

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



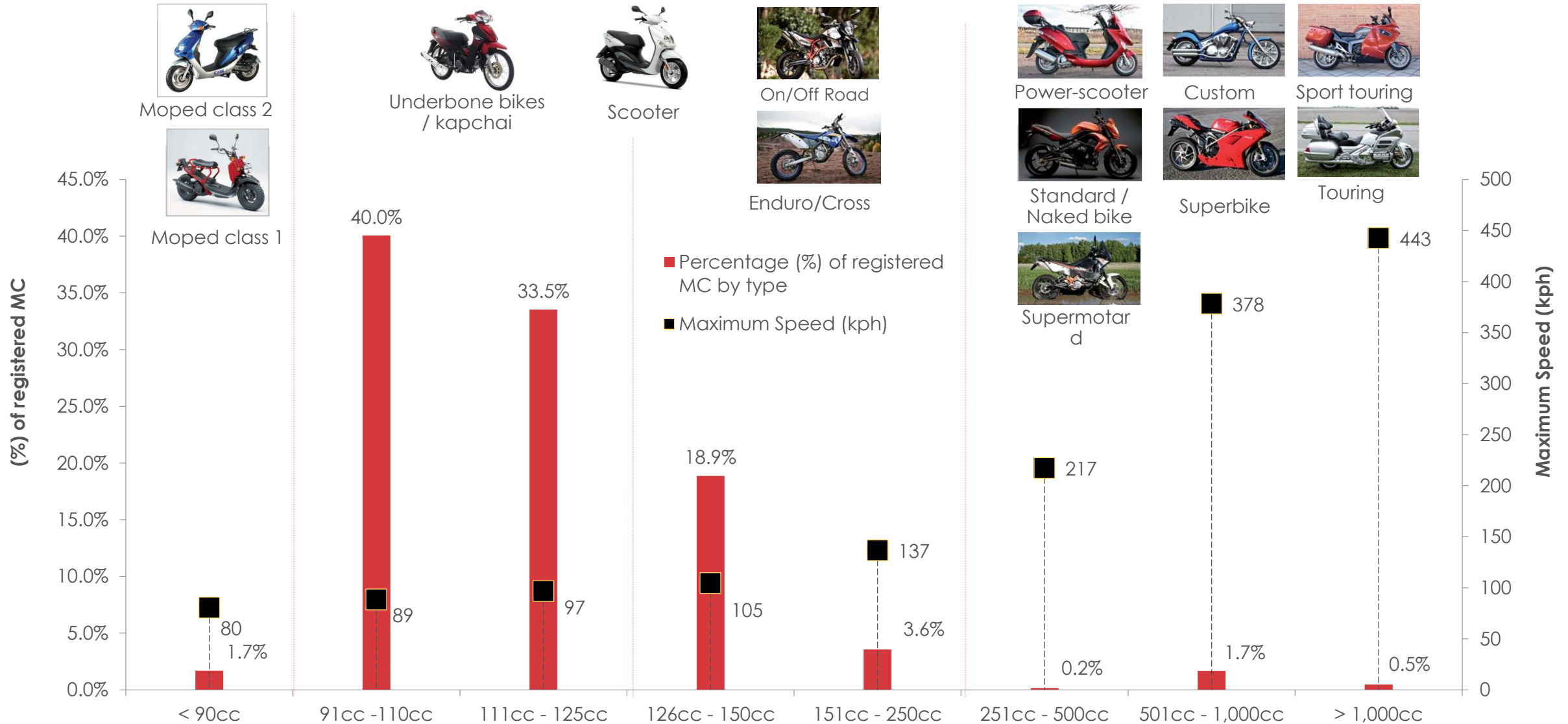
MALAYSIA

- 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



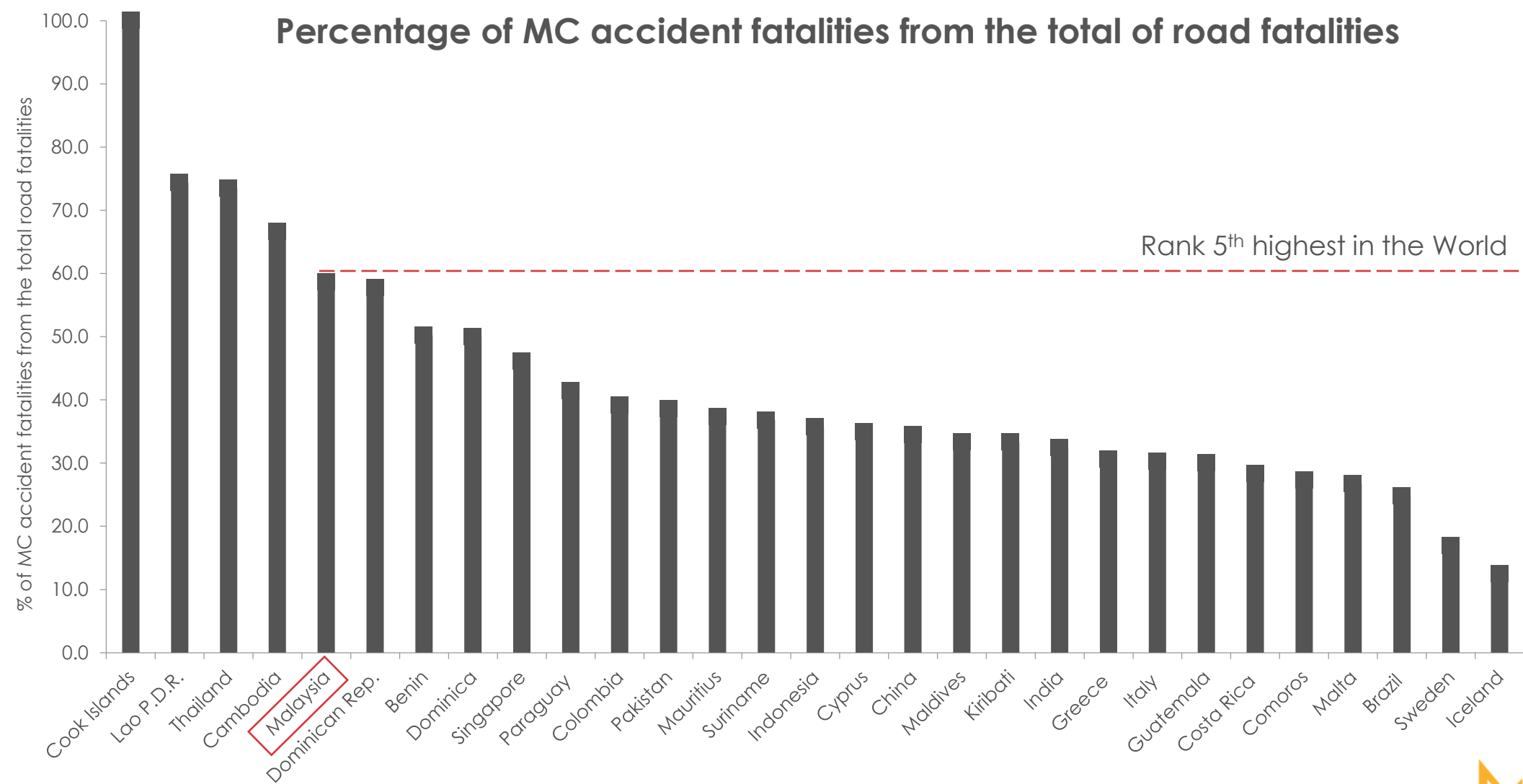
* WHO. (2013). Global status report on road safety 2013: supporting a decade of action. In. Geneva, Switzerland: World Health Organization.

MOTORCYCLE COMPOSITION IN MALAYSIA



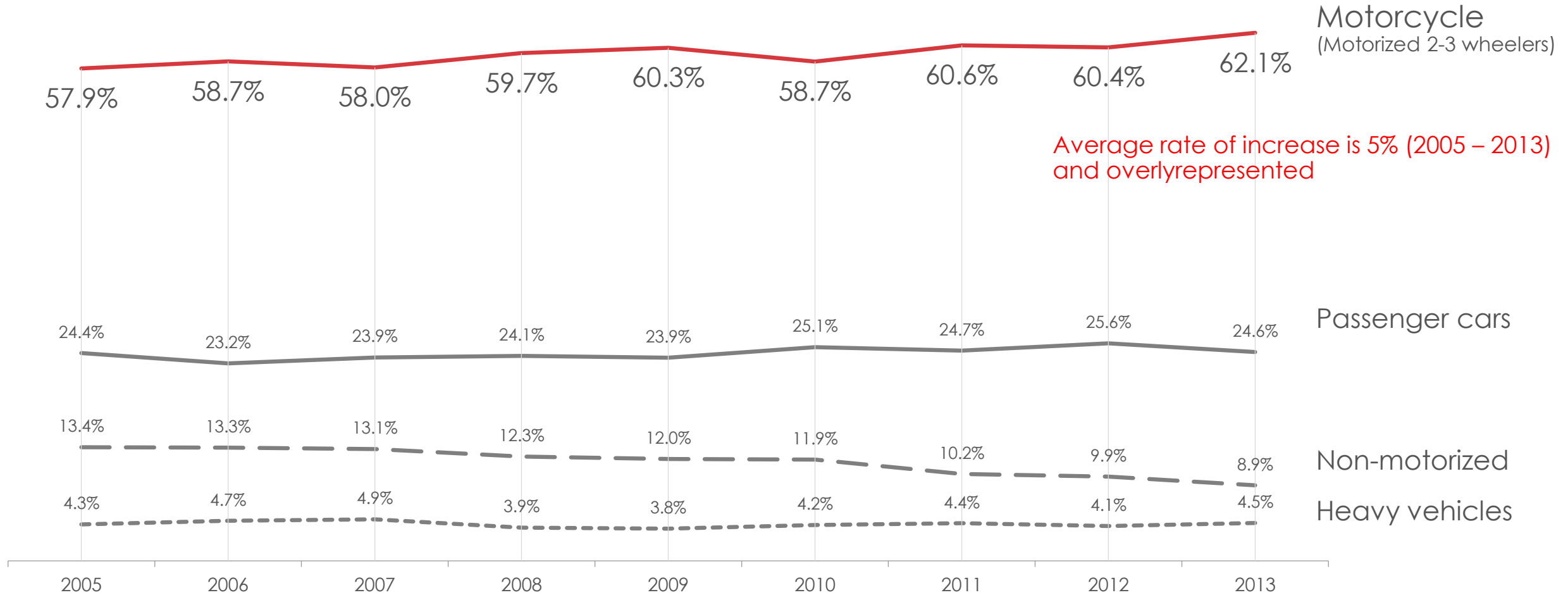
Source: JPJ (2014) – registered motorcycle

% OF MC ACCIDENT FATALITIES IN THE WORLD



* WHO. (2013). Global status report on road safety 2013: supporting a decade of action. In. Geneva, Switzerland: World Health Organization.

MALAYSIAN ROAD TRAFFIC FATALITIES BY TYPE OF ROAD USER



Source: PDRM (2013), analyzed by MIROS (2014)



MC CURRENT FINDINGS (1/8)

The factors /category which has the highest number of motorcycle accident fatalities in Malaysia

Percentage of the total motorcycle accident fatalities (%)

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

- Abdul Manan, M. M., & Várhelyi, A. (2012). Motorcycle fatalities in Malaysia. *IATSS Research*, 36, 30-39.

- Abdul Manan, M. M., Jonsson, T., & Várhelyi, A. (2013). Development of a safety performance function for motorcycle accident fatalities on Malaysian primary roads. *Safety Science*, 60, 13-20.



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., & Várhelyi, A. (2012). Motorcycle fatalities in Malaysia. *IATSS Research*, 36, 30-39

** 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)

Road environment factors	Single motorcycle fatal crashes	Motorcycle fatal crashes involving another vehicle	Motorcycle fatal crashes involving two of more vehicle
Freeway	↓ -3.5%		↑ 6.2%
Primary road	↓ -20.7%	↑ 7.9%	↑ 24.6%
Secondary road	↓ -10.7%	↑ 3.8%	↑ 14.1%
Collector road	↓ -5.2%		
Rural	↓ -6.8%	↑ 6.7%	↓ -17.5%
Curve	↑ 17.5%	↓ -9.7%	
1 way traffic	↑ 2.0%		↓ -3.8%
110 KMJ			↑ 2.7%
70 KMJ			↑ 5.9%
90 KMJ	↓ -3.3%	↑ 1.2%	↑ 4.2%
Double (passing not permissible)	↓ -5.5%	↑ 1.7%	↑ 8.6%
Single (passing permissible)			↑ 17.1%
No lane marking	↑ 2.5%	↓ -1.1%	
12am-6am	↑ 8.5%	↓ -4.7%	
6am-9am	↑ 2.7%	↓ -1.5%	
9am-12pm	↑ 1.6%	↓ -0.6%	↓ -1.8%
7pm-12pm	↑ 4.3%	↓ -3.1%	↑ 3.9%
Day	↓ -7.8%	↑ 3.2%	↑ 7.6%

** 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)

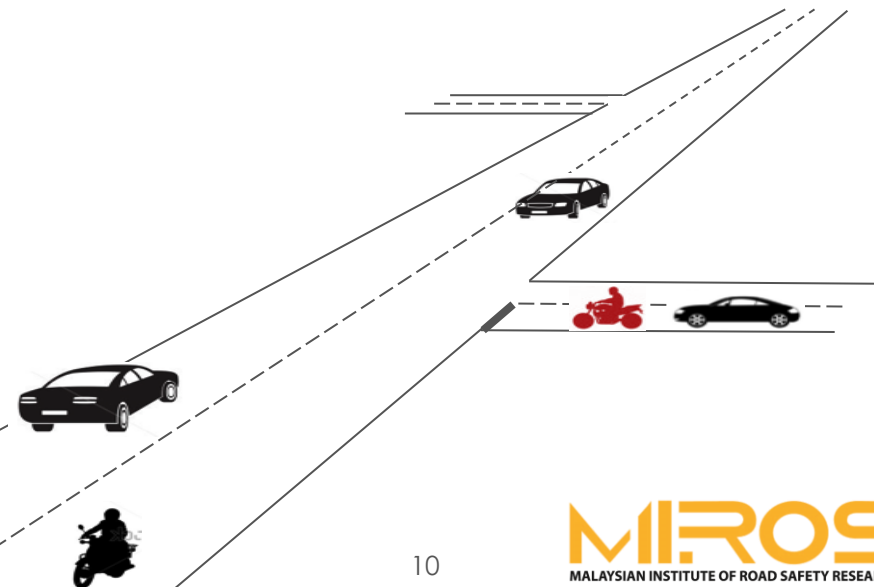
- a. Abdul Manan, M. M., Jonsson, T., & Várhelyi, A. (2013). Development of a safety performance function for motorcycle accident fatalities on Malaysian primary roads. *Safety Science*, **60**, 13-20.
- b. Abdul Manan, M.M. Factors associated with motorcyclists' safety at access points along primary roads in Malaysia (2014). Institutionen för Teknik och samhälle, Trafik och väg. Bulletin - Lunds Univesitet, Lunds Tekniska Högskola I Lund, Institutionen för Teknik och samhälle, 290. ISBN: 978-91-7473-903-9, ISSN: 1653-1930
- 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
- d. Nur Fazzialah MN, Azzuhana R, Muhammad Marizwan MM, Spatial Distribution and Adequacy of Speed Limit Signs in Negeri Sembilan (2014)



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)

- a. Abdul Manan, M. M., Jonsson, T., & Várhelyi, A. (2013). Development of a safety performance function for motorcycle accident fatalities on Malaysian primary roads. *Safety Science*, 60, 13-20.
- b. Abdul Manan, M.M. Factors associated with motorcyclists' safety at access points along primary roads in Malaysia (2014). Institutionen för Teknik och samhälle, Trafik och väg. Bulletin - Lunds Univesitet, Lunds Tekniska Högskola I Lund, Institutionen för Teknik och samhälle, 290. ISBN: 978-91-7473-903-9, ISSN: 1653-1930
- 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
- d. Nur Fazzialah MN, Azzuhana R, Muhammad Marizwan MM, Spatial Distribution and Adequacy of Speed Limit Signs in Negeri Sembilan (2014)
- e. Ibrahim, M. K. A., Ab Rashid, A. A., Mohd Ariffin, M. Q. (2012). Evaluating novice motorcyclists' hazard perception skills at junctions using naturalistic riding data. In N. A. Stanton (Ed.), *Advances in Human Aspects of Road and Rail Transportation* (pp. 420-428). Florida, FL: CRC Press



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)

Vehicle type	Fatal to vehicle driver	Fatal to pedestrian
Heavy Vehicle (HV)	0	3
Passenger car (PC)	8	69
Motorcycle (MC)	20	2
Bicycle (BC)	6	8
Source of accident data: Royal Malaysian Police (2010 – 2012), analysis done by MIROS		



MC CURRENT FINDINGS (7/8)

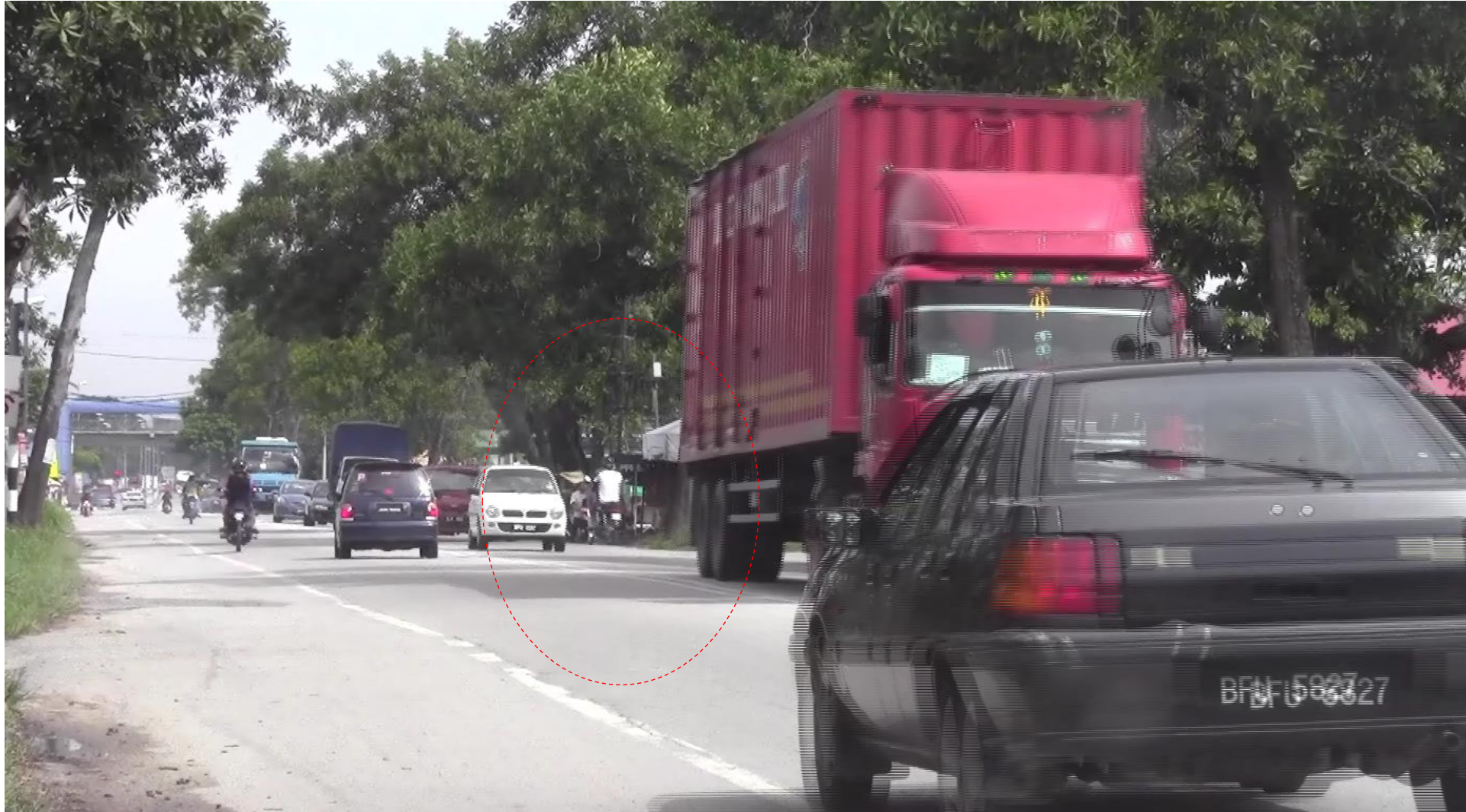
- The Opposite Indirect Right Turn (OIRT)
 - 18% to 26% of right turning motorcyclists
 - Majority of motorcyclists do not stop at the stop line
 - Accept shorter gap ($t_G < 4s$) at high traffic volume
 - BUT low rate of serious traffic conflict! compared to normal right turn movement



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)

TYPE	PHOTO	CRITERIA	
Exclusive Motorcycle Path (EMCL)		Width	Between 2.5m – 3.0m
		Separator	Physical traffic barrier
Non-exclusive Motorcycle Lane (NEMCL) – Dedicated lane		Width	Between 2.0m – 2.5m
		Separator	Road marking

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

(a) Radin Umar, R.S., Mackay, M., Hills, B., 2000. Multivariate Analysis of Motorcycle Accidents and the Effects of Exclusive Motorcycle Lanes in Malaysia. *Journal of Crash Prevention and Injury Control* 2, 11-17.

(b) Abdul Manan, M. M., & Várhelyi, A. (2012). Motorcycle fatalities in Malaysia. *IATSS Research*, 36, 30-39.

(c) Norfaizah, M.K., Abdul Manan, M.M., (2015) Safety Evaluation of Egress and Ingress Points Along Exclusive Motorcycle Lane

MC ROAD SAFETY MEASURES (2/2)

MC lane facilities

Path
(Exclusive)



T2: Presence of auxiliary lane for acceleration on the motorcycle lane



T4: Entry angle <90 degree, length of slip lane >15m

MC accident reduce to 39%^(a)
Makes up less than 1% of the whole length of primary roads (Federal Roads),
whereas

Lane
(Non-exclusive)



May reduce the crash risk by 80% among motorcyclists as compared to section without.

Account for about 20% of the whole primary road network

(a) Radin Umar, R.S., Mackay, M., Hills, B., 2000. Multivariate Analysis of Motorcycle Accidents and the Effects of Exclusive Motorcycle Lanes in Malaysia. *Journal of Crash Prevention and Injury Control* 2, 11-17.

(b) Abdul Manan, M. M., & Várhelyi, A. (2012). Motorcycle fatalities in Malaysia. *IATSS Research*, 36, 30-39.

(c) Norfaizah, M.K., Abdul Manan, M.M., (2015) Safety Evaluation of Egress and Ingress Points Along Exclusive Motorcycle Lane

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

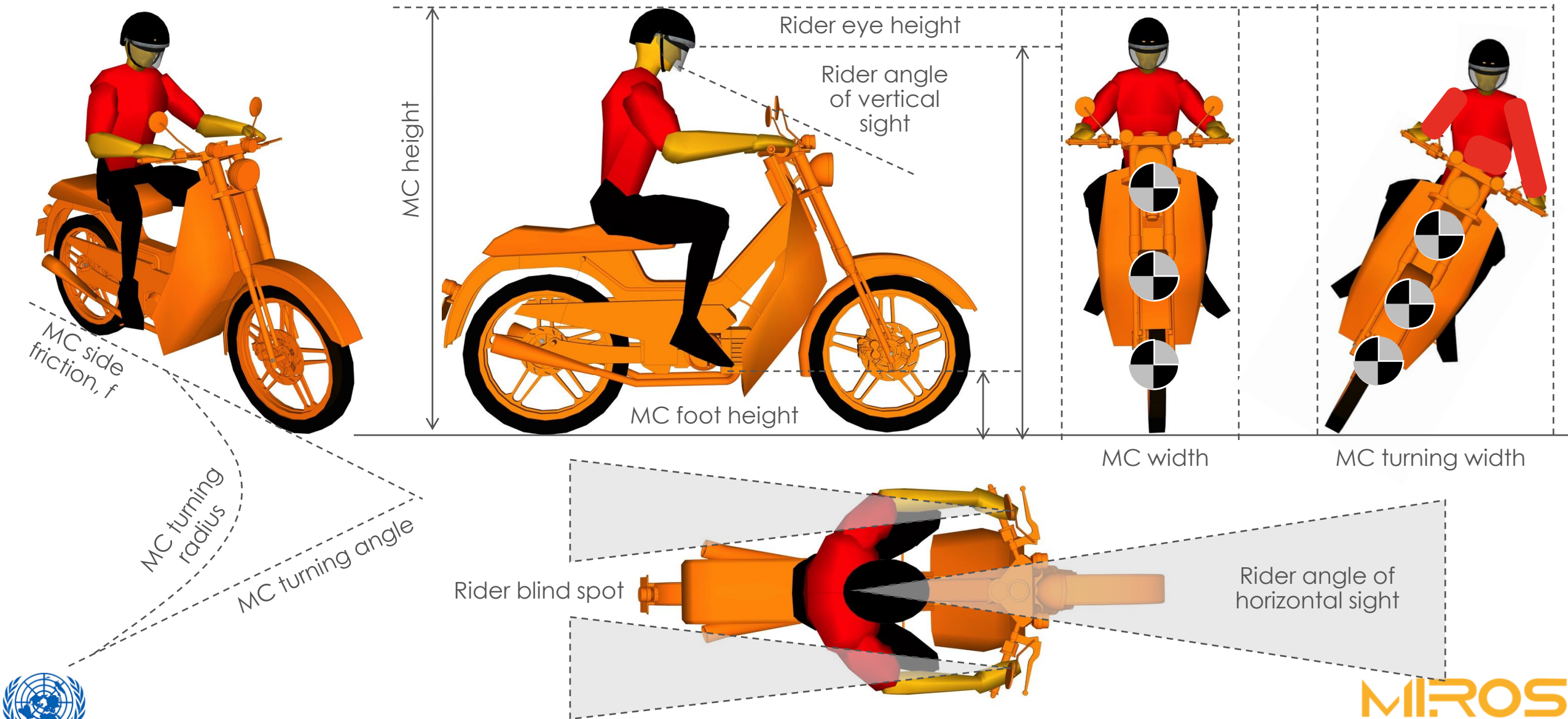


FUTURE RESEARCH IN MALAYSIA

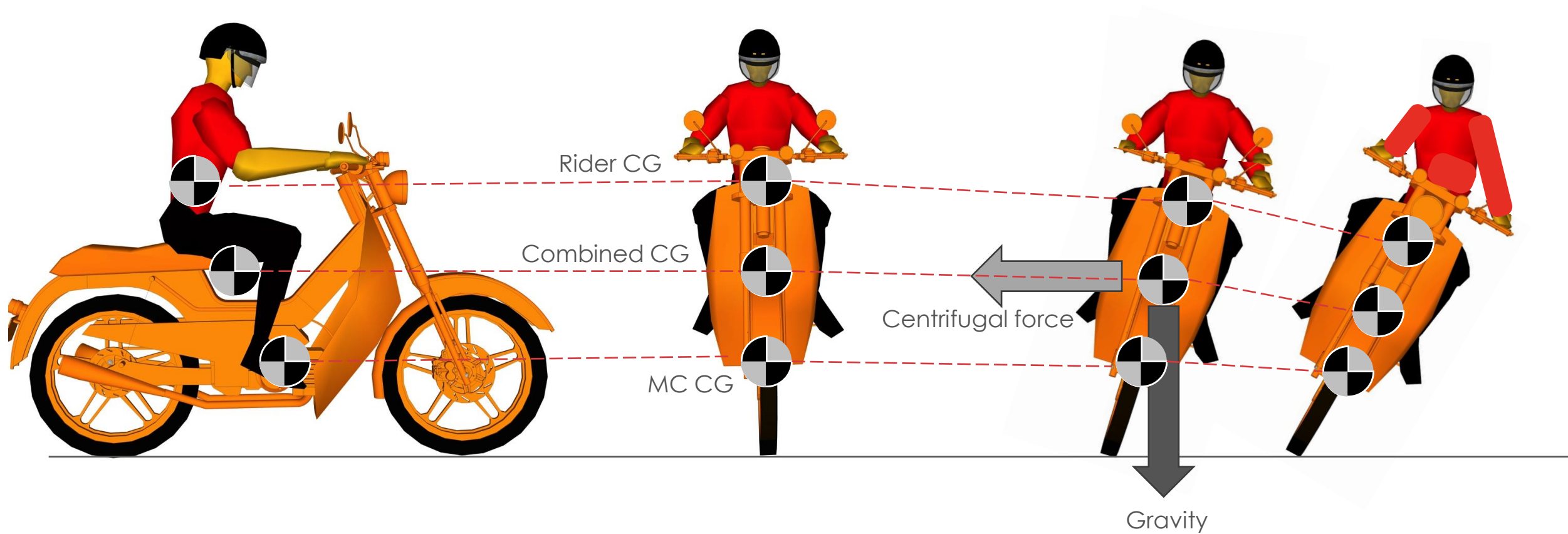
- Motorcycle and motorcyclists anthropometry
- Motorcycle behavior at pedestrian crossing
- Motorcycle safety performance function on urban highways
- Naturalistic road safety observation and reporting
- Regulating the **Opposite Indirect Right Turn Movement**
- Development of Motorcycle crash barrier



MOTORCYCLE AND RIDER ANTHROPOMETRY

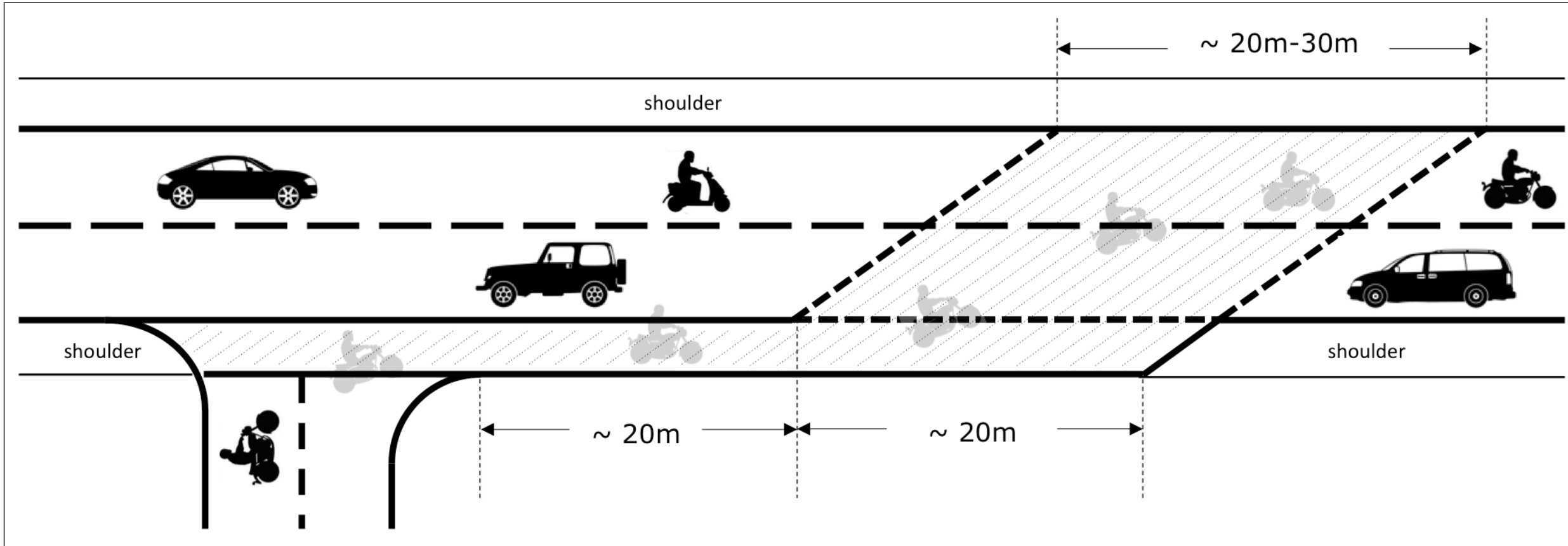


MC CENTER OF GRAVITIES



M-OIRT

MC Opposite Indirect Right Turn



Abdul Manan, M. M., (2014), Motorcycle reverse-flow indirect right-turn zone (M-REVIRTZ): a probable solution to improve motorcycle safety at access point, PIARC International Seminar on Slopes, Road Foundation Drainage and Storm Water Mangement: Proceeding of the 9th Malaysian Road Conference (MRC9), 10-12 November 2014, Kuala Lumpur, Malaysia.

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
MERCII!**



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

