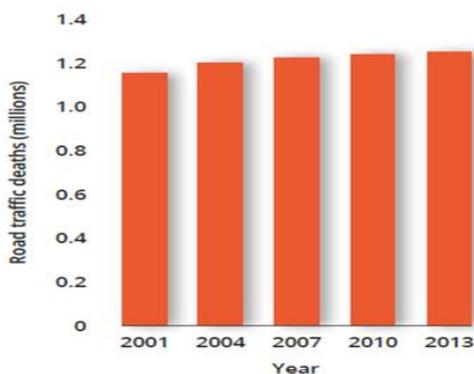
Source: WHO, 2015

Figure 5. Basic Information on Causes of Death & Fatalities

Figure 5 showed that road-related causes of deaths are high and is leading compared to other causes. Furthermore, it illustrated the situation among the regions of the world. Figure 6 on the other hand provided another look at the situation of road-related fatalities and even equated these to the income levels of the regions. At a glance, one could note that there are more road-related deaths attributed to lower income levels. On the other hand, Figure 7 illustrated the road-related deaths by mode of vehicles and motorcycles showed significant figures. This is particularly true for Southeast Asia and had the highest percentage. Equating Figure 3.3 to Figure 3.2, it can be noted that low income levels and motorcycle-related deaths had positive correlation.

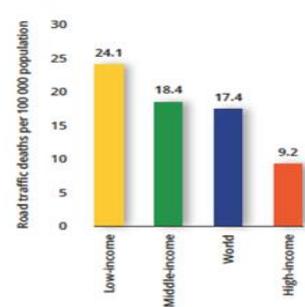
With these observations, there is therefore a need to look deeper at the impact of motorcycle use not only on mobility and access but also on road safety. The figures shown are clear evidence that road safety should not only be a local concern, but also regionally or globally. It is imperative that concerted efforts among countries are needed in addressing this; especially related to motorcycles. A number of studies had already provided support for global cooperation in address this. Notable of these are those by Haworth, 2012, Rogers, 2008, Esmael, et. Al., 2013, Chen, et.al., 2011, and Herwangi, et.al., which provided some insights on how to look at crashes and motorcycles and what measures need to be done.

Number of road traffic deaths, worldwide, 2013



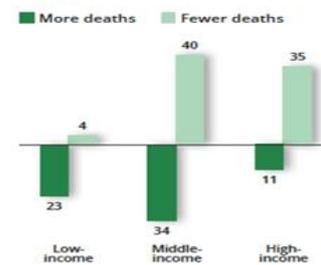
Source: WHO Global Road Safety Report, 2015

Road traffic deaths per 100 000 population, by country income status<sup>a</sup>



<sup>a</sup> Country income status was determined based on data from the World Development Indicators database, World Bank, March 2015. (See <http://data.worldbank.org/indicator/NY.GNP.IC.AP.CD/countries>). Data relate to 2013, whereby low-income = < US\$ 1046 per capita; middle-income = US\$ 1046 to US\$ 12 745; high income = > US\$ 12 746.

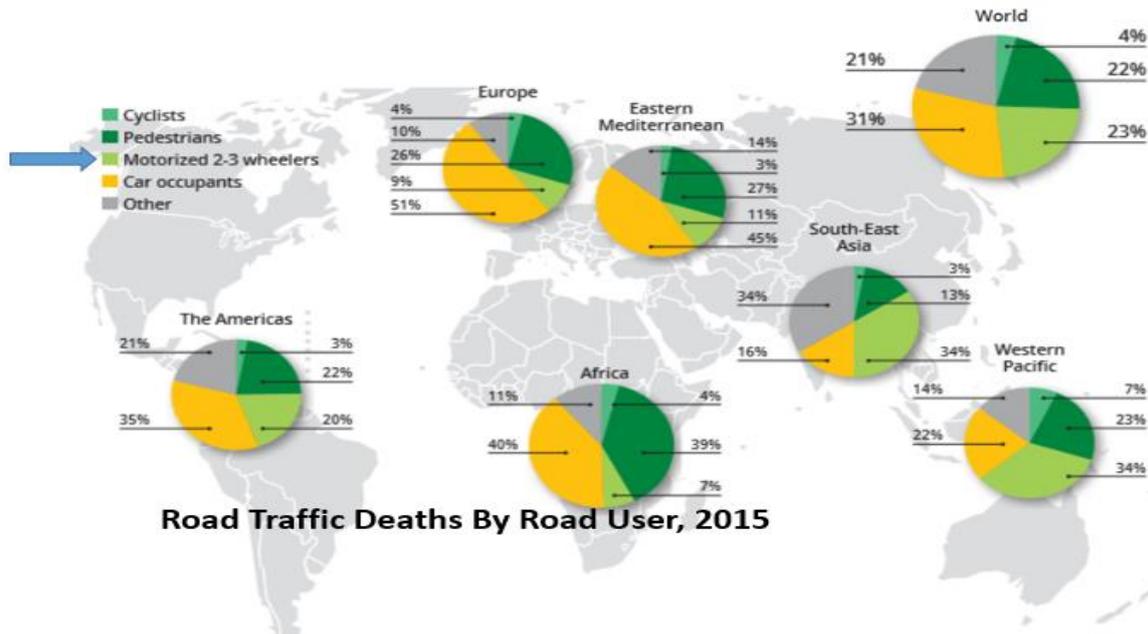
Countries showing changes in the number of road traffic deaths, 2010–2013, by country income status<sup>a</sup>



<sup>a</sup> These data represent countries that have seen more than a 2% change in their number of deaths since 2010, and excludes countries with populations under 200 000. Data shown are for 48 out of 52 participating high-income countries, 86 out of 98 middle-income countries, and all 30 participating low-income countries.

Source: WHO Global Road Safety Report, 2015

Figure 6. Graphic Information on Road Traffic Death



Source: Global Status Report on Road Safety, WHO 2015

Figure 7. Road Traffic Deaths by Road User, 2015

#### 4. THE SITUATION OF MOTORCYCLE USE AND ROAD SAFETY IN METRO MANILA

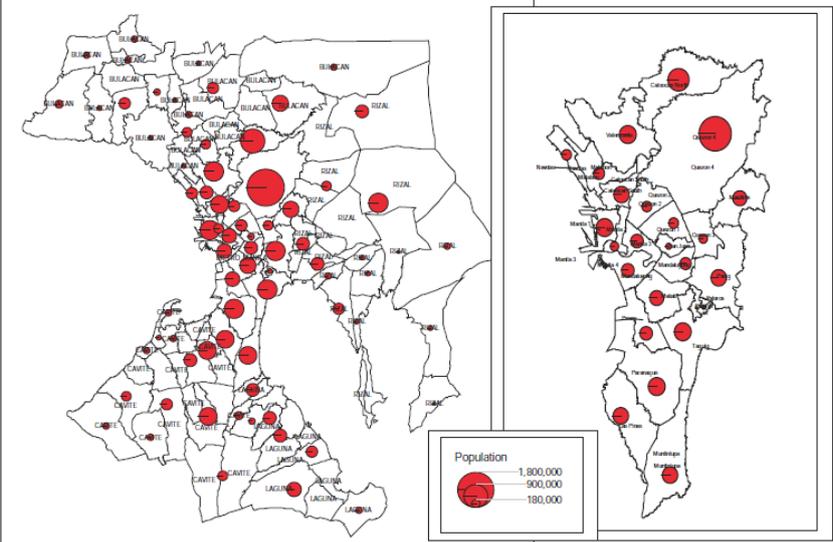
Metro Manila is located in the southwestern portion of Luzon. It is the smallest region in terms of land area occupying only 619.5 sq. km. with eighteen cities and municipalities. Metro Manila is the seat of the national government and considered as the financial, commercial, social, cultural and educational center of the country. Figure 7 showed the population of Metro Manila by its component LGUs (local government units) totalling to 12,877,253 in the latest census in 2015 with an average increase of 1.58% for the period 2010 to 2015. This is a slight decrease compared to the period 2000 to 2010.



Source: PSYE 2015

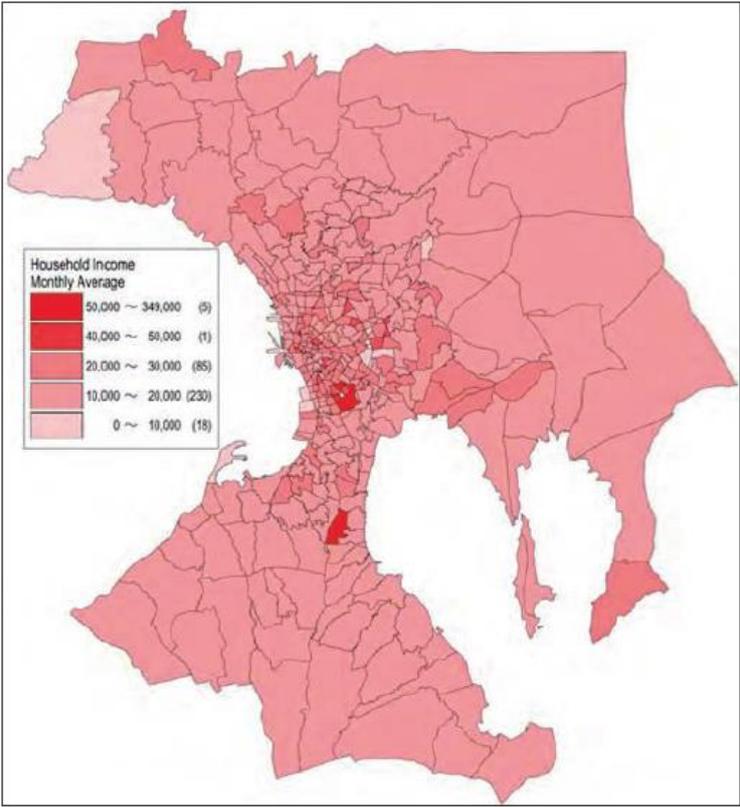
Figure 8. Metro Manila Population

The population distribution in Metro Manila and its surrounding areas is shown in Figure 9; and later this will have bearing on the distribution of motorcycle-related crashes in the metropolis. While Figure 10 provided distribution of monthly household incomes in the capital region.



Source: MUCEP, 2015

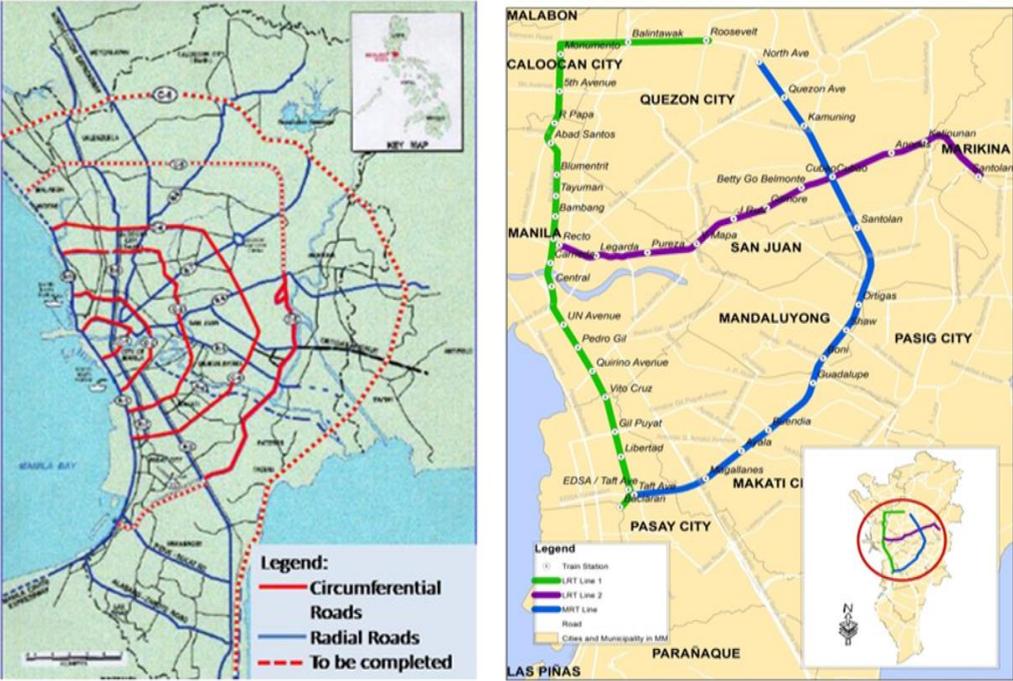
Figure 9. Population Distribution in Metro Manila and Its Surroundings



Source: MUCEP, 2015

Figure 10. Average Household Incomes in Metro Manila & Nearby Area

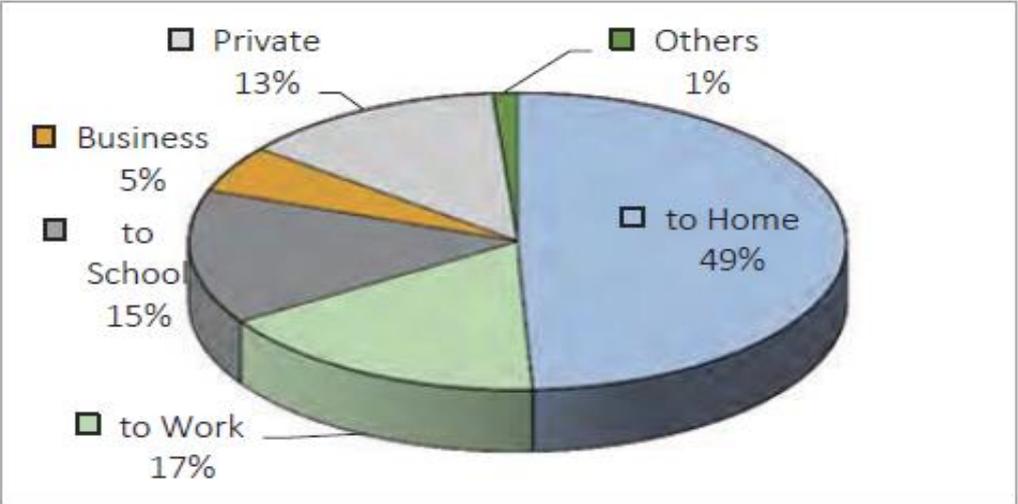
The major road network of Metro Manila and mass rail-based transit system are given in Figure 11. There are three rail-based transit system operational at the moment. A new one, being constructed along Commonwealth Avenue from San Miguel, Bulacan to North Avenue, will definitely contribute in not only improving the levels of services of Metro Manila’s transport system, but may also alleviate congestion. There is a perception that this will contribute in the reduction of motorcycle use.



Source: DPWH & DOTC

Figure 11. Metro Manila’s Transport System

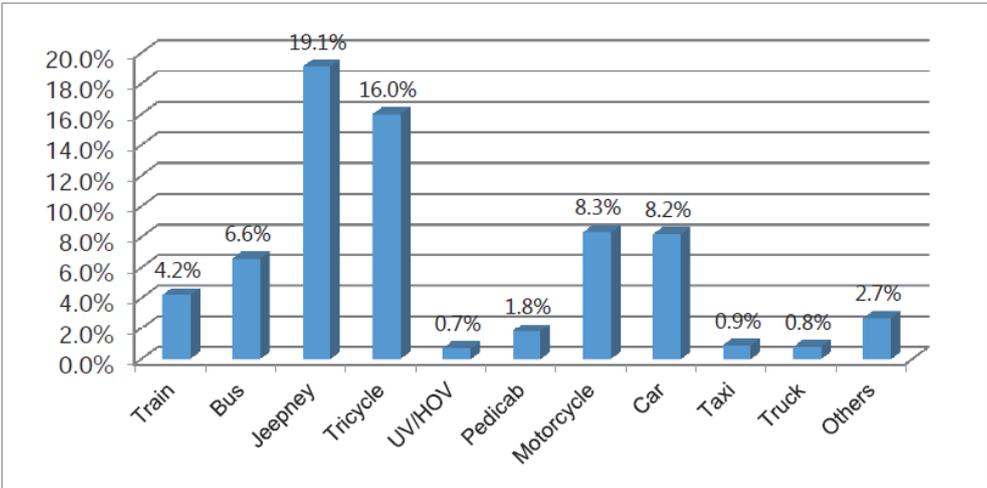
Looking at the composition of trip purposes by people in Metro Manila, (Figure 12), it is still ‘to home’ that dominates, followed by ‘to work’ and ‘to school’.



Source: MUCEP, 2015

Figure 12. Trip Purpose Composition in Metro Manila and Its Surroundings

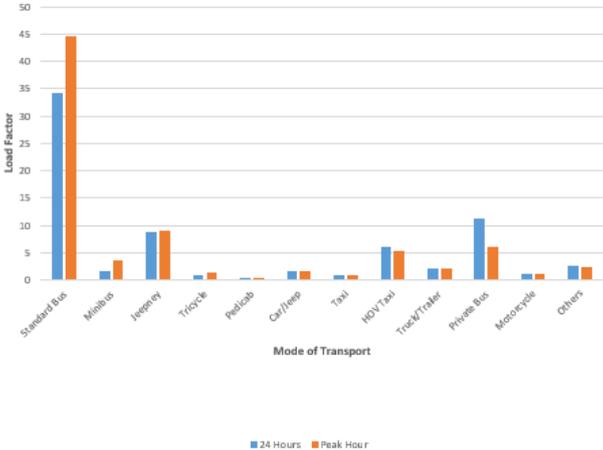
The condition of the increase in motorcycle use in Metro Manila is worth looking at, given the characteristics of Metro Manila’s transport system and indicated its significant role in the last decade, notably with the entry of cheap brands and affordable financing schemes. Flexibility in addressing traffic congestion is another factor that resulted to the sharp increase in motorcycle use for mobility and commuting. The succeeding tables showed the household income patterns and employment of motorcycle users and supported the earlier points that the users belong to the lower income households and are in the service and industrial sectors.



Source: MUCEP, 2015  
 Figure 13 Shares of Private and Public Transportation by Mode

Figure 13 showed that, combining motorcycles (8.3%) and tricycles (16%), their share on Metro Manila’s travel demand is higher than the other modes of transport. As a private mode, motorcycles slightly overtaken cars and tricycles follow second to jeepneys. Those familiar with Metro Manila’s transport system know that most of the trips by tricycles are short and mainly as access or feeder to higher occupancy vehicles such as jeepney, bus and rail-based mass transit systems (MRT and LRT). Figure 14, on the other hand, shows the load factor by mode in Metro Manila and its surroundings. The data indicated that public transport modes with high occupancies had higher factors even on both 24-hour and peak hour periods. Motorcycles and tricycles had same load factors for both periods

Mode	Load Factor	
	24 Hours	Peak Hour
Standard Bus	34.19	44.63
Minibus	1.63	3.56
Jeepney	8.84	8.96
Tricycle	0.94	1.24
Pedicab	0.14	0.34
Car/Jeep	1.58	1.57
Taxi	0.81	0.88
HOV Taxi	6.06	5.35
Truck/Trailer	2.17	2.17
Private Bus	11.28	5.96
Motorcycle	1.2	1.19
Others	2.67	2.43



Source: MUCEP, 2015  
 Figure 14. Load Factor By Mode in Metro Manila and Its Surroundings

Equating the figures above with Figure 15 would imply that motorcycle as mode of transport in Metro Manila would seem to have shorter trips, however, its coverage is extensive too. This implies that motorcycles indeed play a significant role in the mobility of people in the metropolis.

Table 3. Household Motorcycle Ownership by Household Monthly Income

		Below 15K	15K- 34999	35K- 59999	60K- 149999	150K- 299999	300K & Above	Total
<b>No. of Motorcycles Owned</b>	1	2832	1530	264	54	5	23	4708
	2	187	171	31	7	0	21	417
	3	43	29	8	2	0	21	103
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	5	4	0	1	0	0	21	26
	More than 5	6	3	0	2	0	124	135
<b>Total</b>		<b>3074</b>	<b>1743</b>	<b>306</b>	<b>65</b>	<b>5</b>	<b>231</b>	<b>5424</b>

Source: MUCEP, 2015

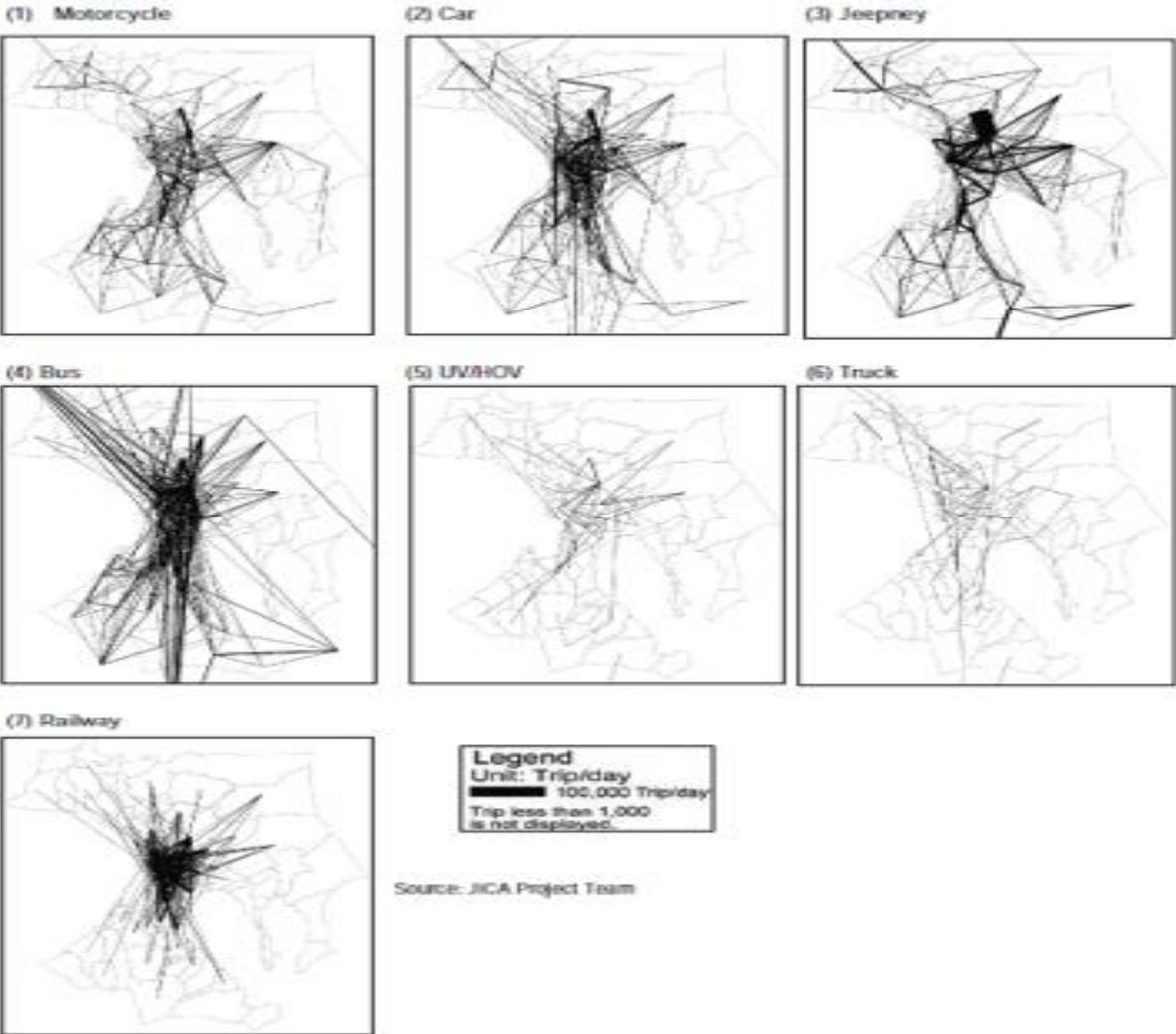
Table 4. Household Member Motorcycle Usage by Employment Sector

Employment Sector	1	2	3	More than 3	Total	%
Wholesale & Retail Trade; Repair of Motor Vehicles, Personnel & Household Goods	1889	30	6	3	1928	20.0%
Other Community, Social & Personal Services	1111	26	0	3	1140	11.8%
Transport, Storage & Comm.	1102	23	4	1	1130	11.7%
Public Admin. & Defense; Compulsory Social Security	841	16	0	1	858	8.9%
Manufacturing	812	10	0	1	823	8.5%
Construction	666	10	0	0	676	7.0%
Hotels & Restaurants	442	2	0	1	445	4.6%
Electricity, Gas & Water Supply	361	8	0	1	370	3.8%
Agriculture, Mining & Related Industries	206	9	2	1	216	2.2%
Real Estate Development, Rental and Sale	186	1	1	0	188	1.9%
Financial Intermediation	150	3	1	1	155	1.6%
Education	140	1	0	0	141	1.5%
Health & Social Work	108	1	0	1	110	1.1%
Private Households	95	0	1	0	96	1.0%
Extraterritorial Organizations	18	0	0	0	18	0.2%
Unemployed	1283	22	6	4	1315	13.6%
<b>Total</b>	<b>9410</b>	<b>162</b>	<b>21</b>	<b>18</b>	<b>9645</b>	<b>100.0%</b>
<b>%</b>	<b>97.6%</b>	<b>1.7%</b>	<b>0.2%</b>	<b>0.2%</b>	<b>100.0%</b>	

Source: MUCEP, 2015

Another growing concern that has not fully been looked at or studied is the entry of 'habal-habal', the equivalent of a motorcycle taxi, in Metro Manila, which is evident south of Metro Manila. Unlike that in Jakarta, which seems to have some regulations, in Metro Manila, there is still a need to come up with. 'Habal-habal' originated in Mindanao, in the mountainous communities where the roads are rough. It began to enter urban areas in

Mindanao for its popularity to move easily and with flexibility in congested roads and recently in Metro Manila. It is therefore worth recommending that a thorough study be done.

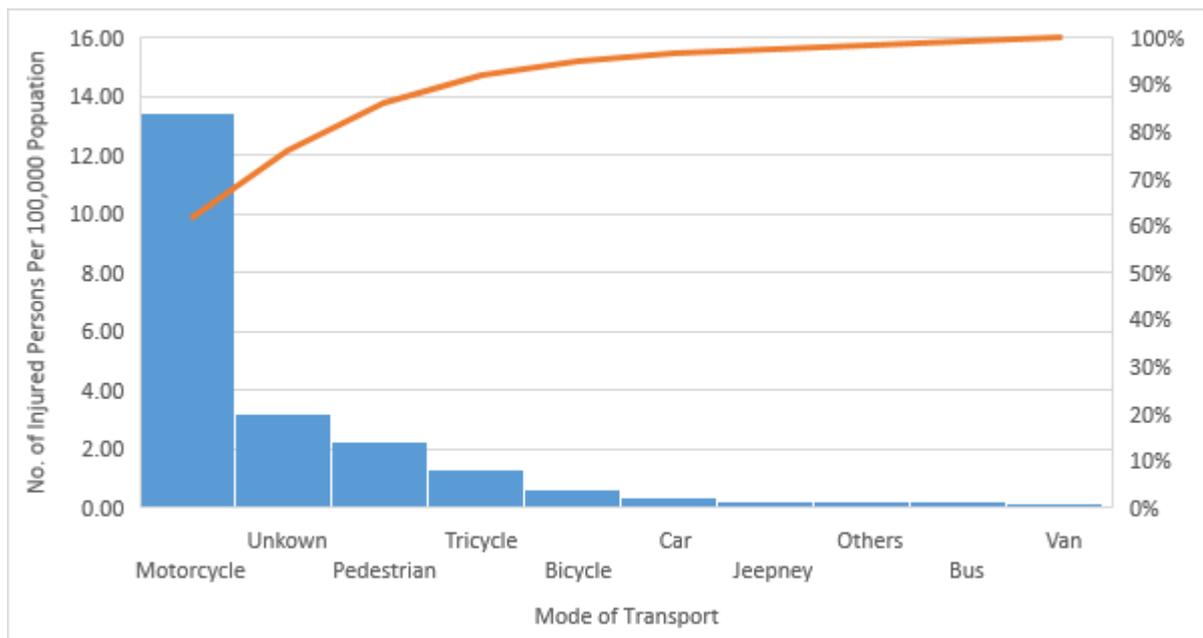


Source: MUCEP, 2015

Figure 15. Desire Line Charts by Travel Mode in Metro Manila and Its Surroundings

The discussions on the relationship of motorcycles with the mobility in Metro Manila have shown that they play a significant role in the metropolis’ transport system. Albeit this observation, the increase in motorcycle use in Metro Manila also resulted to increase in road-related crashes and accidents. Looking first at the national level, motorcycle-related crashes/accidents (Figure 16) showed the highest among the causes of vehicular crash; more so if adding tricycles. This indeed implied that the situation is alarming at the national level. In Metro Manila, where the main bulk of the motorcycles are, reflects the same observation and concern for transport policy makers, enforcers and planners. A detailed discussion on Metro Manila’s motorcycle-related crashes/accidents follows.

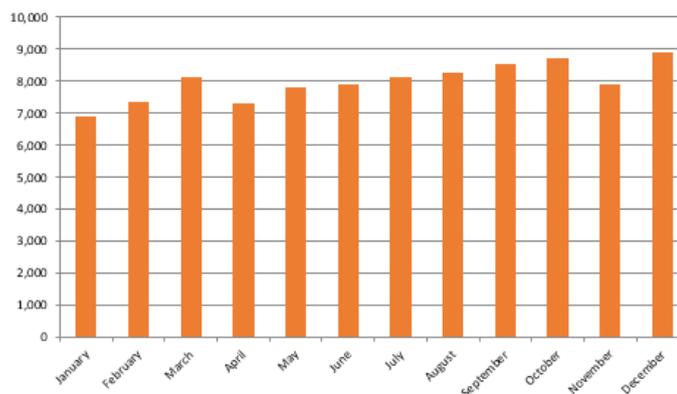
The following figures showed the statistics related to vehicular crashes in Metro Manila, indicating indeed that motorcycle-related crashes are alarming. There is a need to further look at the motorcycle users’ travel behavior and crashes relationship to come up fully with the image on crashes and motorcycle travel behavior in Metro Manila given the notion that motorcycles are becoming to be modes of transport for commuting and other trip purposes in the capital region.



Source: DOH ONEISS, 2015

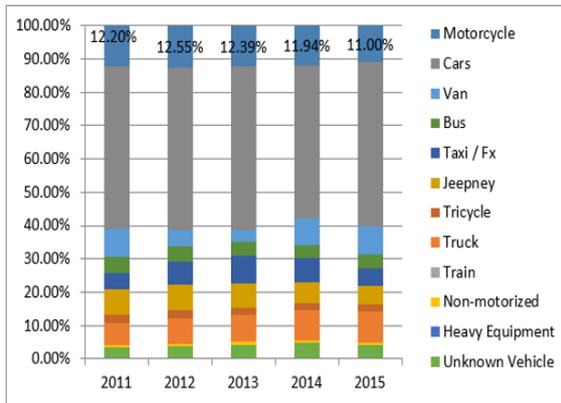
Figure 16. Distribution of Vehicular Crash Related Injured Persons by Mode of Transport, Philippines, 2015

Month	No. of Accidents
January	6,914
February	7,361
March	8,143
April	7,313
May	7,822
June	7,876
July	8,105
August	8,280
September	8,518
October	8,714
November	7,878
December	8,872
Total	95,796

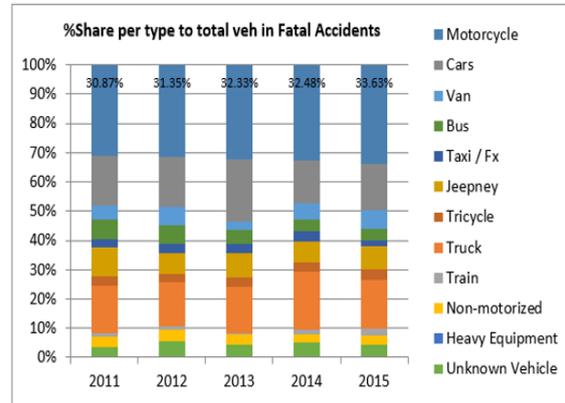


Source: MMDA, 2015

Figure 17. Total Accidents Per Month in Metro Manila



Percentage of Motorcycles to Total Vehicles Involved in Accidents

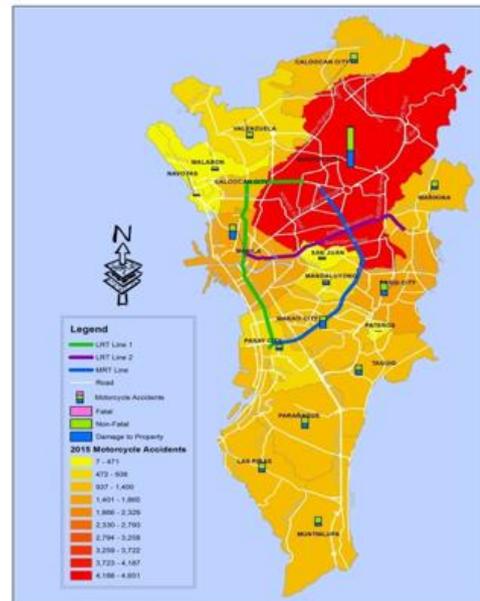


Percentage of Motorcycles to Total Vehicles Involved in Fatal Accidents

Source: MMDA, 2015

Figure 18. Percentages of Motorcycles Involved in Accidents

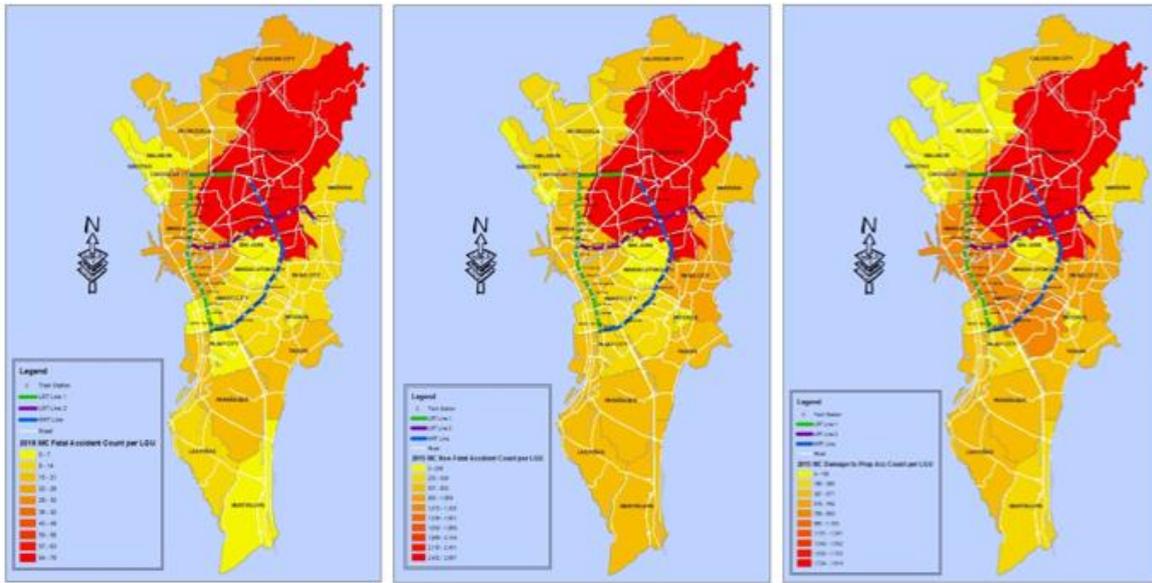
Cities	Fatal	Non-Fatal Injury	Damage to Property	Total MC Involved
Quezon	70	2,667	1,914	4,651
Mandaluyong	3	234	301	538
Marikina	14	627	311	952
Pasig	14	963	619	1,596
San Juan	1	170	127	298
Caloocan	22	696	400	1,118
Malabon	2	270	99	371
Navotas	6	125	62	193
Valenzuela	18	500	172	690
Las Piñas	11	644	393	1,048
Makati	10	492	873	1,375
Muntinlupa	7	669	347	1,023
Parañaque	17	773	529	1,319
Pasay	3	392	282	677
Pateros	0	3	4	7
Taguig	16	542	560	1,118
Manila	24	717	954	1,695
Total	238	10,484	7,947	18,669



Source: MMDA, 2015

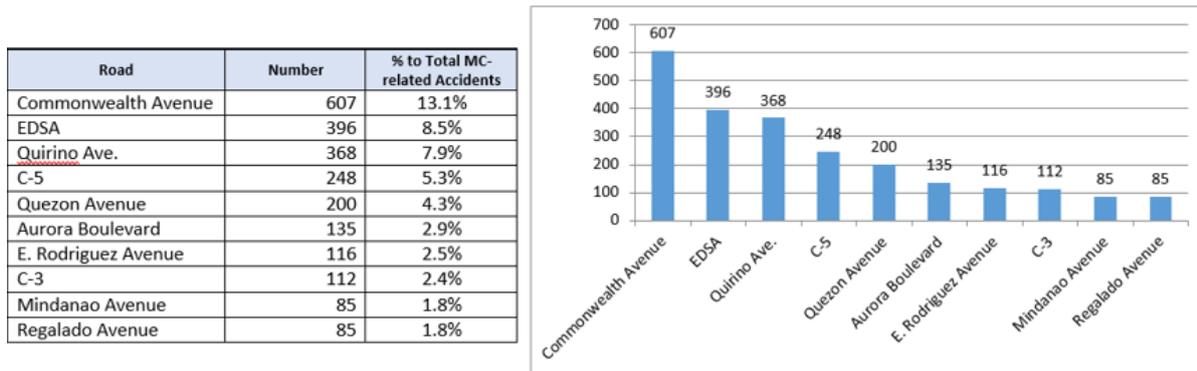
Figure 19. Distribution of Motorcycle-Related Crashes in Metro Manila

Figure 19 implied that the motorcycle crashes are in Quezon City and indeed indicated that the usage of motorcycles significantly for work trips since the city is not only the largest in terms of area, but also the concentration of service-related industries and of the government. The Figure 20 further corroborate this observation. Similarly, looking at the statistics on motorcycle crashes by road segments again indicated that these are in Quezon City.



Source: MMDA, 2015

Figure 20. Distribution of Motorcycle Accidents in MM per LGU per Classification of Accident, 2015

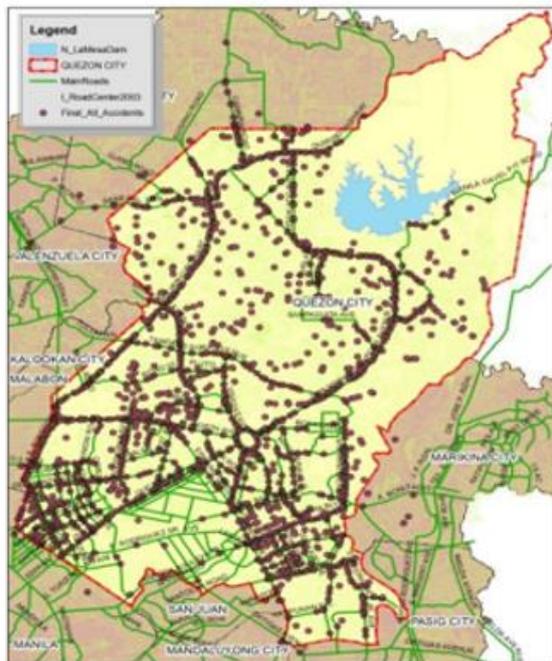


Source: MMDA, 2015

Figure 21. Top Ten Roads Where Motorcycle-Related Accidents Occurred

In a paper presented in the EASTS 2013 Conference in Taipei, Taiwan, plotted the accidents in Quezon City, where most of the accidents occurred validated and corroborated Figures 20-21 above. This is given in Figure 22. The EASTS paper of De Leon (2013), using GIS data illustrated clearly the situation. Furthermore, by supporting the EASTS paper, this paper can provide suggestions on how to come up with the policy framework.

The Black Spot Cluster Analysis employed in the EASTS paper provided an approach on how to analyze accidents using GIS data and thereby can be relevant in determining which corridors have motorcycle accidents and helpful in coming up with measures on how to address them. Some recommendations worth looking are the following, which are now being promoted – utilization of GPS devices, installation of cameras on either motorcycles or helmets of motorcycle users/drivers, improving further traffic investigation and analyses using GIS data. This paper further supports this.



Plot of Motorcycle & Tricycle Accidents in Quezon City



Plot of Motorcycle & Tricycle Fatal Accidents in Quezon City

Source: De Leon, et.al., EASTS Proceedings, 2013

Figure 22. Location of Motorcycle Accidents in Quezon City

Chikaraishi (2013), et.al. mentioned that traffic safety and mobility are interrelated, notably involving accident risks. On the other hand, Esmael (2013), et.al. noted that increasing volume of motorcycle ownership and traditional measures in addressing accidents related to motorcycles are no longer effective. This could be one plausible explanation on why the exclusive motorcycle lane introduced in Commonwealth had not reduced the rate of motorcycle related accidents. A study in Indonesia (Putranto & Rostiana, 2015) showed that socioeconomic factors, such as gender, income class and civil status, are contributory to the increase in motorcycle accidents. The same study also showed that motorcycle riders with accident history are prone to repeat the same. Relatedly, psychological factors influencing speeding intentions of car drivers and motorcycle drivers were found to be significant in formulating safety measures (Tankasem, et.al., 2015). Severity of motorcycle casualties are attributed to gender, speeding, peak hour and age (middle age) by a study in Phnom Penh (Ath Sarm and Kunnawee, 2015).

A paper, Hagen, et. al., (2016) looking at the motorcycle use for urban travel in Latin America utilizing qualitative approach is another one worth considering that can also relate closely with this paper. The Hagen (2016) paper's conclusions were basically the same with the findings of this study linking motorcycle use to mobility, socioeconomic characteristics of people and in evading congestion. The policy implications mentioned in the Hagen (2016) paper are worth mentioning for Metro Manila – need to make motorcycle travel safer and more importantly, improving public transportation. The latter would lead to modal shift and travel behaviour changes of motorcycle users. Introducing efficient mass transit systems such as BRT (Bus Rail Transit), perhaps monorail or AGT, apart from the current MRT lines being planned, will definitely decide motorcycle users to return back to or utilize public transport. This will definitely not only contribute to reducing motorcycle presence on the roads of Metro Manila, but also improve road safety.

Enhanced road safety motorcycle policy framework for Metro Manila is given in Figure 4.15, which highlights the introduction or promotion of public transport system, anchored on mass transit system, is hereby recommended.

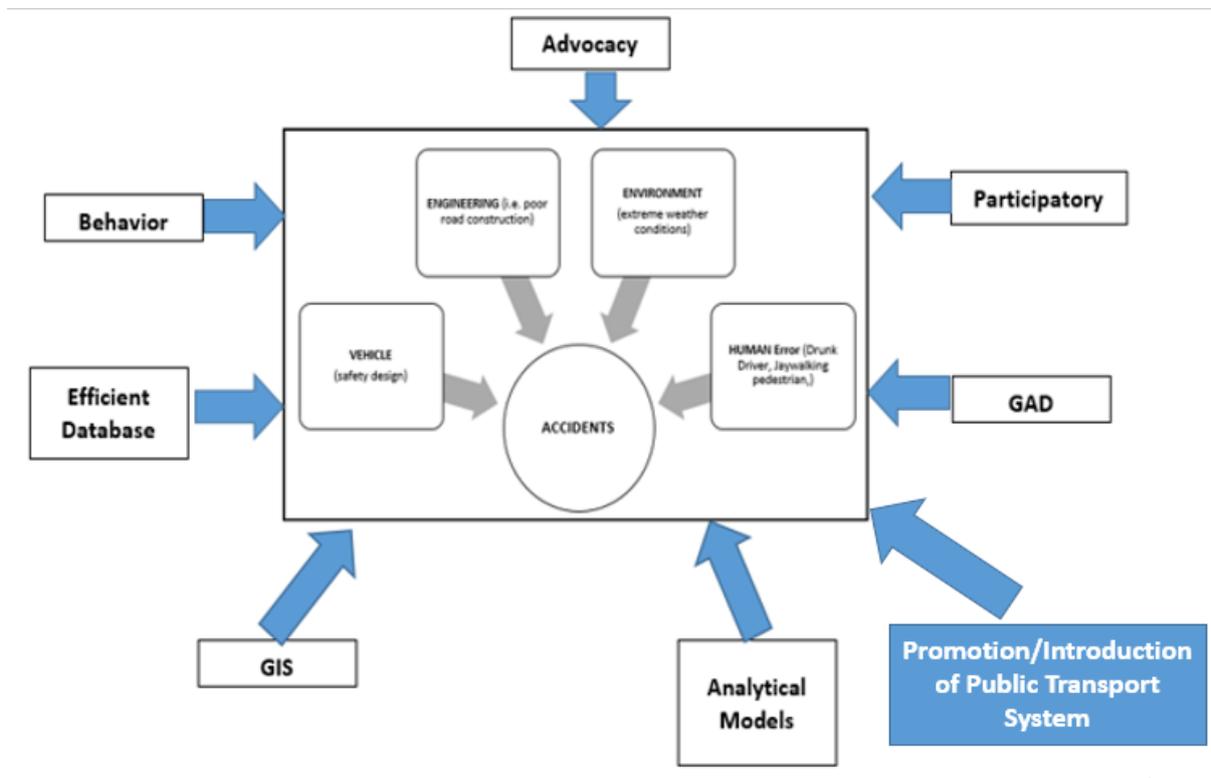


Figure 23. Enhanced Motorcycle Road Safety Policy Framework

The enhanced road safety policy framework, therefore, include the following:

- a) advocacy in the form of social media information dissemination;
- b) considering behavioral factors anchored on human understanding of the veracity of road safety in the context of motorcycle accidents;
- c) participatory approach in support of the above;
- d) efficient database collection and management;
- e) enhanced application of GIS;
- f) inclusion of GAD in the motorcycle road safety framework;
- g) application of analytical modeling that is responsive to Metro Manila environment; and more importantly,
- h) promotion and introduction of public transport system.

Proper information dissemination is essential in formulating the policy framework. With this view, recommendations on how to tap civil organizations for advocacy and active participation in information dissemination will be considered. Similarly, tapping social media, through the development of apps for smart phones, tablets and gadgets, is among the technological innovations that can be introduced. Human dissemination, through the *bayanihan* (term referring to community participation) is another relevant approach. For this purpose, guidelines, information kits and related materials can be developed highlighting the magnanimity and cost of motorcycle accidents.

Relatedly, considering behavioral aspects anchored on human understanding on the veracity of road safety will significantly contribute in minimizing accidents. Understanding

human behavior of motorcycle drivers and passengers is useful in crafting safety rules and regulations and in developing safety gears, especially helmets. Incorporating human behavior in the design and the appropriate understanding of the importance of safety gears is very important. Filipino motorcycle drivers will carefully handle their safety gears and know the proper usage and as such discourage the habit of not using the gears, especially the helmets. Participatory approach indicates that all sectors must be part of the advocacy on improving safety and reduction of motorcycle-related accidents. The communities, notably barangays, peoples' organizations and civic groups can join hands in promoting the advocacy for road safety for motorcycle driving. Reputable and big civic groups, such as Rotary Club, Jaycees and Lions Club can spearhead in coming up with advocacy programs, including information dissemination and training of motorcycle drivers' associations.

It is important to reiterate the recommendation of the previous study to come up with efficient database collection and management. To this end, detailed socioeconomic information, as well as including data on how the motorcycles were purchased and the financing schemes, is recommended. These data are relevant in framing policies and strategies anchored on the human and socioeconomic behaviors of motorcycle drivers. By providing spatial information through GIS, not only technical and engineering strategies can be formulated. Perhaps, it can facilitate deeper analyses on the relation of land use to the spatial distribution of accidents. Installing GPS devices on motorcycles and cameras on the them or on the helmets of users will be of aid in this regard.

Considering GAD in the motorcycle road safety framework is relevant and important. Consistent with the GAD framework/guidelines, it will ensure inclusiveness of the policy framework. The requirements of all sectors (women, senior citizens, PWDs) and standards, as mandated in the GAD guidelines, will be considered. This will especially apply in the development of safety facilities and gears. The same will be undertaken on the responsive information dissemination.

Finally, the promotion and/or introduction of public transport systems, such as mass transit systems, is perhaps a more tangible medium to long term approach in addressing motorcycle road safety. It is also suggested that the 'habal-habal' and other growing motorcycle-driven transport modes be examined and assessed on whether they have different travel behavior in relation to road accidents and as such appropriate policy directions be recommended. Recently, it is observed that such modes are being employed for various deliveries by small establishments, such as food stores, restaurants, private companies, etc. It is further recommended that motorcycle taxi systems in metropolitan regions of other ASEAN countries, like Jakarta be looked at to learn from their experiences on how they address motorcycle accidents related to such systems and what policies and strategies they introduced.

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