

Road Traffic Accident Trend in Developing Countries- The Policy Implications

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Abstract: About 1.3 million lose their life worldwide, and this is set to double by 2030 if status quo continues. It is the developing countries which account for overwhelming part of the current fatalities, and forecasted accident fatalities. There are local as well global initiatives to address the safety issues, in developing countries in particular. However, there are emerging issues in developing countries that may result in safety trend different from that of industrialized countries. This has huge policy implication as it may make innovative measures inevitable. Therefore, to address the safety issues effectively it is necessary to grasp its nature and trend in developing countries. This paper analyses the dynamics in traffic accident trend in Asian countries, re-evaluates the current traffic safety approaches for strategic policy recommendations for emerging trends in the region.

Key Words: Road Safety, Safety trend, Safety strategies, Transport system

1. INTRODUCTION

Developing countries, where 90% of the world road accident fatalities occur (WHO. 2009), are recently trying to set up long-term strategies to address their safety issues. Southeast Asia alone contributes to over 20% of the reported world road accident fatalities. Motorcycle remains a major safety challenge in this region. Motorcycle users make 60% or more of the road accident fatalities in countries such as Thailand, Indonesia or Malaysia. The discussion on road safety in developing countries, including the Asian ones, focus mainly on lack of legislations, laxity in their reinforcement, poorness of the infrastructure or emergency service system. Currently, overwhelming majority of Asian developing countries has introduced prominent safety legislations: helmet, seatbelt, and drink driving laws are adopted by 95%, 87%, 88%, of Asian developing countries respectively, as the survey conducted by the WHO confirms. The effectiveness of the implementation of the measures, however, is questionable. Only 30% of the motorcycle pillions wear helmet in Thailand and half of the Malaysian in rural area don't wear helmets, for example. The same can be said on others safety measures such as seatbelt wearing rate or drink-driving.

Developing Asians countries, like many others, are mainly focusing on traditional safety measures mentioned above, emphasizing the wide gap that exits relative to the industrialized

countries. While improving compliance rate is importance, there is a risk that may arise from ignoring the socio-economic constraint and too much concentration on just traditional measures. This may limit the opportunity of developing countries to take innovative measures to address their unique nature, or use opportunities that industrialized countries may have missed in their course of development. More importantly, developing countries risk of failing to address new safety trend emerging in these countries.

Asian developing countries are facing unprecedented motorcycle growth, with the risk becoming dominant in the transport system. However, there is no clear vision of how to handle this new trend, or its subsequent road safety issues. Some local governments in China are restricting the motorcycle use, while others such as Malaysia see the motorcycle issue manageable and trying to accommodate in the transport system. Many more countries are facing the dilemma, of whether they should accommodate the motorcycle or restrict it to improve safety, beside other traditional measures. There is also pending questions on the extent that accommodative-based intervention approaches could improve motorcycle safety. The long-term implications of accommodative approaches, in contrast to other opportunities available at this early stage of development, to influence the transport system and the safety are not clear yet.

2. RESEARCH OBJECTIVE AND METHODOLOGY

This paper explores if the emerging motorcycle ownership trend is affecting the developing Asian safety trend, and the importance of taking new safety intervention approaches. To identify the trend of traffic safety in developing Asia and how it varies, a long-term traffic accident data, motorization of representative countries are analyzed. The safety trends of developing Asian countries are compared with that of Japan at the same economic levels, to analyze of whether the countries are taking different safety trend. US per capita fatality rate trend which is in contrast to that of Japan is also used for better understanding of the developing Asia's trend and future scenario. To grasp the Asia's future motorcycle safety scenario, the paper compares motorcycle safety evolution of Japan and Taiwan, which has taken different approaches that has led to different results. The ultimate objective of this paper is make strategic policy recommendation for developing Asian countries

Long-term traffic accident data is collected from official statistical publication for the selected countries used in this paper. As different countries adopt different definition for road safety casualties, all the fatality data used in this paper is normalized to fatalities within 30-days of the accident, whenever necessary. For this purpose the European Conference of Ministers of Transport (ECMT) defined methodology for standardized 30-day road crash fatality adjustment factors is used.

3. TREND OF ROAD ACCIDENT FATALITIES

Though total fatality is generally growing in developing Asia there are fluctuations in the trend fatality rate as shown in Figure-1. The fluctuation may be best be explained by the economic changes over time, which affects the mobility. There is fall in fatalities in mid 1990s, during the Asian financial crisis, and the fatality started once again to increase after the

economic recovery. All the countries but Thailand have passed this temporary total fatality peak after economic recovery. Countries have taken several safety measures which may have also affected the trend to some extent, though difficult to prove due to data constraints.

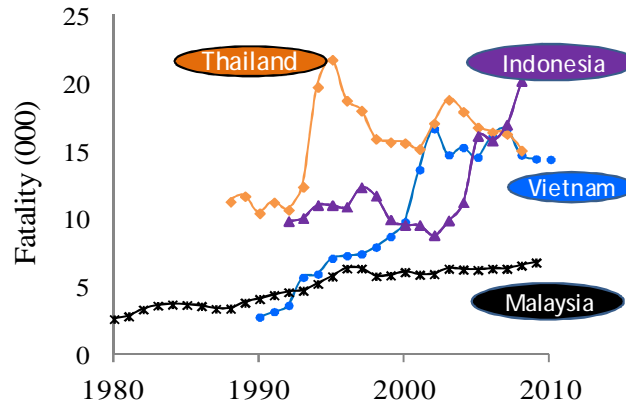


Figure 1: Trend of fatality in selected developing Asian countries
Series of statistical yearbooks of respective countries

The per-capita fatality rate by year is basically similar to the total fatality trend. To understand the difference in the road safety trend of the developing Asia, the per-capita fatality rates are compared with that of Japan, at the same economic level, as Figure-2 shows. It is clear that developing Asian countries show significantly higher fatality rate trend than the rate Japan recorded when it was at the same economic level. It is also important to note that developing Asian countries have already recorded fatality rate higher than the maximum rate Japan ever recorded. At earlier economic level Malaysia and Thailand has already recorded a fatality rate about 50% and 70% higher than the maximum Japan recorded in 1970, respectively. Malaysian trend is similar to that of US, which has per-capita fatality rate of about three times that of Japan.

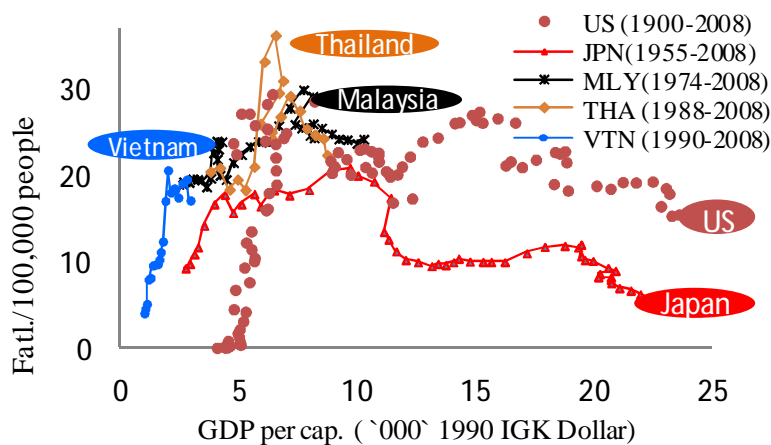


Figure 2: Fatality rate trend by income of selected countries
Series of statistical yearbooks, FHA of US

Like many other developed countries US and Japan have since 1970s improved their safety level, that the fatality rate per vehicle distance travelled has improved significantly. In fact the fatality per-vehicle distance travelled in developed countries is converging, and US and Japan currently shows similar rates. Thus, it is the transport system and behavior that has contributed to the higher US per-capita fatality rate, as US per-capita vehicle distance travelled is about three times of that of Japan.

The differences in the US and Japan has a big implication for the developing countries safety trend, as the transport system achieved could define the safety in the long-term. This is important for the Asian developing countries, being challenges by unprecedented motorcycle ownership, and struggling to define the motorcycle role in the transport system. The following sections look at the dilemmas that the developing Asian countries are facing with the emerging motorcycle issues that not necessarily limited to this region.

3.1 Motorcycle safety issues

The possible source of variation of the per capita fatality rate trend, discussed in the previous section, may be attributed into one or a combination of the following four factors: transport system, safety level, timing of the intervention, and safety management. Asian developing countries, like other developing countries, have introduced intervention measures, such as helmet or seatbelt wearing to improve the safety level. There is no lag in the timing of the intervention, as many of them introduced earlier than Japan, in terms of the economic level. However, many of them have poor management system that the measures haven't been effectively implemented. The shortcomings may partly be attributed to the economic constraints. However, as the experience of the industrialized countries shows, the economic constraints will be overcome with the development. Therefore, in the long-term, it is how this developing countries shape their transport system which will mainly matter in defining the safety.

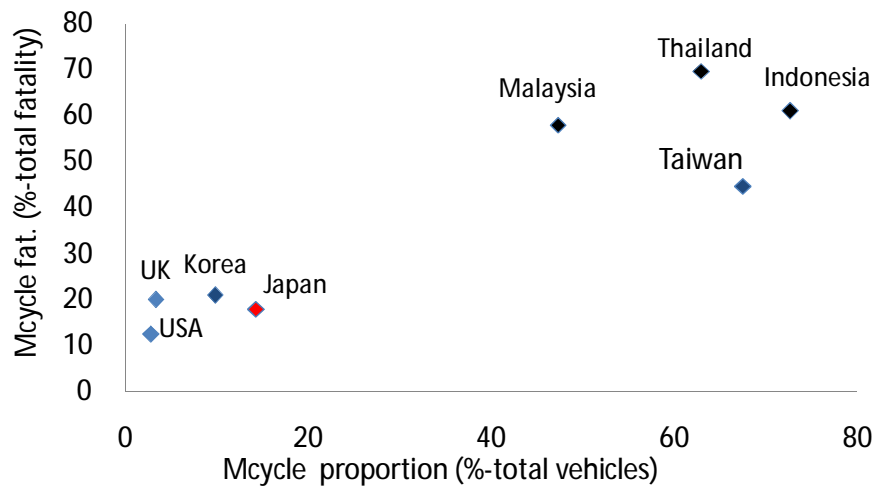


Figure 3: Motorcycle fatality and proportion of selected countries
Japan statistical bureau & NPA, IIHS and DoT of US, DfTof UK, Kor. Road Traf. Authority, MIROS of Malaysia, WHO statistics for Thailand and Indonesia

Motorcycle user fatalities make over half of the total road accident fatalities in developing

Asia. Motorcycle fatalities make 60% or above of the total fatalities in Malaysia, Thailand and Indonesia (Figure-3). As motorcycle is the most vulnerable motorized mode that is dominating the developing Asia, its safety is critical for any significant positive change. However, as the motorcycle dominance at late stage of economic development is new trend, there is no clear vision of how to ensure the motorcycle safety (Figure-4). The following section summarizes the dilemma in this regard.

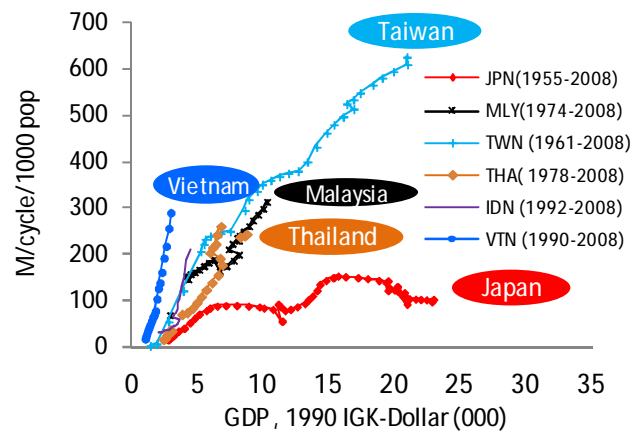


Figure 4: Motorcycle ownership trend in selected Asian countries
Series of statistical yearbooks

4. JAPAN AND TAIWAN MOTORCYCLE SAFETY STRATEGIES

As mentioned in Section 3.1, developing Asia understand how critical the motorcycle safety issues are to make significant progress in overall road safety of the region. There is a large consensus among these countries on the short- and mid-term safety measures, such as the introduction and enforcement of helmet laws, strengthening the safety educations, improve vehicle safety etc. However, the above measures are basically based on the traditional assumptions that motorcycles proportion will fall as income increases. As motorcycle proportion remained high in unprecedented way, despite the income growth, there is a growing debate on the motorcycle role in the transport system and its safety implications.

As the trend is just emerging without any precedence, it's difficult to get a clear answer for the above issues. However, Taiwanese and Japanese experience may give some insight on viable long-term motorcycle strategies. Taiwan has basically considered motorcycle safety manageable, and adopted various motorcycle centered safety policies and motorcycle still makes about 70% of all motor vehicles despite the economic development. In contrast, Japan has succeeded to change the 1960s motorcycle dominance to the current status in which motorcycle makes just 14% of all vehicles. Many developing Asian countries are at cross road and it's the policies that they adopt today that decided the future role of the motorcycle and the road traffic safety scenario. Therefore, the following section evaluates the historical road safety development of Japan and Taiwan and its impact on the trend.

The most significant difference in road safety of Japan and Taiwan is in the motorcycle fatality proportion. Motorcycle user fatalities make half of the road accident fatalities in

Taiwan, while in Japan they make just 18% of the total fatalities. Motorcycle fatality proportion has increased by about 50% since 1999 in Taiwan, while it has been stable for over 20 years in Japan (Figure-5).

The road safety trend is affected by many factors such as change in travel behavior, policies adopted and the transport system and the timing of policies. However, we will just focus on the issue relevant to this paper, and the main differences that may have contributed to the distinct safety trend.

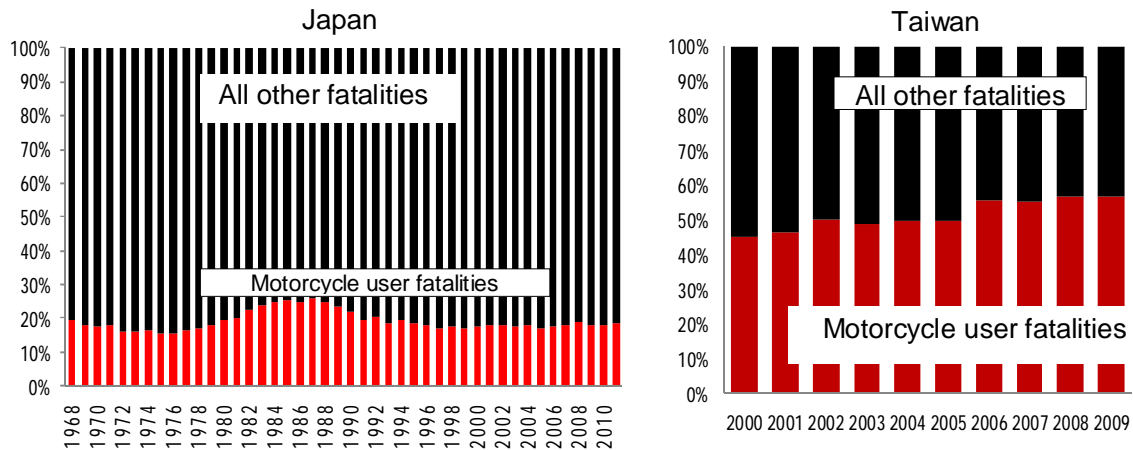


Figure 5: Japan and Taiwan Road accident fatality trend by road user types
Japan National Police Agency, Ministry of Transport and Communication of Taiwan

4.1 Safety strategies

The main reason behind the relatively low Japanese motorcycle user's fatality is due to the fact that it is marginalized from the main transport system. However, this is a result of long gradual process that took place over decades of period. Historically, Japan has avoided of any policy that may favor or encourage motorcycle use. Policies were introduced step by step, which helped to bring the behavioral changes in line with the long-term objectives. Complete helmet wearing introduction, for example, has taken more than twenty years. Though helmet was made first compulsory in 1965, it was only in 1985 that it was effective on all roads and for all types of motorcycles with penalty (Figure 6).

Educating the public to bring the necessary behavioural changes, and make them supportive of the government policies was another notable strategic approach of Japan. Even though the motorcycle helmet wearing was partially made compulsory with penalty in 1975, the compliance rate had already been as high as 70% before the law. This is interesting as many developing Asian countries have yet to achieve similar helmet wearing rate even after years of making it compulsory with penalty. Moreover, by 1975 the fatality-

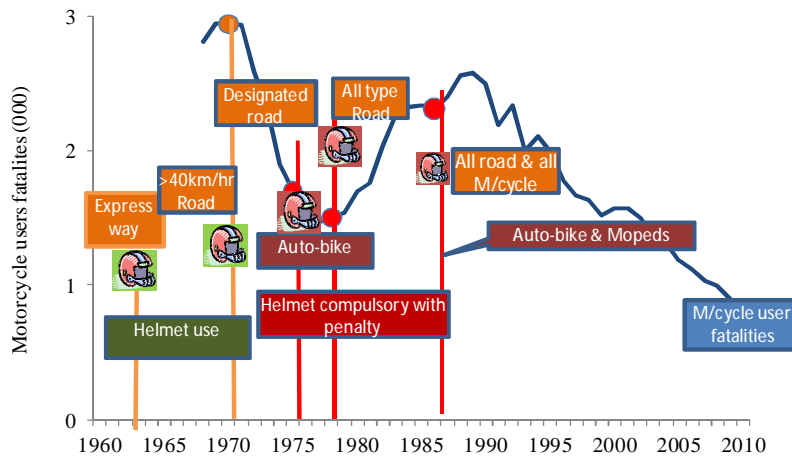


Figure 6: Motorcycle safety measures and fatality trend of Japan
National Police Agency of Japan

rate of which motorcycles were primary causes reduced by 60%, despite the motorcycle growth. Systematic education on motorcycle safety pursued by Japan is believed to have contributed to this change.

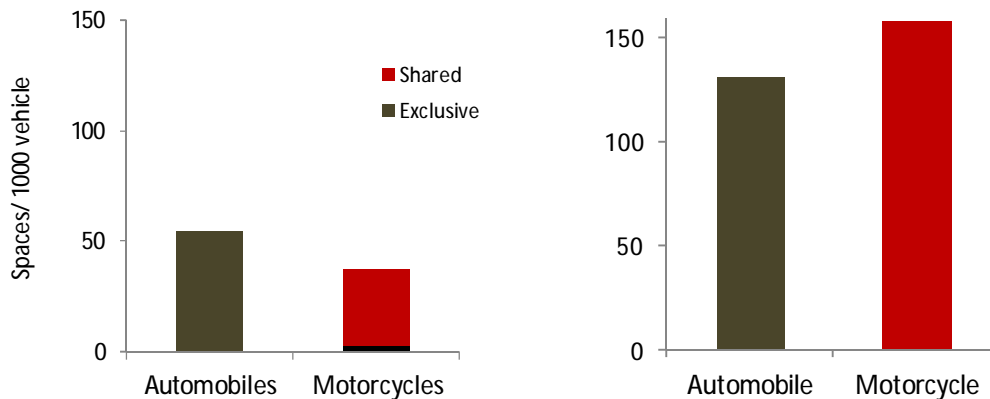


Figure 7: Available vehicle parking spaces
Japan Cabinet Office, Parking Management and Development Office of Taipei City

Moreover, Japan has in general implemented policies to discourage motorcycle use, portraying it as risky mode. There have been strict policies on illegal parking, despite the already limited parking space provided for motorcycles (Figure-7). Motorcycle and bicycle parking management is given a priority and handled at cabinet level since 1970s. A comprehensive law was issued in 1980 to control the illegal parking, and unlike many developing Asian countries road side parking is strictly controlled. The parking management is found to be the main factor in restricting the use and ownership of motorcycles (JAMA, 2012).

In contrast, even though Taiwan started national safety programs early 1980s, unlike Japan, it mainly focused on traffic segregation by using motorcycle lanes, or traffic signal system.

Moreover, Taiwan was very late in introducing helmet, as it was only in 1997 that it was made compulsory. In fact, significant drop in overall fatality trend has been observed in the fatality until the end of the 1980s (Figure-8).

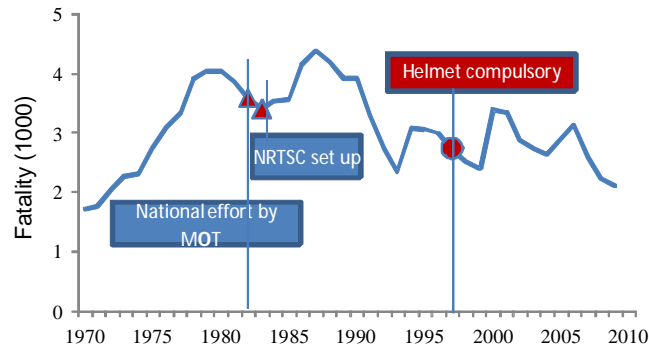


Figure 8: Motorcycle safety measures and fatality trend of Taiwan
Ministry of Transportation and Communications of Taiwan

However, since 1993 the total fatality has been fluctuating without any significant change and the fatality rates remain high. The per-capita fatality rate of Taiwan is currently about three times of that of Japan. Similarly, the fatality rates per-vehicle kilometre travelled (VKT), of Taiwan is more than three times of that of Japan (Figure-9).

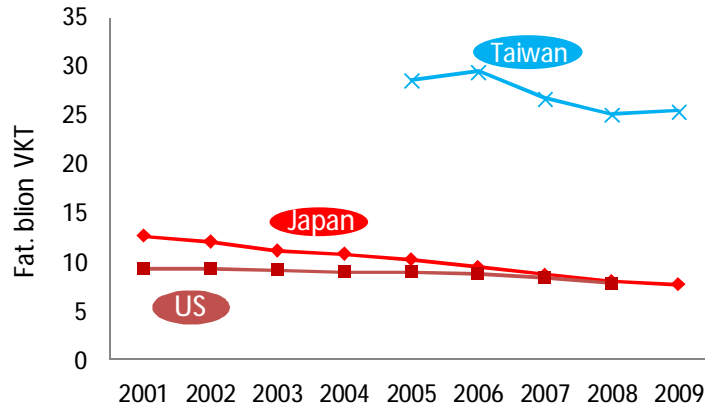


Figure 9: Recent trend of fatality per vehicle-kilometre travelled
Japan Statistical Bureau, US FHA, Ministry of Transportation and Communications of Taiwan

The high fatality rate trend of Taiwan is linked with the motorcycle which dominates the transport system. As Figure-10 shows motorcycle fatality has increased by about 30% while that of automobiles decreased by 42% since 1999.

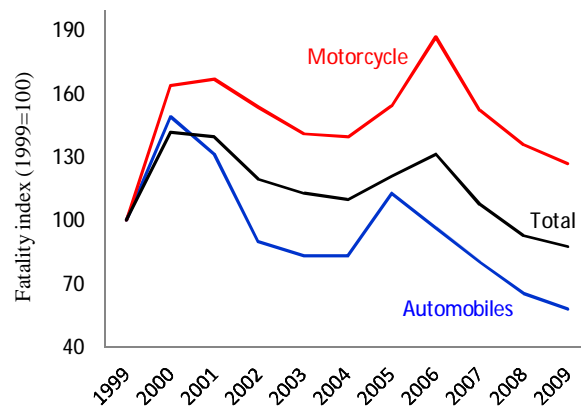


Figure 10: The fatality trend by mode of Taiwan
Ministry of Transportation and Communications of Taiwan

Despite the introduction of all the major safety measures, motorcycle safety remained challenging in Taiwan, as discussed above. To overcome this, Taiwan has indicated strategic shift in its recent policies on motorcycle issues. Decreasing the motorcycle proportion has become the main target of Major Taiwanese cities to address the motorcycle issues. The change which aims at managing the motorcycle use by providing alternative modes is discussed below.

4.2 Taiwanese motorcycle policy shift

Taipei is the first place which exhibited the shift in motorcycle management. The main target is currently to control the motorcycle growth, by improving the public transport service and restricting the motorcycle use (Taipei City, 2011). Taipei has been improving its public transport service since late 1990s, and known to be leading in this regard. Following this, Taipei started to restrict the motorcycle use. This was mainly through imposing motorcycle parking charges, and control of illegal parking which started in 2005. Even though Taipei still shows a motorcycle increase, it is much lower than the national average or that of city of Kaohsiung where similar measures started just in April, 2012 (Figure-11).

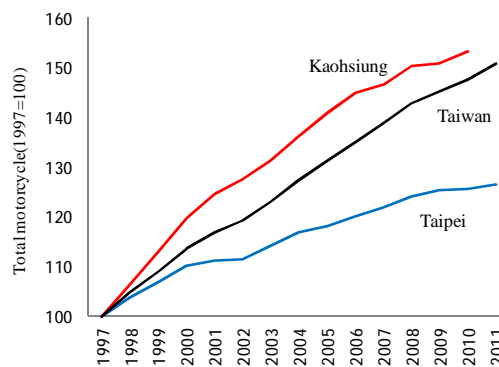


Figure 11: Recent motorcycle growth trend in Taiwan
Ministry of Transportation and Communications, Taipei City Department of Transportation, Kaohsiung City government

More importantly, Taipei could control the growth of accidents, resulting in deaths or injuries, which motorcycle is the primary cause. As Figure-12 shows, the motorcycle accident in Taipei has increased by just 20% until 2008, after which it suddenly jumped to almost double of that of 2000. However, this is low compared to that of the national average which increased by six times.

Motorcycle makes 34% of Taipei modal-share in terms of trips. Though this is lower than the 48% national average it is very high in compared to Tokyo where motorcycle accounts for just 1% of the trips. This may be attributed to the Taipei's environment that still relatively favours motorcycles, despite the recent attempt to restrict it. In Taipei, 94% are road side parking and only 6% of motorcycle parking is charged. Moreover, it is just one third of the road which has been covered by the parking management program.

Overall, Taiwan, though very late, is adopting policies similar to Japan. As mentioned earlier, it was in 1980 that Japan introduced a comprehensive law to restrict parking and control illegal parking. The, Japan has already had a public transport system in place as an alternative. Moreover, Japan had better road infrastructural development than Taiwan, favouring automobile use. Japan observed sharp decrease in the motorcycle proportion in 1960s, which may at least partly attributed to the intensive road improvement of that period.

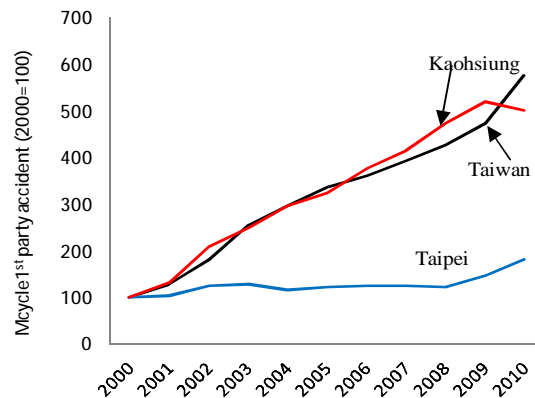


Figure 12: Accidents where motorcycle is first party
 Ministry of Transportation and Communications, Taipei City Department of Transportation,
 Kaohsiung City government

5. SCNARIOS AND PROSPECTS OF ASIAN TRAFFIC SAFETY

The main challenge for Asian developing countries is in adopting safety measures, without undermining the long-term safety objectives. Safety helmet, education or strict licensing system or law reinforcement are all critical, but the socioeconomic status puts some constraints from effectively implementing them. However, in the mid- or long-term, as the economy grows these challenges will be overcome and those policies would be implemented as effective as the industrialized countries at some time.

The main implication of the experience of Japan and Taiwan is that, it is the role of the motorcycle and its proportion that would decide the motorcycle safety in the long-term. Therefore, safety strategies in developing Asia should be based on such long-term vision and

make sure that the short-term policies implemented wouldn't compromise in the long-term targets.

Traffic segregation is effective in decreasing motorcycle fatalities. However, as the Taiwanese experience shows the improvement or the return diminishes relative to other modes such as automobiles with the economic development. With higher prospect of improving automobile safety further with the technology advancement, the motorcycle safety relative to that of the cars is expected to decrease further. Traffic segregation, however, may be used as a short-term intervention in the early stage of development where difference in fatality rate for automobile and motorcycle is small. This may serve as a transition period for implementing necessary policies for providing alternatives. Therefore, care should be taken from systematically introducing of traffic segregation through physical means such as introduction of exclusive lanes which may have long-term impact on motorcycle ownership and uses.

Besides this, developing Asia need to take integrated policy approaches to address motorcycle safety. The long-term implications of policies that unnecessarily favour motorcycles such as easy and free parking, that is common among developing Asia, should be taken into account.

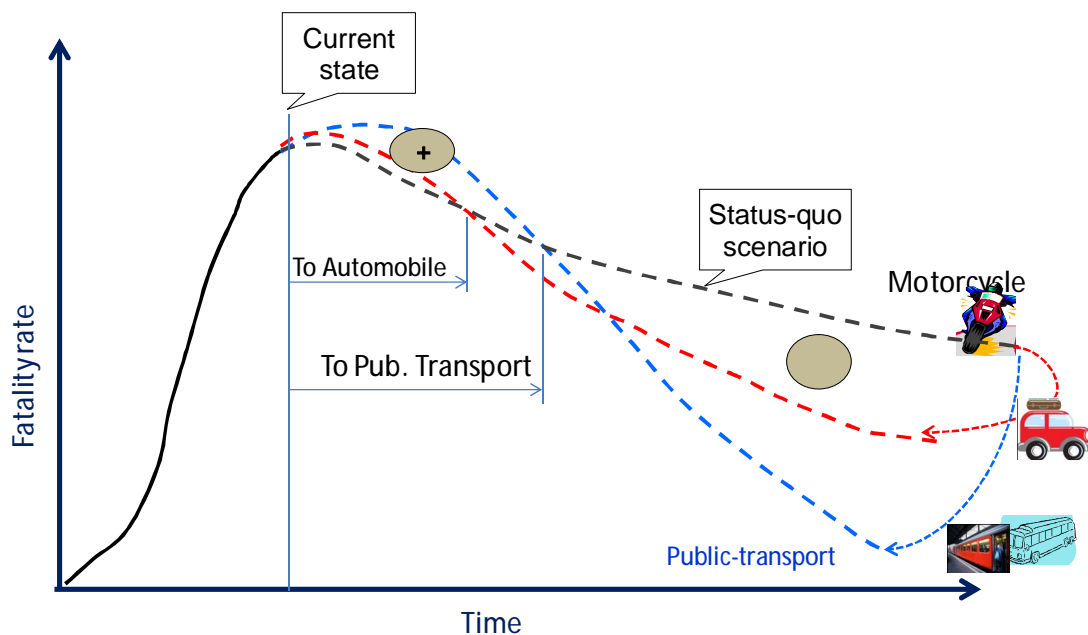


Figure 13: Future scenarios of developing Asia fatality rate trend

Overall, the future scenario of the developing Asia would depend on the strategies that these countries adopt (Figure-13). If the status-quo continues and motorcycle remains dominant, it is likely that developing Asia would maintain recording higher fatality rate which may lead to unprecedented safety situation. This is because the motorcycle is the most vulnerable mode with the highest fatality rate, compared to cars or public transport. While shifting to cars could create safer transport system, following a strategy that would make public transport a dominant mode is the best future transport safety scenario. Developing countries still have the opportunities to adopt strategies that encourage shaping the transport

system by encouraging safer modes, automobiles or public transport, with high prospect of reversing the fatality rate trend. In the later case, developing Asia may observe temporary increase in fatality rate due to suspension of the policies with the potential of decreasing motorcycle fatalities in the short-term, such exclusive lanes, but with the risk of long-term adverse consequences by encouraging motorcycle use (Figure-13).

6. CONCLUSION

Fatality rate trend in developing Asian is significantly higher than that of Japan, or other industrialized countries, at the same economic level. Some of these countries have already recorded fatality rate higher than the maximum Japan ever recorded by 50% or more, while fatality is still increasing. Motorcycle safety is the major safety concern in these developing Asian countries, as it accounts up to 60% or above of the total road accident fatalities in many of them. Traditionally, motorcycle is believed to be an intermediate mode that would be substituted by other modes as income grows. However, Taiwan emerged with new trend where motorcycle remains dominant despite the income growth, and many other developing Asian countries are showing similar trend. As a new trend many of these countries are concerned about the implication of the new trend, in terms of safety in particular.

This paper analysed the challenges that the new motorcycle are posing, and possible strategic options to address it, taking into account the Japanese and Taiwanese experience. Even though Taiwan has taken an accommodative approach toward motorcycles, and adopted motorcycle centred safety policies, its safety still remains a major challenge. Taiwan has a safety rate that is about three times as high as that of Japan, which has taken restrictive approach toward motorcycles. The high Taiwanese fatality trend may be attributed to the high motorcycle proportion, which its users make half of all road accident fatalities. Recently this problem is acknowledged and there are efforts in cities like Taipei to restrain the motorcycle use.

Many developing Asians are considering the prospect of improving motorcycle safety by systematically introducing traffic segregation measures beside the traditional measures. While these measures improve the motorcycle safety, it is advantages over other modes such as automobiles or public transport decreases with the economic development. Thus its impact is limited to short-term, and may not be considered as feasible option in the long-term. This is particularly important, as these developing countries still have the opportunity to implement policies to shape their developing transport system to a safer one.

Unlike Taiwan, Japan has avoided of adopting any policies that may favour motorcycles. In fact, it has restricted the motorcycle dependency which has contributed in limiting the motorcycle role. The improvement of the road and an already established convenient public transport system are all believed to have contributed in limiting the motorcycle role.

Developing Asians have already engaged in unprecedented motorcycle safety issues, and current strategy is mainly focused on measures with immediate impact. However, some of these short-term measures could have long-term adverse consequences by encouraging motorcycle use and developing risky motorcycle dominated transport system.

There is a high potential of creating a vulnerable transport system dominated by motorcycle if status-quo continues in developing Asia. This could create unprecedented road

safety scenario, that can't be addressed with conventional safety measures that these countries currently focusing on. To avoid the worst scenario, developing countries need to change their intervention approach. Unlike the industrialized countries, developing countries still have the potential of influencing their developing transport system, that Asians shouldn't miss these opportunity at these critical stage and before it's too late for such policies. All other short- or mid-term measures should conform to the long-term objective. Motorcycle is not only cheap, but often used to overcome congestion. Therefore, should take into account in providing alternatives which may be subway, elevated public transport, etc.

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