Motorcycles Growth and Its Impacts to Urban Transportation

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Abstract: Indonesia is the third biggest motorcycles market in the world after China and India. In the year 2007, population of motorcycles in Indonesia reached 37 million units, equivalent to 78.3% of total the vehicle population. Motorcycles producers have expanded their capacities to meet domestic and overseas markets. Motorcycles dealers and agents were intensively market and distribute their products at time when urban public transport services paralyzed. Social and economic impacts of motorcycles industry may include: economics growth, traffic accident, traffic jam and the environment impacts. There is a complicated causality, amongst involving sectors, starting from motorcycles ownership, usage, growth and impact generated by motorcycles. This paper recommends some feasible policies to control motorcycles negative impact. Also, motorcycles growth and usage need to be restricted, effective policy instruments should be sought to minimize risk and protect the public interests. Some research agendas for the continuation of the study are outlined.

Key Words: motorcycle, safety, control

1. BACKGROUND

Indonesia is the third largest motorcycles market in the world, after China and India. In 2007, the population of motorcycles reached approximately 37 million of units or equal to 78.3% of total private and public vehicles. For motorcycles producers, which dominated by Japanese producers, Indonesia is very attractive market, therefore attracted them to completely establish manufactures to fulfill domestic and foreign demand, simultaneously the sales forces are aggressively push the promotion.

Based on data from Indonesian Motorcycles Association (AISI, 2007), the production of motorcycles in 1997, just before monetary crisis, was 1,852,906 units. After the crisis, the number significantly decreased by approximately 21%. Backward in economic condition had resulted significant decrease in motorcycles production to just 517,914 units in 1998 and 584,114 units in 1999. In 2002, the population was 18,061,414 units, and reached 40,205,230 in 2006. Nowadays, it has reached 45 millions units. With this 21% growth of motorcycles, the number of motorcycles found in urban areas will be enormous. This also followed by the growth of cars in urban areas. What policies should be taken to reduce the risks and safety vulnerability, also social and environment impacts caused by the above phenomena?

This paper tries to outline the result of motorcycles phenomena study, overlooking the causal relationship of reasons for the significant growth, and impacts caused by it. Recommendations to reduce the risks resulted from motorcycles use, and some continuous studies are also outlined in this paper.
2. THE GROWTH TREND OF MOTOCYCLES

For The Ministry of Industry, expansion in motorcycles industry is one the priority aspects in national industrial development policies. The data from the ministry showed that in 2007, the number of motorcycles produced was 4,772,521 units, while sales at the same time was 4,688,264 units. The sales then jumped by 32.6% in 2008 to 6,215,865 units. The growth rate of motorcycles production from 2001 until 2007 reached 26%, and the sales growth at the same period was 29.2%. Figure 1 and Table 1 below provide the production and sales numbers of motorcycles from 2001 until 2008. Figure 2 shows the market shares of major producers in 2008.

![Figure 1 Production and Sales of Motorcycles](image)

**Table 1 Production and Sales of Motorcycles**

<table>
<thead>
<tr>
<th>NOTES</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2007</th>
<th>2008</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRODUCTION</td>
<td>1,390,449</td>
<td>2,453,966</td>
<td>2,830,536</td>
<td>4,200,000</td>
<td>5,113,487</td>
<td>4,458,886</td>
<td>4,772,521</td>
<td></td>
</tr>
<tr>
<td>SALES</td>
<td>1,203,508</td>
<td>2,351,328</td>
<td>2,823,703</td>
<td>4,100,000</td>
<td>5,089,425</td>
<td>4,428,274</td>
<td>4,688,264</td>
<td>6,215,865</td>
</tr>
</tbody>
</table>

![Figure 2 Market Shares of Major Producers](image)
Motorcycles industrial policies in Indonesia which prepared by clear vision of The Ministry of Industry, is to take Indonesia to be the automotive industrial base and world class spare parts producers. The missions are (1) strengthening automotive industrial structure through industrial component capability and technological infrastructure improvements and (2) improve automotive industrial competitiveness through development of human resources quality and industrial management.

Development of automotive industrial policies (motorcycles) is further explained in production industrial target policies goals, sales and exports until the year 2025, in that year, motorcycles production is expected to reach 7,575,000 units, sales is expected to reach 7,524,000 units and export to reach 51,000 units. Ultimate destination of the development of automotive industrial policies (motorcycles) is to take Indonesia to conquer world class production base, technological mastering and component industry capability.

From marketing perception, Indonesia has to expand domestic market and stimulate export, expand market information network, and increase promotion. Population of motorcycles in Indonesia is expected will not have reached maturity stage in which the growth would not be as significantly as the growth phase during 2000 until 2007. This may occur in another 20 years to come. However, when it eventually occurred, the number of motorcycles in urban areas in Indonesia will be unimaginable. Figure 3 shows the major cities in Indonesia such as Jakarta, has not reached maturity stage in motorcycles growth. Taiwan has the highest motorcycles population by 555 units per 1000 people, while in its capital Taipei 338, Ho Chi Minh reaches 380, Jakarta 339, nationally Indonesia has 168 units per 1000 people.
known to be properly managed (Hsu, 2003). Compare to Indonesia which only has just reached 165 units per 1000 people. It means that Indonesia still has a possibility to reach 555 units per 1000 people or almost 4 times of the current motorcycles maturity level in Indonesia. To reach 500 units per 1000 people may take another 20 years.

![Figure 4 Typical trajectory of motorcycles growth](image)

### 3. WHY MOTORCYCLES HAVE TO BE CONTROLLED?

Main issues listed of why motorcycles have to be controlled: (1) safety, (2) Traffic discipline, (3) economy, (4) environment, specially air pollution and noise. Problems occurred from motorcycles use was started from continually escalation of motorcycles. Some factors are causing the escalation, included, easiness to purchase motorcycles, population growth, and people’s purchasing power, perception of benefits gained in riding motorcycles compared to public transport or cars.

Issue in traffic accidents involving motorcycles is not the only main issue of the impacts caused by the escalation of motorcycles use in urban areas, but has already expanded to become national transportation safety issue. This aroused as a result of the fact in considerably rising number of accidents involving motorcycles compared with other vehicles (cars, public transports, air transport, railway, sea transport). One out of three motorcycles accidents has led to fatality, 65% of traffic accidents involving motorcycles. Generally the main causes of the accidents were indiscipline behaviors of motorcycles riders, added by physically unprotected characteristic of motorcycles provides greater vulnerability and risk towards the riders if any accident should occurred. Figure 5 provides examples of how indiscipline the riders’ daily behaviors are, carrying people more than the capacity, under age rider.

Economically motorcycles is a travel solution for middle to low class people, this may acceptable, as to logic perception that believes the increasing of motorcycles production will lead to higher national income and employment rate.
Although the economic contribution of motorcycles industry and their uses are significant, there are contradictive facts, which are number of accidents involving motorcycles riders, traffic congestions air pollution which can be harmful to health, urban criminalities, and other following negative impacts.

65% of 30,000 traffic accidents were involving motorcycles. Data gathered from National Police, in 2000, accidents involving passenger’s cars were 4,395 causalities and motorcycles were 5,961 casualties. In 2005, accidents involving passengers cars were 5,795 casualties and motorcycles were 19,000 casualties. It means that in a period of 2000 until 2005, the number of accidents involving motorcycles had increased by 3 (three) times. One out of three accidents led to fatality.

Excessive use of motorcycles provides traffic congestion, although it is not the only factor causing traffic congestion. Problem in traffic congestion is caused by some factors below:

- High growth in private vehicles.
- Behaviors of road users, indiscipline behaviors are the reason for congestion
- Traffic congestion are not only caused by motorcycles, but also private vehicles drivers
- Road constructions do not effectively reduce congestion, because they are growing slowly, while private vehicles are growing significantly, public transportation optimizing would be a more effective policy.
- Many barriers in road-sides such as: road-sides are used for parking space, trading (PLK) etc.

Figure 6 below describes daily situation in some road sides in Bandung City, the mix of motorcycles and other vehicles will be more possibly to create congestion, the functions of road supporting facilities are transferred, sidewalk and vehicles line are transferred into motorcycles parking spaces.
Environmental issues are generally caused by traffic and industrial activities. Dominant pollutants created by traffic and industrial activities are CO, SOx, NOx, THC (Total Hydro Carbon), and TSP (Total Suspended Particulate) or particulate dust. Environmental problems caused by motorcycles use need to be done in a separate specific exploration.

Escalation population of motorcycles is affected by some factors. Those factors are society purchasing power, accessibility of road infrastructures as transportation medium origin and easier to reach destination, comparison benefits of flexibility in motorcycles with level of service quality in public transportation, even cars.

To anticipate the escalation of motorcycles population in the next 10 years which expected to continuously increase and potentially will create new problems, policy issues faced will automatically be how to limit motorcycles ownerships, together with reducing people’s desire to own and to use motorcycles, and also re-manage traffic in sidelines.

4. ACCIDENTS INVOLVING MOTORCYCLES IN INDONESIA

According to Asian Development Bank (2002), there had been serious problems regarding road transportation safety in several developing countries, included Indonesia. There are some factors causing such issue, one of them is significant growth of motorcycles in those countries. Moreover, some studies also indicated that traffic accidents involving motorcycles which led to fatalities had placed a big portion from total accidents.

In Indonesia, during Idul Fitri in 2008, in period of 25th September until 4th October 2008, accidents reached 1,258 occurrences. From those accidents, those which involving motorcycles ranked first and counted to 836 occurrences, followed by cars with 219 occurrences. Accidents which led to fatality reached 427 people killed, 524 heavily injured and 884 people with minor injuries.

5. PROFILES OF MOTORCYCLES’ USERS
Surveys have been conducted to obtain descriptions of motorcycles’ uses. Questions were addressed toward respondents of the purposes and reasons in using motorcycles. These questions were sharpened by comparing motorcycles’ use to public transportation in DKI Jakarta area. The comparison aimed to measure comparative advantage of motorcycles to public transportation. The number of respondents was 705 persons, dispersed in Jabotabek area.

5.1 Trip Purpose
Travel destination of motorcyclists is described in Figure 7. Based on survey, it is identified that most of the trip purpose of motorcyclists in Jabotabek area is to work places (56%). It means that motorcycles are used by society as travel mode to accommodate their social and economic activities, besides macro economically, motorcycles also significantly contribute to national and regional economic activities.

![Figure 7 Trip Purposes of Motorcyclists](image)

5.2 Reasons of Motorcycles’ Uses
Generally, reasons for people to use motorcycles are: (1) economize (2) flexible (3) poor public transportation services and (4) easy to be obtained. Based on the survey, economize is the main reason for people to choose motorcycles as travel mode. Motorcycles have economic advantage in fuel expense compared to other travel modes. This is the main reason due to economic considerations of Indonesian society whose majority incomes are in medium to low level. Figure 8 shows the survey’s result of society’s reasons for using motorcycles.
5.3 Reasons for Choosing Public Transportations Compared to Motorcycles

Surveys also indicated other interesting result of choosing public transportation by motorcyclists. The survey was conducted in Jabotabek area to measure performance of public transportation, profile of respondents were Busway TransJakarta and/or train (KRL) users. The survey’s result can be used as recommendations for government to improve performance of public transportation as alternative policy to control motorcycles’ use. The survey was conducted in particular places like train station, and bus stops. From the survey’s result, see Figure 9, the reasons for choosing bus way and train compared to motorcycles are (1) travel time (2) travel length (3) economize (4) avoiding congestions (5) safety and (6) comfort. The reason of avoiding congestions (30%) is the main reason of choosing bus way/train compared to motorcycles. Improvement in public transportation while reducing congestion, is also capable to reduce the growth level of motorcycles’ use as it is a main travel alternative for people.

Choice of public transportation compared to motorcycles does not mean that public transportation performances are better than motorcycles. Figure 10 explains the performance...
of public transportation from motorcycles riders' perceptions. Assessment result of respondents toward public transportation (bus way and train): (1) not good & less good: 57% and (2) good & very good: 43%.

Figure 10 Performance of Public Transportation Services (Motorcyclists’ Perceptions)

Figure 11 provides survey’s result of people perceptions toward public transportation. This survey was done to identify the performance of public transportation according to motorcycles’ users. Negative perceptions can be the reason for people of not to choose bus way and train as their travel modes and stay with motorcycles. Respondent’s assessments toward public transportation (bus way and train) themselves are (1) expensive (2) uncomfortable (3) not safe (4) do not guarantee in safety (5) congestion. For long distance, although public transportation services are relatively poor, bus way and train are still the main choices for motorcycles ‘riders.

Figure 11 Reasons for Poor Performance of Public Transportation Services
5.4 The Costs of Motorcycles Use and Public Transportation

Table 2 explains the average expenses of motorcycles and public transportation in periods of 1 month and 1 day. As explained earlier that the main reason of motorcycles’ choice is to reduce transportation cost. Table 1 explains that motorcycles are averagely cheaper in expenses compared to public transportation. Average monthly economizing is 37.7%.

Table 2 Average expense of motorcycles and Public Transportation

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<tr>
<td>Average Monthly Motors</td>
<td>157,444</td>
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<tr>
<td>Average Daily Motors</td>
<td>5,248</td>
</tr>
<tr>
<td>Average Monthly Public</td>
<td>252,966</td>
</tr>
<tr>
<td>Average Daily Public</td>
<td>8,432</td>
</tr>
<tr>
<td>Percentage of Motors</td>
<td>37.76%</td>
</tr>
</tbody>
</table>

Lisra (2006) examined operational cost of motorcycles, found that average travel cost by using motorcycles is Rp 1.055/km included time cost, if not included average time cost is to be Rp. 757/km, see Figure 12. Found that the biggest item of operational cost of motorcycles is time cost (28.38%), then fuel (24.55%), depreciation (12.71%) and accident (16.62%). Without time value, the ranking would be fuel (34.28%), accident (23.21%), depreciation (17.75%) and parking (11.83%).

6. THE EFFECTS OF MOTORCYCLES’ USE

To make such policy to solve the impacts of motorcycles’ escalation, one has to start from relationship mapping between current impacts and policies that affecting the rapid growth of motorcycles. Mapping is done through analyzing of sectors which related toward the occurrence of traffic problems. Mental map of growth and effects of motorcycles’ use are shown in Figure 13 which explains the causal loop, causal relationships among sectors or variables.

The impacts of excessive growth of motorcycles cover traffic effects, environment and safety. Impacts are occurred at time when motorcycles are being operated for social and economic activities. In reality, the final destination of motorcycles’ use is to do the social and economic
activities that provide benefits toward economic growth. The more people are willing to use motorcycles will pursue people to purchase and own motorcycles. People’s desires to own motorcycles provide incentive to producers to produce more and competitively distribute and sell motorcycles with the only intention of gaining economic and business margins. This causal relationship has a circling characteristic and has snowball effect. It mans that growths of ownership and use of motorcycles will continually grow. This will cause the impacts of the use of motorcycles to continue rising, simultaneously with the growths of ownership and use of motorcycles. Without restriction, in some period of time, there will be fatal and acute impacts, where only radical policies can be taken to effectively solve these motorcycles' problems.

Figure 13 Mental Map of Growth and Impacts of Motorcycles

Figure 13 also explains the benefits of motorcycles’ use growth. With the growth of motorcycles’ use, the benefit resulted is improvement in economic growth. Conditions in reality is where there is improvements in economic growth which lead to better incomes, some of the people will tend to buy motorcycles, on the other side, if working opportunities are then created as a result of motorcycles industry, it will lead workers to do some travels, some of them choose to own and use motorcycles.

This is a dilemma for the government, where in one side supporting motorcycles’ industry will give incentives for economic growth; however on the other side the excessive use of motorcycles has provided negative impacts, such as traffic accident, air pollution. In policies side, it should be a trade off and assessments up to planned or desired combination level of impacts.

From the above phenomena, it offers some interesting research materials to design decisional variables interventions among sectors to solve such motorcycles’ phenomena toward a more desired condition, compared if there are no interventions at all or business as usual. One of the approaches that can be used is by using system dynamic frame, which exploration is now being prepared in further study of this motorcycles’ control.

The significant growth of motorcycles actually is a form of “resistance” of society to overcome public transportation problems. Motorcycles however offer travel solution, especially in short-distance traveling. One of these resistances is by using motorcycles as main travel mode in urban areas, and its trip length pattern is increasingly crossing over neighbor cities.
Up until now, conditions of public transportation in Indonesia, especially in big cities are still in terrible conditions, as they have not been priority policy in order to provide public services, even in many events are used as incomes generator for local governments. Not only in its service side in which the situation is terrible, but also the unreachable tariff, safety, security, sexual harassment are happening in public transportation services, attract doubts in the future continuity of public services. Society as the consumers of public transportation almost can not do anything to claim the poorness of such transportation service, even after they have fulfilled their obligations to pay taxes.

Growing use of motorcycles, beside as a result of poor public transportation infrastructures, also caused by other factors, includes:
- Massive promotions by motorcycles producers. In 2008, according to AC Nielsen, motorcycles’ promotions in mass media have reached Rp 1.9 trillions, second place just after cellular advertisement. However, the promotions did not consider the safety impacts, as they more concerned in showing up the speed factor. From this, question rouse is whether to control and restrict motorcycles’ advertisement, as it similarly done toward cigarette and tobacco industries.
- Many “access” are available and offered by financing agents toward consumers to own motorcycles. In fact those access are only traps, on the other side requirement of motorcycles’ financing agents establishments were sometimes did not fulfilled the existing regulations.
- Loose permission from National Police to provide driving license and traffic law enforcement post obtaining the license. License is only treated as another ID card; license can be obtained by providing the copy of ID card with age limit of 16 years old.

Nevertheless, motorcycles are not ideal transportation mode, as their dangerous and have vulnerable physical characteristics. Therefore, problem control in the use of motorcycles in urban areas is needed. Strategic steps can be taken are, amongst others:
- Improved public transportation services in such ways so there would be better public transportation which reachable, safe, comfort and integrated.
- Introduce measure to control and monitor motorcycles production and marketing so there will not be excessive impacts to the society.

7. ALTERNATIVE POLICY TO SOLVE MOTORCYCLES’ USE PROBLEMS

Socialization and education that currently being delivered by motorcycles’ producers and dealers or even the government, etc, Ministry of Transportation, are proven to have not been able to reduce the number of accidents regarding motorcycles. Solving the motorcycles’ problems does not fall to government’s responsibility only or producers/dealers or police only, however to solve them, has to be done by all parties and treated as a collective responsibility toward the safety of Indonesian people.
Some policy instruments in order to solve the impacts of motorcycles can be listed as followed:

1. Optional regulations to solve the rapid growth of motorcycles’ number
   - Restriction of Motorcycles entry in some particular corridors
   - Limitation of free motorcycles areas in urban area
   - Avoiding parking space in some areas
   - Road pricing for cars and motorcycles if entering the city’s centers
   - Tight procedure to obtain driving license
   - Tight leasing access to obtain motorcycles
- Age limit for motorcycles’ riders

2. Optional regulations to solve traffic congestion and accidents.
   - Construction of special line for motorcycles (Umar, dkk. 2005; Hsu, 2003)
   - Left line use
   - Speed limit in road line
   - Traffic management in intersections (double stages crossing system, as in Taiwan)
   - Use of Helmet
   - Continuing and reinforce regulations of headlamp during the day
   - Age limit for motorcyclist, only those who already in senior high school (equivalent) are permitted, those who are still in junior high school are not, considering that level of maturity is more important for motorcycles’ users compared to cars’

Factors supporting the policy are education, socialization through foundation or Motorcycles Controlling Forum. To solve the impacts of motorcycles in urban areas, there should be cooperation among all involved parties. As a start, there has to be a forum embryo consisting of those who are concerned and closely monitor the policies concerning these motorcycles’ impacts. The forum would then involve government sectors (Ministry of Transportation, National Police, and Ministry of Industry), academicians, producers association, society/community of users and LSM. Task and function of the forum would then to gather and mobilize resources in society as an engine to solve the impacts of motorcycles. Private entities through allocation of Corporate Social responsibility (CSR) can be sponsors of the forum or similar foundation. With this forum, the solution of the motorcycles problems would then be focused and directed to what have been hoped by the society.

8. CONCLUSION AND RECOMMENDATIONS

As a big motorcycles market, Indonesia is facing problem of the impacts of motorcycles use, such as accidents, traffic congestion and air pollution. From traffic safety aspect, the number of accident involving motorcycles’ riders is very high, exceeding number of accidents involving other land, sea and air modes. The potential problems will continually escalate, as the number of motorcycle per 1000 people in Indonesia is still relatively lower compared with those in Vietnam, Thailand, Malaysia and Taiwan.
Based on survey result of the use of motorcycles, motorcycle provides advantage compared other transportation modes. Motorcycle is relatively cheaper in fuel expense, flexible and easy to be obtained. Poor public transportation services provide reasons for people to use motorcycles, beside supported by the easiness to own motorcycles as advertised by agents/dealers. Urgent aspect is if it possible, the government has to immediately improve the public transportation services which in certain period will reduce the growth of motorcycles’ use.

Based on factors analysis that causing motorcycles growth, many factors caused the growth of ownership and use of motorcycles and all of those are correlated with the increasing magnitude of traffic problems, environment and safety. Recommendation for further study, need to prepare guidance, covering (1) Technical plan of operational control of motorcycles in urban areas and (2) Motorcycles control in main roads in urban areas. Technical plan and guidance are concerned more to options and traffic management design, started with pilot project in a particular urban area. The pilot project is a base for future implementation of motorcycles’ traffic management design in all urban areas in Indonesia

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