Current and Future Roles of Motorcycle in Vietnam

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Vietnamese-German University

Hanoi, 27 Sep 2018
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1. Introduction
2. Socioeconomic and transport trends
3. People travel behavior and current role of MC
4. Projecting the future role of MC
5. Merits and Demerits of MC (vs other modes)
6. Experience in improving MC safety & efficiency
7. Recommendations for Vietnam
On-going debates on MC issues

• Controversial debate on how to address MC issues
  ❑ Taiwan accepted MC, improving safety & efficiency
  ❑ Chinese cities banning MC (e-bike) to improve safety, air pollutions
  ❑ UK promoting MC to ease congestion & parking problems

• Vietnam (and other Asian countries) is confronting…
  ➢ What could be the future role of MC and how to respond to motorcycle traffic properly?
Research Objectives

- Understand the current role and anticipate the future role of MC in the transport systems
- Suggest measures for addressing MC traffic issues

Subjects of the Interest
Research Framework

- Socioeconomic & transport trends
- Veh. ownership & travel behaviors
- Scenario 2030 (trend-line, planned)
- Mode choice models
- Choices btw MC and alternative modes by 2030
- Merits & Demerits of MC (vs others)
- Experience in improving MC safety & efficiency
- Recommendations for Vietnam

4,300 samples / 6 cities & provinces (confidence level 99%)
Scope of the Study

- **Bình Dương**: 2.694 km², 1.802.500 pop
  - Thủ Đâu Một
  - Đâu Tiếng
  - Bầu Bàng

- **Hồ Chí Minh City**: 2.061 km², 8.297.500 pop
  - Nơi thành
  - Củ Chi
  - Học Môn

- **An Giang**: 3.537 km², 2.155.300 pop
  - Long Xuyên
  - Châu Thành

- **Hà Nội**: 3.359 km², 7.242.200 pop
  - Nội thành
  - Sóc Sơn
  - Ba Vì

- **Thành Hóa**: 11.130 km², 3.712.600 pop
  - Tp. Thanh Hóa
  - Nga Sơn
  - Thạch Thành

- **Quảng Nam**: 10.438 km², 1.505.000 pop
  - Hội An
  - Thăng Bình
  - Đại Lộc
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MC and Car ownership development

- MCO increased by 13 times / 1995-2016
- CAO increased by 7 times / 1995-2016

<table>
<thead>
<tr>
<th>Year</th>
<th>MC Ownership (1,000 veh)</th>
<th>Car Ownership (1,000 veh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>4,015</td>
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<tr>
<td>1996</td>
<td>5,000</td>
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<td>1997</td>
<td>10,000</td>
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<td>2007</td>
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<td>2008</td>
<td>65,000</td>
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<td>2009</td>
<td>70,000</td>
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<td>2010</td>
<td>75,000</td>
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<td>2011</td>
<td>80,000</td>
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<td>2012</td>
<td>85,000</td>
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<td>2013</td>
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<td>2014</td>
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<tr>
<td>2015</td>
<td>100,000</td>
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<tr>
<td>2016</td>
<td>105,000</td>
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</tr>
</tbody>
</table>
Hanoi, HCMC:
- Bus share 8-10%

Others:
- Bus share 1% or less

Source: Bus ridership (million pax) from TDSI, 2016

- Avg MCO rate = 565 (equivalent to Taiwan’s)
- Avg CAO rate = 35 (~1/10-1/20 developed countries)
**Trends in Modal Splits (% motorized trips)**

**Hanoi**
- **MC** remained dominant.
- **MC** remained dominant.

**Jakarta**
- **MC** increased sharply despite PT improvements.

**Guangzhou** (From 1997, Bus included Rail)
- **MC** reduced by PT improvements & MC ban.
- **MC** still significant despite the good PT services.

**Taipei**
- **MC** still significant despite the good PT services.
Key conclusions (Overview of Trends)

• **General transport picture in Vietnam**: Road infra & public transport services have still remained poor, inadequate despite the so-far improvements → Motorcycle ownership has increased rapidly to meet increasing travel demand

• **For large cities (Hanoi, HCMC)**: Currently, the supplies of road infrastructure and public transport have been much lower than other Asian cities. If the development will continue its current trend, for next 15-20 years, the supply levels of supply will likely remain low, and thus the people mobility will likely be dependent on motorcycle
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Household vehicle ownership characteristics

Avg # of vehicles at a household

- MC is the majority (2.4 veh/HH)

**Avg # of vehicles by HH income**

- MCs & Cars increased by HH income

**MC – Car interaction at a household**

- Car presence does not reduce # of MCs
Individual’s daily travel & mode choice

- On average, a person makes 4.3 trips/day for a total distance of 20.7 km.
- Total daily traveled distance increased by individual income.
- On average: MC 74%, Car 11%, Bus 8%.
- The highest income group: MC 41%, Car 52%.

### Avg # of daily trips per person

- General (N=4347)
- Hanoi (N=745)
- Ho Chi Minh (N=799)
- Binh Duong (N=706)
- An Giang (N=697)
- Danang (N=710)
- Thanh Hoa (N=691)

### Avg daily traveled distance by Income

- Going home
- Others
- Work/study

### Mode share (person-km) by Income

- Motorcycle
- Car
- Bus
- Bicycle
- Walking

### Personal income (million VND/month)

- <2.5 (N=934)
- 2.5-4.9 (N=1135)
- 5-9.9 (N=1680)
- 10-14.9 (N=367)
- >15 (N=231)
- General (N=4347)
9 requirements perceived important, except for "social status showoff"
70%-80% the people chose MC as they perceived it Cheap, Fast, and Flexible
Key conclusions (Interview Surveys)

• As individual income increases, people will continue buying and using a motorcycle to serve the majority of their daily travel demand and travel requirements

• Motorcycle is perceived to be "Cheap", "Fast", "Flexible" – these are important travel requirements given the conditions of low income level, inadequate supply of transport infrastructure and its slow expansion and increasing traffic congestions

• At household level, although car ownership increases by household income but it will not reduce motorcycle ownership
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<th>Section</th>
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<td>6. Experience in improving MC safety &amp; efficiency</td>
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<td>7. Recommendations for Vietnam</td>
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</table>
## 2030 Scenario for Big Cities
(Hanoi, HCMC)

<table>
<thead>
<tr>
<th></th>
<th>Trendline</th>
<th>Planning</th>
</tr>
</thead>
<tbody>
<tr>
<td>GRDP per cap (USD/person)</td>
<td>11,500 (HN) 17,500 (HCM)</td>
<td>17,000 (HN) 21,000 (HCM)</td>
</tr>
<tr>
<td>Road network density (km/km2)</td>
<td>2.55 (HN) 2.20 (HCM)</td>
<td>4.0-6.5</td>
</tr>
<tr>
<td>Bus fleet supply rate (veh/mil. pop)</td>
<td>340 (HN) 460 (HCM)</td>
<td>500-600</td>
</tr>
<tr>
<td>Metro network density (km/mil. pop)</td>
<td>9.8 (HN) 7.2 (HCM)</td>
<td>35 (HN) 20 (HCM)</td>
</tr>
<tr>
<td>Pass car ownership (car/1000 pop)</td>
<td>150 (HN) 150 (HCM)</td>
<td>N.A</td>
</tr>
<tr>
<td>MC ownership (mc/1000 pop)</td>
<td>850 (HN) 880 (HCM)</td>
<td>N.A</td>
</tr>
<tr>
<td>MC parking fee</td>
<td>1.5 times</td>
<td>3 times</td>
</tr>
<tr>
<td>Car parking fee</td>
<td>1.5 times</td>
<td>3 times</td>
</tr>
</tbody>
</table>
Estimated mode choices for **Big Cities 2030**

- **Prob MC vs MRT**
  - Trendline 2030
  - Plannd 2030
  - By 2030, MC share would remain extremely even if the local gov could implement fully the infrastructure/services improvement plan

- **Prob MC vs Bus**
  - Plannd 2030
  - Cost diff.: 3000
  - Cost diff.: 5000
  - Cost diff.: 7500
  - Cost diff.: 10000
  - Cost diff.: 15000
  - Cost diff.: 20000
  - Cost diff.: 30000

- **Prob MC vs Car**
  - Plannd 2030
  - Trendline 2030
  - Cost diff.: 20000
  - Cost diff.: 40000
  - Cost diff.: 60000
  - Cost diff.: 80000
  - Cost diff.: 100000
  - Cost diff.: 150000

- **Prob MC vs Bicycle**
  - Plannd 2030
  - Cost diff.: 3000
  - Cost diff.: 5000
  - Cost diff.: 7500
  - Cost diff.: 10000
  - Cost diff.: 15000
  - Cost diff.: 20000
  - Cost diff.: 30000
### 2030 Scenario for **Medium Cities** (TH, HA, TDM, LX)

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<thead>
<tr>
<th></th>
<th>Trendline</th>
<th>Planning</th>
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</thead>
<tbody>
<tr>
<td><strong>GRDP per cap (USD/person)</strong></td>
<td>5,000</td>
<td>N.A</td>
</tr>
<tr>
<td><strong>Road network density (km/km2)</strong></td>
<td>3.0</td>
<td>N.A</td>
</tr>
<tr>
<td><strong>Bus fleet supply rate (veh/mil. pop)</strong></td>
<td>100</td>
<td>N.A</td>
</tr>
<tr>
<td><strong>Metro network density (km/mil. pop)</strong></td>
<td>N.A</td>
<td>N.A</td>
</tr>
<tr>
<td><strong>Pass car ownership (car/1000 pop)</strong></td>
<td>60</td>
<td>N.A</td>
</tr>
<tr>
<td><strong>MC ownership (mc/1000 pop)</strong></td>
<td>850</td>
<td>N.A</td>
</tr>
<tr>
<td><strong>MC parking fee</strong></td>
<td>1.5 times</td>
<td>N.A</td>
</tr>
<tr>
<td><strong>Car parking fee</strong></td>
<td>2 times</td>
<td>N.A</td>
</tr>
</tbody>
</table>
By 2030, MC share would remain extremely high if infrastructures/services would continue its current development trends.
Opinion survey on the MC ban policy by 2030 (N=1203)

- On average, only 28% believed that "the ban policy will happen"
- Hanoi: 31% believed so (as compared to 90% by TDSI 2017 Survey)
- HCMC: only 12% believed so
MC Ban in Guangzhou (China)

- **To reduce Congestions, Air Pollutions, Fatal Accidents**
  - 1991-98 Banned registration
  - 2004-06 Restricted rides on main roads (off-peak)
  - 2006-07 Completely banned in urban area (incl., e-bikes)

**The timing of the ban policy**
- Restriction started when the bus system was quite good
  - 1998: Bus 34%, MC 15% (150 mc/1000 pop.)
- Ban started when public transport systems were much improved
  - 2007: PT share ~ 46% with 5 MRT lines, 480 bus lines (8,300 buses)

**Cars sharply increased …**

**Consequences of the ban policy**
- Sharp increase in car use → congestion level increased by 7% year (Ibid, 2016)
- Guangzhou = top ten Asian cities ranked for worst traffic congestion
- Guangzhou + 15 Chinese cities = the top 20 world most air polluted cities (Frost & Sullivan, 2014)

Source: Statistical yearbooks of Guangzhou
Key conclusions (Future role of MC)

• The overview of infrastructure trends, travel behavior analysis and review of international experience shows that MC will still play the role of dominant mode in the future (at least until 2030 & beyond)

• It is important to address the issues of MC traffic in a comprehensive and effective way, especially safety issue for motorcycle users
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### Performance comparison: MC vs others

<table>
<thead>
<tr>
<th></th>
<th>Bicycle</th>
<th>e-bike</th>
<th>M-cycle</th>
<th>Pass Car</th>
<th>Bus</th>
<th>BRT</th>
<th>MRT</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parking area</strong></td>
<td>n.a</td>
<td>n.a</td>
<td>2.5-3.0</td>
<td>25</td>
<td>n.a</td>
<td>n.a</td>
<td>n.a</td>
</tr>
<tr>
<td>(m²)</td>
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<tr>
<td><strong>Capacity</strong></td>
<td>n.a</td>
<td>n.a</td>
<td><strong>7,920</strong></td>
<td>2,500</td>
<td>4,125</td>
<td>9,000</td>
<td>38,500</td>
</tr>
<tr>
<td>(pax/h)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Energy use</strong></td>
<td>3</td>
<td>1.9</td>
<td><strong>23.2</strong></td>
<td>63.1</td>
<td>16.6</td>
<td>n.a</td>
<td>5.4</td>
</tr>
<tr>
<td>(KWh/100 pax-km)</td>
<td></td>
<td>(1.8-2.1)</td>
<td>(20-26.4)</td>
<td>(52.9-73.2)</td>
<td>(13.5-19.7)</td>
<td></td>
<td>(3.3-7.5)</td>
</tr>
<tr>
<td><strong>CO2 emission</strong></td>
<td>n.a</td>
<td>21.6</td>
<td><strong>46.7</strong></td>
<td>157.6</td>
<td>44.0</td>
<td>n.a</td>
<td>26.4</td>
</tr>
<tr>
<td>(g/pax-km)</td>
<td></td>
<td>(15.8-27.3)</td>
<td>(33.4-59.9)</td>
<td>(144.2-170.9)</td>
<td>(36.9-51.0)</td>
<td></td>
<td>(24.2-28.6)</td>
</tr>
<tr>
<td><strong>Fatal rate</strong></td>
<td>43.5</td>
<td>n.a</td>
<td><strong>17.7</strong></td>
<td>4.8</td>
<td>1.7</td>
<td>n.a</td>
<td>1.4</td>
</tr>
<tr>
<td>(death/bil pax-km)</td>
<td>(36-51)</td>
<td></td>
<td>(14-21.3)</td>
<td>(2.7-7)</td>
<td>(0.3-3.1)</td>
<td></td>
<td>(0.4-2.4)</td>
</tr>
<tr>
<td><strong>User out-of-pocket cost</strong></td>
<td>574 (518-630)</td>
<td>742 (630-855)</td>
<td><strong>1,564</strong> (1,440-1,688)</td>
<td>7,268 (6,525-8,010)</td>
<td>664 (495-832)</td>
<td>n.a</td>
<td>1,215 (968-1,462)</td>
</tr>
<tr>
<td>(VND/pax-km)</td>
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</tbody>
</table>

(Compiled from various studies)

- Capacity: MC = 3 Car, 2 Bus (comparable to BRT) → help ease congestions
- Energy & GHG: e-bike > Bus, & comparable to MRT → shift to e-bike
- Fatal risk: MC = 4 Car, 10 Bus, 13 MRT → need to improve safety for MC riders
Accident death rates by mode
(death/billion pax-km)

- MC riders take the highest fatal risk
- Aus., US, UK: MC > 500cc, high speeds/EXPW → higher death rates
- Taiwan: MC = 100-125cc, low speeds/cities → a lower death rate
- MC fatal rate: Vietnam = 1.5 Taiwan → improvement possibilities

- Figures of Vietnam were based on the data collected in HCMC and Binh Duong for 2012-2015
Analysis of 5573 accidents in HCMC (2010-2015)

- More than 60% involved MC
- 70-80% were driver risky behaviors

- MC vs MC, Truck, Ped, Car, Container

- MC vs MC, Truck, Ped, Car, Container

- More than 60% involved MC
- 70-80% were driver risky behaviors

- MC vs MC, Truck, Ped, Car, Container

- MC vs MC, Truck, Ped, Car, Container
In-depth interview survey on MC drivers (N=100)

- 14% without the driving license → strict enforcement
- Poor knowledge (less than 30% answered correctly more than 50% of the given questions) → effective & lifelong education & training for riders

- Perceived road infrastructure at risk → safer road design and management

![Bar chart showing the distribution of test track and theoretical results for different categories of correct answers.]

- All correct: 23-28%
- 3/4 correct: 10%
- 1/2 correct: 22%
- 1/3 correct: 46%
- All wrong: 49%

![Graph showing perceived accident risk vs. daily to weekly encountering frequency.]

- Meeting drivers who use...: 0%
- Roads have many trucks: 0%
- Road curve: 0%
- Roads have rough areas: 0%
- Rail/road intersection: 0%
- Large intersection without...: 0%
- Large road has many students: 0%
- Roads at...: 0%
- Roads have many lanes: 0%
- Small intersection without...: 0%
- Large road has many lanes: 0%
- The large intersection has...: 0%
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Four Stage Strategy for Safer Motorcycling

Creating a favorable environment for safer motorcycling …

1. Policy & Regulation - Incorporating PTWs into Transport & Safety Public Policy
   - Road Safety policy should include PTWs
   - Recognition of the economic and social contribution of motorcycling
   - Adapting Policies to Local Situations

2. Infrastructure - Committing to Safer Infrastructure
   - Combination of improvements for PTW use
   - Adequate maintenance of roads and infrastructure should remain a priority

3. Awareness, Education and Training for all Road Users
   - Awareness Raising for All Road Users
   - Lifelong Training of PTW Riders
   - Preventing Impaired Riding
   - Protective Riding Gear
   - Regular maintenance of the vehicles

4. Technology Advances
   - Safety of the product is committed
   - Advances in preventive, primary, secondary safety

(Source: IMMA, 2014)
**Best practices – Policy & Regulation**

<table>
<thead>
<tr>
<th>Policy/Regulation</th>
<th>Countries</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>MC safety programs</strong></td>
<td>Malaysia, Philippines</td>
</tr>
<tr>
<td><strong>National Road Safety Agenda (2011-2021)</strong></td>
<td>Thailand</td>
</tr>
<tr>
<td><strong>Restrictions on MC max speed/power</strong></td>
<td>Japan, EU</td>
</tr>
<tr>
<td><strong>All-time Headlight On</strong></td>
<td>Singapore, Taiwan, Malaysia, Thailand</td>
</tr>
<tr>
<td><strong>MC Emission Standards</strong></td>
<td>Thailand, Indonesia</td>
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<tr>
<td><strong>MC Inspection &amp; Maintenance</strong></td>
<td>Taiwan, Thailand</td>
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### Best practices – Infrastructure

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<th>Infra Measure</th>
<th>Countries</th>
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<td>Motorcycle Dedicated Lane</td>
<td>Malaysia, Philippines</td>
</tr>
<tr>
<td>Motorcycle Priority Lane</td>
<td>Taiwan</td>
</tr>
<tr>
<td>Advanced Stop Lines</td>
<td>Indonesia</td>
</tr>
<tr>
<td>MC Left-turn Area at Intersection</td>
<td>Taiwan</td>
</tr>
<tr>
<td>Signal Control Systems for Mixed Traffic</td>
<td>Taiwan, Malaysia</td>
</tr>
<tr>
<td>Guidelines on Safer Road Design for Powered Two-Wheelers</td>
<td>Europe</td>
</tr>
</tbody>
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## Best practices – Education & Training

<table>
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<tr>
<th>Program</th>
<th>Countries</th>
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<tbody>
<tr>
<td>Traffic Law Exam for moped 50cc, e-bike</td>
<td>Taiwan</td>
</tr>
<tr>
<td>Practical Driving Test for MC 51-250cc</td>
<td>Taiwan</td>
</tr>
<tr>
<td>Free Training Course on Safe Riding Skills for New Drivers</td>
<td>Taiwan</td>
</tr>
<tr>
<td>Safe Riding School Events</td>
<td>Japan, Indonesia</td>
</tr>
<tr>
<td>Female Safety Riding Training</td>
<td>India</td>
</tr>
<tr>
<td>Road Safety Outreach Seminar</td>
<td>Philippines</td>
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<tr>
<td>Training for commuters</td>
<td>Malaysia</td>
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<tr>
<td>Proper Wearing of Helmets campaign</td>
<td>Japan</td>
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<tr>
<td>PTW Service check-up campaign</td>
<td>Thailand</td>
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## Best practices – Technology Advances

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<th>Makers/Countries</th>
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<td>All-Time Headlight On (AHO)</td>
<td>Japan, Malaysia, Thailand</td>
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<tr>
<td>Anti-Lock Breaking System (ABS), Combined Breaking System (CBS)</td>
<td>Bosch</td>
</tr>
<tr>
<td>Motorcycle Stability Control (MSC)</td>
<td>Bosch</td>
</tr>
<tr>
<td>Vehicle-to-Motorcycle Communication (V2M)</td>
<td>Honda/Taiwan</td>
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</tbody>
</table>
Opinion survey on measures considered for Motorcycle Safety & Efficiency

- Compulsory AHO for motorcycles: 18% support
- Ban of riding MC on expressways: 54% support
- ABS system required for new motorcycles: 54% support
- Adding a practical driving test to the driving licensing: 64% support
- Compulsory audit of motorcycle once a year: 64% support
- Safe riding certificate for children aged 16-18 (if want to ride an e-bike or a...): 67% support
- Promotion of a handbook for safe motorcycling: 68% support
- Dedicated lanes for motorcycle traffic: 82% support
- Compulsory helmet for kids < 6 yrs old: 82% support

(N = 1203) (% respondent supported)

- ↓ 20-40% accidents (Malaysia, Japan), ↓ 25% head-on collision
- ↓ 30-40% Num. accidents (Australia, EU, US)
- ↓ 35% children fatalities (Canada)
- ↓ 40% MC accidents (Malaysia)
- ↓ 16% head injuries (WHO studied in Vietnam)

- Supportive rates are high and very high → shall be implemented soonest
- Although supportive rate of AHO measure is low, but effective → should be implemented

(MOT proposed)

(www.mot.gov.my)
7. Recommendations for Vietnam

- The study has confirmed that MC will continue its dominant role in the transport systems in the future, therefore efforts and resources need to be invested in improving the rider safety.

- It is a good timing to tailor-make a Four Stage Strategy for Safer Motorcycling in Vietnam with a concrete roadmap for implementation and with the participation from MC industry and other institutions.

- In coming years, priorities shall be given to the selected measures for MC safety with high supports from people.
“The significant problems we face cannot be solved by the same level of thinking that created them”

Albert Einstein

Q & A