ECONOMIC COMMISSION FOR EUROPE (UNECE)
INLAND TRANSPORT COMMITTEE
WORKING PARTY ON ROAD TRAFFIC SAFETY

EXPLORING THE USE OF ROAD SAFETY LEGAL INSTRUMENTS TO ADDRESS POWERED TWO-WHEELER SAFETY POLICIES IN LOW-MIDDLE INCOME COUNTRIES
A ROAD SAFETY FORUM (WP.70)
ROUND TABLE PALAIS DES NATIONS, GENEVA,
23RD MARCH 2015

- POLICY OVERVIEW AND DOMESTIC PROGRAMS -

DR. IR. MUHAMMAD MARIZWAN BIN ABDUL MANAN
Malaysian Institute of Road Safety Research (MIROS)
marizwan@miros.gov.my
MALAYSIA

- Population = 29 million
- Registered vehicle = 17.8 million
- GDP = 313 Billion USD, 6% growth
- Road traffic death = 7,085*
- % registered motorcycle = 47%*
- % motorcycle on road = 10% - 30%
- Road length:
  - Expressway: 1.3%
  - Primary / arterial road: 13.6%
  - Secondary / collector road: 43.9%
  - Local streets: 34.8%
  - Minor roads: 6.4%
- Malaysia is a country with left-hand traffic

MOTORCYCLE COMPOSITION IN MALAYSIA

% of registered MC by type

Percentage (%) of registered MC by type

Maximum Speed (kph)

Source: JPJ (2014) – registered motorcycle
% OF MC ACCIDENT FATALITIES IN THE WORLD

Percentage of MC accident fatalities from the total of road fatalities

Rank 5th highest in the World

MALAYSIAN ROAD TRAFFIC FATALITIES BY TYPE OF ROAD USER

Average rate of increase is 5% (2005 – 2013) and overlyrepresented

Motorcycle (Motorized 2-3 wheelers)

Passenger cars

Non-motorized

Heavy vehicles

Source: PDRM (2013), analyzed by MIROS (2014)
The factors /category which has the highest number of motorcycle accident fatalities in Malaysia

<table>
<thead>
<tr>
<th>Location</th>
<th>Area type</th>
<th>Rural</th>
<th>61</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road Hierarchy</td>
<td>Primary or arterial roads</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Road geometry</td>
<td>Straight section</td>
<td>66</td>
<td></td>
</tr>
<tr>
<td>Traffic control</td>
<td>Access point / un-signalized junction</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Collision</td>
<td>By type</td>
<td>Angular or side</td>
<td>28</td>
</tr>
<tr>
<td></td>
<td>With vehicle</td>
<td>Passenger car</td>
<td>28</td>
</tr>
<tr>
<td>Day</td>
<td>Saturday, Sunday, Monday &amp; Tuesday</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>Between 4pm to 10pm</td>
<td>35</td>
<td></td>
</tr>
<tr>
<td>Light condition</td>
<td>Daylight</td>
<td>56</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Clear weather</td>
<td>93</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td>Males</td>
<td>92</td>
<td></td>
</tr>
<tr>
<td>Age group</td>
<td>16 to 20</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>Occupancy</td>
<td>Rider only</td>
<td>89</td>
<td></td>
</tr>
<tr>
<td>License</td>
<td>Full licence</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>Helmet wearing</td>
<td>Wearing helmet properly</td>
<td>76</td>
<td></td>
</tr>
<tr>
<td>Injury type</td>
<td>Head injury</td>
<td>63</td>
<td></td>
</tr>
</tbody>
</table>

MC CURRENT FINDINGS (2/8)

• Malaysian road accidents are severely underreported (based on severe and slight injuries)*
  • 7 severe MC injuries : 1 MC fatality (Sweden)
  • 1.4 severe MC injuries : 1 MC fatality (Malaysia)

• MC multi-crash accidents is a problem!**
  • Single motorcycle accident – 5% to 6% resulted in fatal crashes
  • Multi vehicle accident involving motorcycle – 13% to 18% resulted in fatal crashes

• MC helmet wearing & running headlight : 66% to 74% compliance but, female motorcyclists exhibit lower compliance with helmet usage compared to males – more on rural areas

• Motorcycle fatal accident due to intoxication = 1.1%!

** Abdul Manan, M.M., Celik, A.K., Hizal Hanis, H., Road environment factors associated with single and multi-vehicle fatal crashes involving motorcycles in Malaysia. (in press)
### MC CURRENT FINDINGS (3/8)

<table>
<thead>
<tr>
<th>Road environment factors</th>
<th>Single motorcycle fatal crashes</th>
<th>Motorcycle fatal crashes involving another vehicle</th>
<th>Motorcycle fatal crashes involving two of more vehicle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freeway</td>
<td>-3.5%</td>
<td></td>
<td>6.2%</td>
</tr>
<tr>
<td>Primary road</td>
<td>-20.7%</td>
<td>7.9%</td>
<td>24.6%</td>
</tr>
<tr>
<td>Secondary road</td>
<td>-10.7%</td>
<td>3.8%</td>
<td>14.1%</td>
</tr>
<tr>
<td>Collector road</td>
<td>-5.2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>-6.8%</td>
<td>6.7%</td>
<td>-17.5%</td>
</tr>
<tr>
<td>Curve</td>
<td>17.5%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 way traffic</td>
<td>2.0%</td>
<td></td>
<td>-3.8%</td>
</tr>
<tr>
<td>110 KMJ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>70 KMJ</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>90 KMJ</td>
<td>-3.3%</td>
<td>1.2%</td>
<td>4.2%</td>
</tr>
<tr>
<td>Double (passing not permissible)</td>
<td>-5.5%</td>
<td>1.7%</td>
<td>8.6%</td>
</tr>
<tr>
<td>Single (passing permissible)</td>
<td></td>
<td></td>
<td>17.1%</td>
</tr>
<tr>
<td>No lane marking</td>
<td>2.5%</td>
<td>-1.1%</td>
<td></td>
</tr>
<tr>
<td>12am-6am</td>
<td>8.5%</td>
<td>-4.7%</td>
<td></td>
</tr>
<tr>
<td>6am-9am</td>
<td>2.7%</td>
<td>-1.5%</td>
<td></td>
</tr>
<tr>
<td>9am-12pm</td>
<td>1.6%</td>
<td>-0.6%</td>
<td>-1.8%</td>
</tr>
<tr>
<td>7pm-12pm</td>
<td>4.3%</td>
<td>-3.1%</td>
<td>3.9%</td>
</tr>
<tr>
<td>Day</td>
<td>-7.8%</td>
<td>3.2%</td>
<td>7.6%</td>
</tr>
</tbody>
</table>

**Abdul Manan, M.M., Celik, A.K., Hizal Hanis, H., Road environment factors associated with single and multi-vehicle fatal crashes involving motorcycles in Malaysia. (AAP - in press)**
MC CURRENT FINDINGS (4/8)

- Motorcycle (MC) speed is statistically significantly different than passenger cars (PC) – all road hierarchy types (a & b)

- When % of MC is higher, other vehicle tend to exceed speed limit (e)

- When Average Daily Traffic (ADT) volume increases, MC mean speed increases (b & e)

- MC maintains their speed even when ADT on the road is high (b & c)

---


MC CURRENT FINDINGS (5/8)

- MC fatalities per km on Malaysia primary road increases with increase number of access per km (a)

- MC behave differently in the vicinity of access points – at risk of accidents (b, c, d & e)
  - MC increase speed when they observed a vehicle waiting at the access points
  - Majority of motorcyclists do not comply to the stop line rule:
    - Enter by accepting shorter gaps \( t_G < 4s \) (e)

- MC that enters the primary road are found to be associated with serious conflict with vehicles passing on the primary roads (c)

---


c. Abdul Manan, M. M. (2014). Motorcycles entering from access points and merging with traffic on primary roads in Malaysia: Behavioral and road environment influence on the occurrence of traffic conflicts. Accident Analysis & Prevention, 70, 301-313


MC CURRENT FINDINGS (6/8)

- MC have issues with pedestrian
- Prelim findings shows that: for every 5 pedestrian crossing on a pedestrian crossing facility, there will be 7 vehicles beating the red light! – mostly are MC\(^{(a)}\)
- When MC hit a pedestrian, the result are more severe as compared to a passenger car (PC)

<table>
<thead>
<tr>
<th>Vehicle type</th>
<th>Fatal to vehicle driver</th>
<th>Fatal to pedestrian</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy Vehicle (HV)</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Passenger car (PC)</td>
<td>8</td>
<td>69</td>
</tr>
<tr>
<td>Motorcycle (MC)</td>
<td>20</td>
<td>2</td>
</tr>
<tr>
<td>Bicycle (BC)</td>
<td>6</td>
<td>8</td>
</tr>
</tbody>
</table>

Source of accident data: Royal Malaysian Police (2010 – 2012), analysis done by MIROS

MC CURRENT FINDINGS (7/8)

• The Opposite Indirect Right Turn (OIRT)
  • 18% to 26% of right turning motorcyclists
  • Majority of motorcyclists do not stop at the stop line
  • Accept shorter gap ($t_G < 4s$) at high traffic volume
  • BUT low rate of serious traffic conflict!
    compared to normal right turn movement

OPPOSITE INDIRECT RIGHT TURN
OPPOSITE INDIRECT RIGHT TURN
OPPOSITE INDIRECT RIGHT TURN
MC ROAD SAFETY MEASURES INTERVENTION
CURRENT LAWS FOR MC THAT EFFECT ROAD SAFETY

• Malaysian Road Traffic Act (1987 – 2009)
  • No license (Max. pen: 75 EUR), Permitting minors (Max. pen: 250 EUR)
  • Exceeding National road speed limit (Court & Max. pen: 75 EUR)
  • Reckless riding and cause fatality (Court & Max. pen: 5,000 EUR)
  • Riding under influence (Court & Max. pen: 250 EUR)
  • Overloading (goods and passenger) (Max. pen: 65 EUR)
  • Illegal racing (Court & Max. pen: 500 EUR)
  • Not riding on the left of the lane (Max. pen: 250 EUR)
  • Not wearing helmet (Max. pen: 75 EUR)
  • No daylight running headlight & No nighttime headlight (Max. pen: 40 EUR)
  • Not stopping on the stop line (Max. pen: 75 EUR)
  • Using hand phone (Max. pen: 75 EUR)
  • No side mirrors (Max. pen: 40 EUR)
  • Exhaust too loud (Max. pen: 65 EUR)
### MC ROAD SAFETY MEASURES (1/2)

<table>
<thead>
<tr>
<th>TYPE</th>
<th>PHOTO</th>
<th>CRITERIA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exclusive Motorcycle Path (EMCL)</td>
<td><img src="image1" alt="Exclusive Motorcycle Path" /></td>
<td>Width</td>
</tr>
<tr>
<td></td>
<td><img src="image2" alt="Exclusive Motorcycle Path" /></td>
<td>Separator</td>
</tr>
<tr>
<td>Non-exclusive Motorcycle Lane (NEMCL) – Dedicated lane</td>
<td><img src="image3" alt="Non-exclusive Motorcycle Lane" /></td>
<td>Width</td>
</tr>
<tr>
<td></td>
<td><img src="image4" alt="Non-exclusive Motorcycle Lane" /></td>
<td>Separator</td>
</tr>
</tbody>
</table>

Even with the segregation, motorcycle crashes are still unavoidable and these crashes include both multiple and single motorcycle crashes \( ^{(b)} \)

---


### MC ROAD SAFETY MEASURES (2/2)

<table>
<thead>
<tr>
<th>MC lane facilities</th>
<th>Path (Exclusive)</th>
<th>Lane (Non-exclusive)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MC accident reduce to 39%</strong>&lt;sup&gt;(a)&lt;/sup&gt;</td>
<td>Makes up less than 1% of the whole length of primary roads (Federal Roads), whereas</td>
<td>May reduce the crash risk by 80% among motorcyclists as compared to section without.</td>
</tr>
<tr>
<td></td>
<td>Path (Exclusive)</td>
<td>Lane (Non-exclusive)</td>
</tr>
<tr>
<td></td>
<td>T2: Presence of auxiliary lane for acceleration on the motorcycle lane</td>
<td>T4: Entry angle &lt;90 degree, length of slip lane &gt;15m</td>
</tr>
</tbody>
</table>

**Notes:**


EXCLUSIVE MOTORCYCLE PATH
Exclusive motorcycle path (Egress)
Exclusive motorcycle path (Ingress)
CURRENT MC RESEARCH IN MALAYSIA

- Motorcycle speeding behavior (on-going)
- Motorcycle compliance to non-exclusive motorcycle lane
- Evaluating the design of motorcycle exclusive motorcycle lane
- Malaysian motorcycle simulation
FUTURE RESEARCH IN MALAYSIA

- Motorcycle and motorcyclists anthropometry
- Motorcycle behavior at pedestrian crossing
- Motorcycle safety performance function on urban highways
- Naturalistic road safety observation and reporting
- Regulating the Opposite Indirect Right Turn Movement
- Development of Motorcycle crash barrier
MOTORCYCLE AND RIDER ANTHROPOMETRY

- Rider eye height
- Rider angle of vertical sight
- MC height
- MC foot height
- Rider angle of horizontal sight
- MC width
- MC turning width
- MC turning angle
- MC side friction, f
- Rider blind spot
MC CENTER OF GRAVITIES
BIG CONCLUSION

• What should we call it...PTW or Motorcycle?

• We need funding for our research

• We encourage segregation of MC away from other vehicles
  • MC risk taking behavior is evident based on the fact that MC maintains their speed even when ADT on the road is high

• But segregation should be carried out properly considering the fact that
  • MC behave differently in the vicinity of access points – at risk of accidents

• Protective clothing? – Malaysia is hot and humid, need better alternative

• Our road traffic accident database needs better reporting

• Enforcement of the traffic law is still poor – Motorcyclists in Malaysia is fearless?

• We need better technology, e.g. ABS, EBD, etc. in our motorcycle
TERIMA KASIH
MERCI!
NOTES

• Presentation
• Working party WP1
• Sharing session on motorcycle safety
• WP1: global road safety
• Enforcing helmet wearing and compliance to standard
• Legal instrument well known beyond the UNECE region
• We don’t have report card on our performance