



IRF - Mandatory Conspicuity Regulations in SEA Countries

Harish Banwari
3M Asia Pacific, Singapore

17 Nov 2017

SEA = South East Asia

Agenda

APAC/SEA Traffic Fatality Analysis

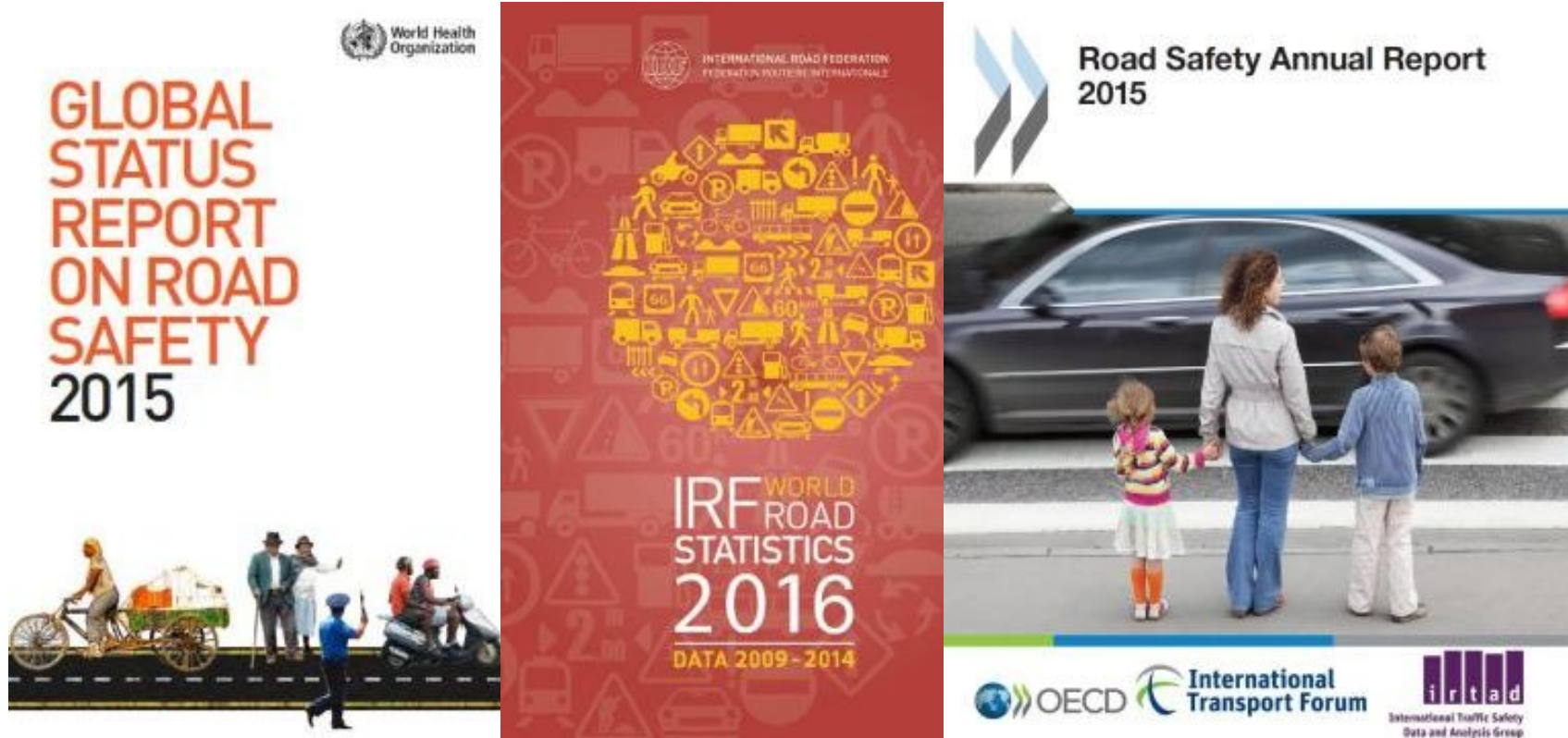
UN Decade of Action - Safer Vehicles

APAC Conspicuity Regulations

Economic Benefits

Conclusions

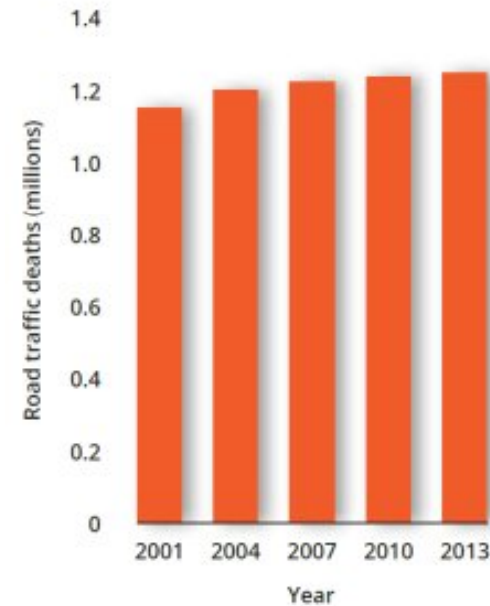
Traffic Safety Data: WHO, IRF and IRTAD



WHO 2013, IRF 2014 and IRTAD 2013 Traffic Fatalities for APAC Countries

Total Traffic Fatalities vs # Registered Vehicles/1k Pop.				
Rank	APAC Ctry/Area	Ctry Rept'd Fatal. 2013	WHO Est'd Fatal. 2013	Reg Veh / 1000 pop
1	Hong Kong	100	100	96
2	Singapore	159	197	174
3	New Zealand	253	272	748
4	Australia	1,192	1,252	755
5	Taiwan	1,819	1,819	908
6	Sri Lanka	2,362	3,691	227
7	Korea	5,092	5,931	450
8	Japan	5,679	5,971	695
9	Malaysia	6,915	7,129	815
10	Philippines	1,469	10,379	78
11	Vietnam	9,845	22,419	439
12	Thailand	13,650	24,237	547
13	Indonesia	26,416	38,279	424
14	India	137,572	207,551	134
15	China	62,945	261,367	159
	APac - 15	275,468	590,594	

Number of road traffic deaths, worldwide, 2013



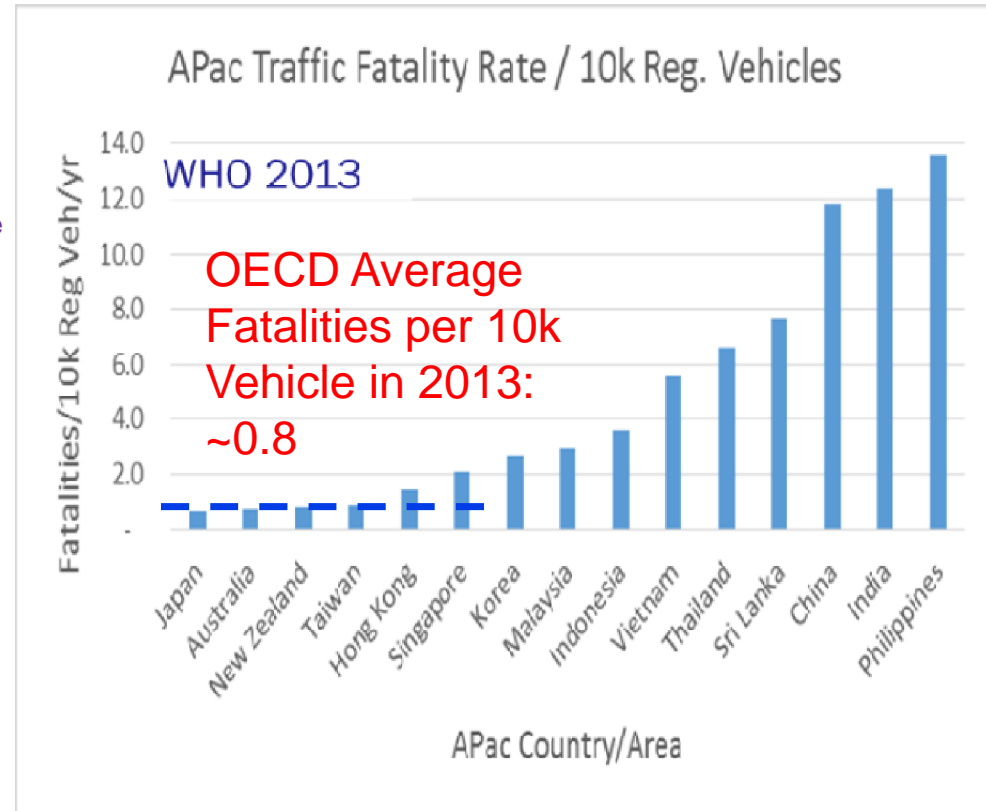
APAC has 50% of the global 1.25M/year traffic fatalities.

SEA here refers to ASEAN-5 countries: Indonesia, Thailand, Malaysia, Philippines and Vietnam.

APAC/SEA Traffic Fatalities per 10k Registered Vehicles (2 / More Wheels)

Use WHO's Est Fatalities 2013			
Rank	APAC Ctry/Area	Fatal. / 100k pop.	Fatal. / 10k reg. veh.
1	Japan	4.7	0.7
2	Australia	5.4	0.7
3	New Zealand	6.0	0.8
4	Taiwan	7.8	0.9
5	Hong Kong	1.4	1.4
6	Singapore	3.6	2.1
7	Korea	12.0	2.7
8	Malaysia	24.0	2.9
9	Indonesia	15.3	3.6
10	Vietnam	24.5	5.6
11	Thailand	36.2	6.6
12	Sri Lanka	17.4	7.7
13	China	18.9	11.8
14	India	16.6	12.4
15	Philippines	10.5	13.6

OECD Average



Agenda

APAC/SEA Traffic Fatality Analysis

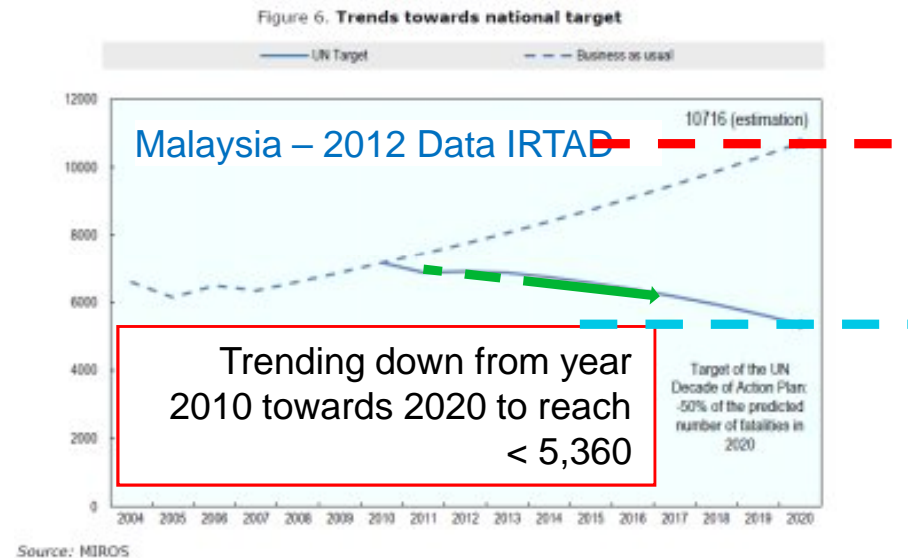
UN Decade of Action - Safer Vehicles

APAC Conspicuity Regulations

Economic Benefits

Conclusions

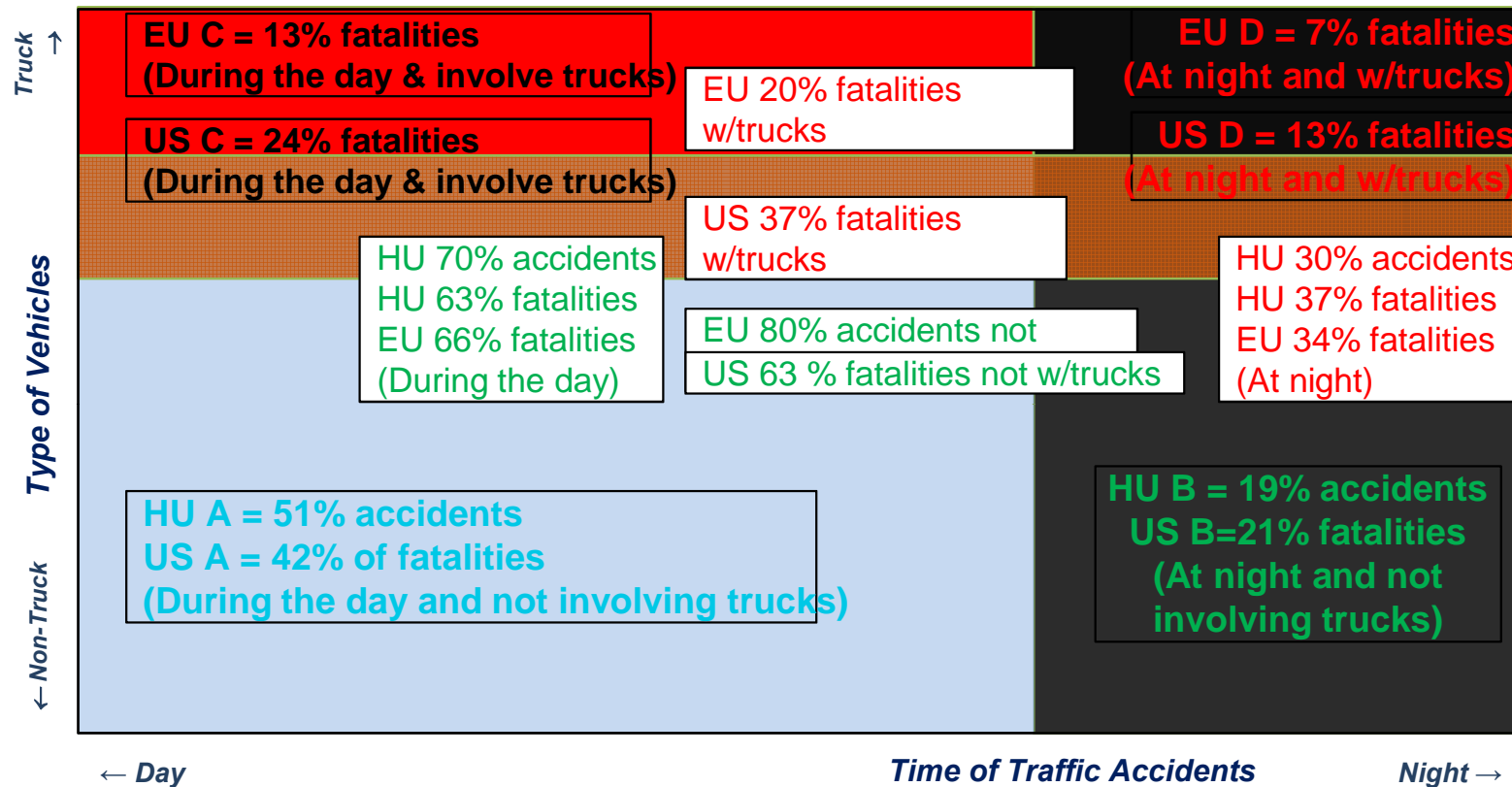
United Nations Decade of Action (UNDoA) for Road Safety 2011 – 2020: Malaysia Case Study



- Malaysia MOT's Road Safety Plan (PKJRM 2014-2020)
- Target fatality index to drop from 3.4 in 2010 to 2.0 per 10k vehicles by 2020

Safer Vehicles is UNDoA pillar we focus on today.

Model of Heavy Vehicles Crash Statistics



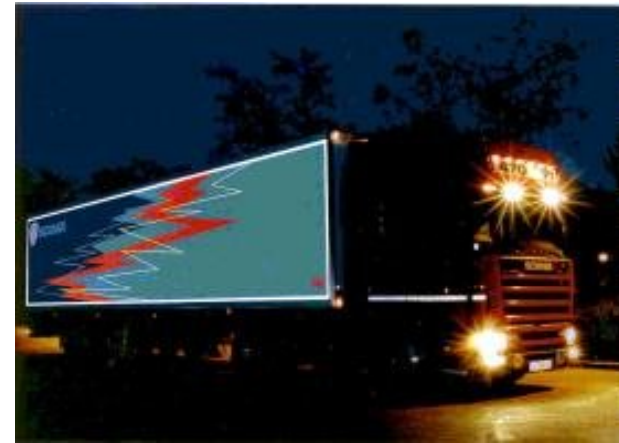
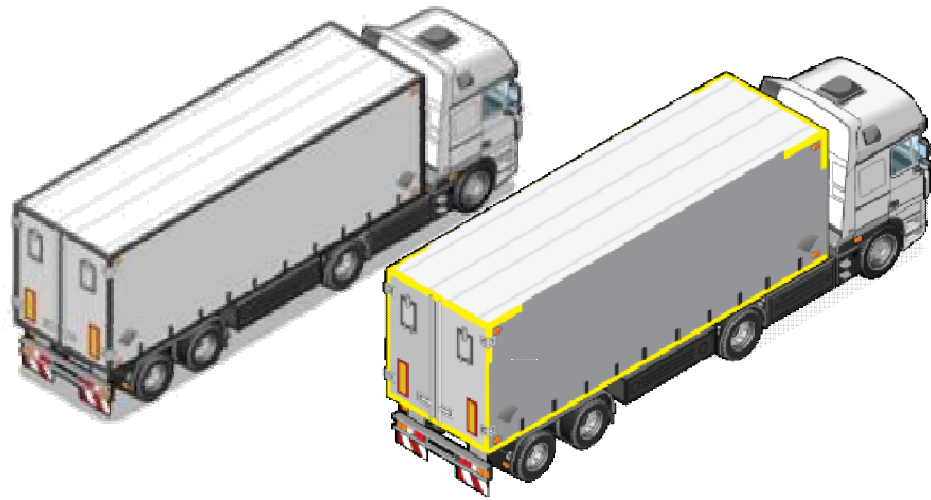
References

1. [US NTSB Safety Study Report 2013](#)
2. [Hungary Institute of Vehicle Safety Study](#)
3. [EU Traffic Safety Data on HGV and Buses 2013](#)

Trucks contribute 20-37% of fatalities despite their 5-10% vehicle population mix.

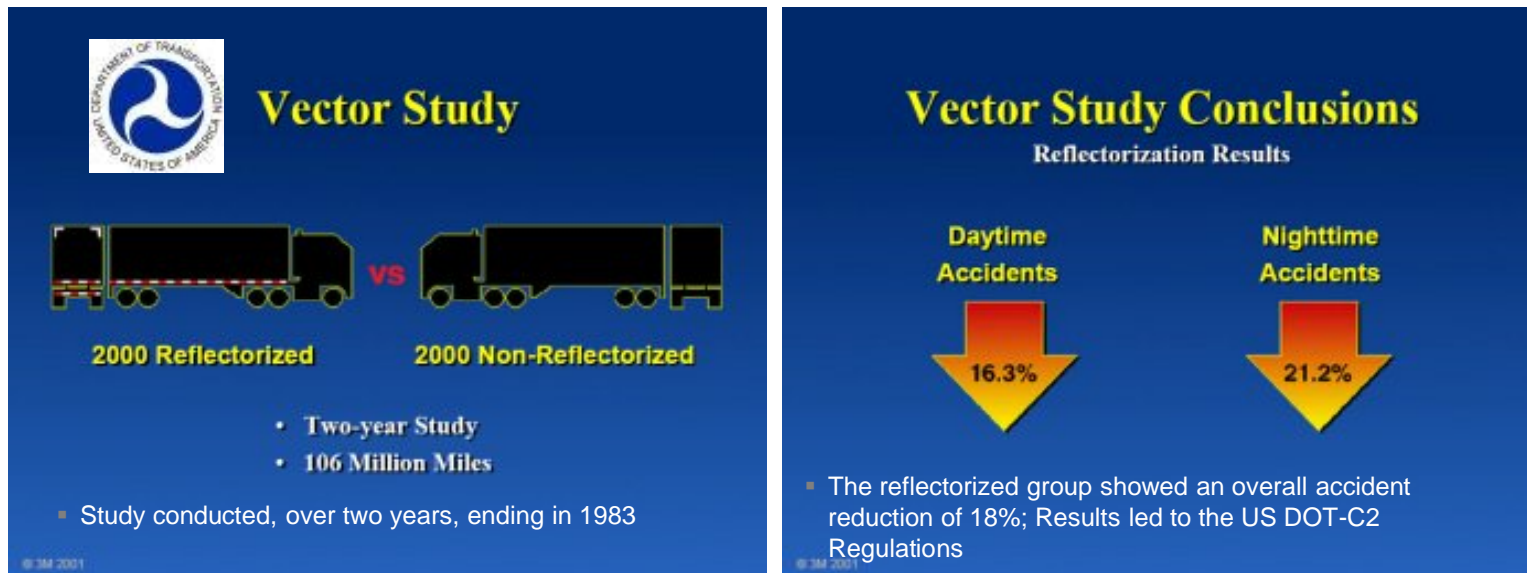


What is Vehicle Conspicuity?



Large vehicles with conspicuity are visible at night, whether driven or un-operated.

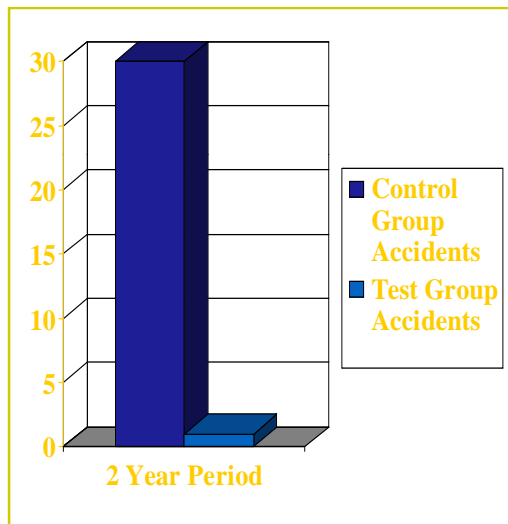
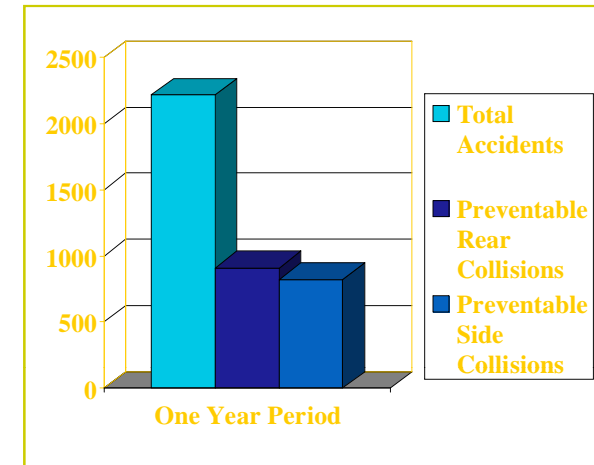
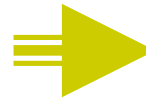
It all began with this US Vector Study for Vehicle Reflector 1981



This study found 18% overall accident reduction w/conspicuity.

German Darmstadt Study 1984

Over a one-year period, **37% of all truck side and 41% of truck rear** collisions during darkness and twilight were caused by the **truck not having been recognized in time**.



Over a two year period, the control group had **30** different side or rear collisions during the night. Only **one (1)** accident occurred in the test group of trucks with contour markings.

In the Darmstadt study, 1000 trucks were applied with conspicuity markings.

A German Darmstadt Analysis Shows:



41%
rear end collisions
could be prevented with
visibility



37 %
side collisions could
be prevented with
visibility

Source: Darmstadt University, Germany

This study found 37-41% of rear end and side collisions could have been prevented with truck visibility.

Agenda

APAC/SEA Traffic Fatality Analysis

UN Decade of Action - Safer Vehicles






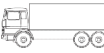





APAC Conspicuity Regulations

Economic Benefits

Conclusions

UN ECE Regulation 104

- Uniform provisions concerning retroreflective markings for:
- Commercial vehicles (sub-categories N2 and N3 Mandatory)
- Trailers and semi-trailers (sub-categories O3 and O4 Mandatory)

Vehicle Category	Sub - Category and Max. Mass in tonnes	Max # passengers (excl. driver)	
M (Passenger transport)	M1 (Passenger Car)	8	
	M2 (Bus) Mass ≤ 5 T	> 8	
	M3 (Bus) Mass > 5 T	>8	
N (Commercial Vehicles)	N1 Mass ≤ 3.5 T	N.A.	
	N2 3.5 T < Mass ≤ 7.5 T	N.A.	
	N2 7.5 < Mass ≤ 12 T	N.A.	
	N3 Mass > 12 T	N.A.	
O (Trailers & Semi Trailers)	O1 T1 Mass ≤ 0.75 T	N.A.	
	O2 T2 0.75 < Mass ≤ 3.5 T	N.A.	
	O3 T3 3.5 < Mass ≤ 10 T	N.A.	
	O4 T4 Mass > 10 T	N.A.	

PROHIBITED
ALLOWED
ALLOWED
ALLOWED
ALLOWED
MANDATORY
MANDATORY
PROHIBITED
ALLOWED
MANDATORY
MANDATORY

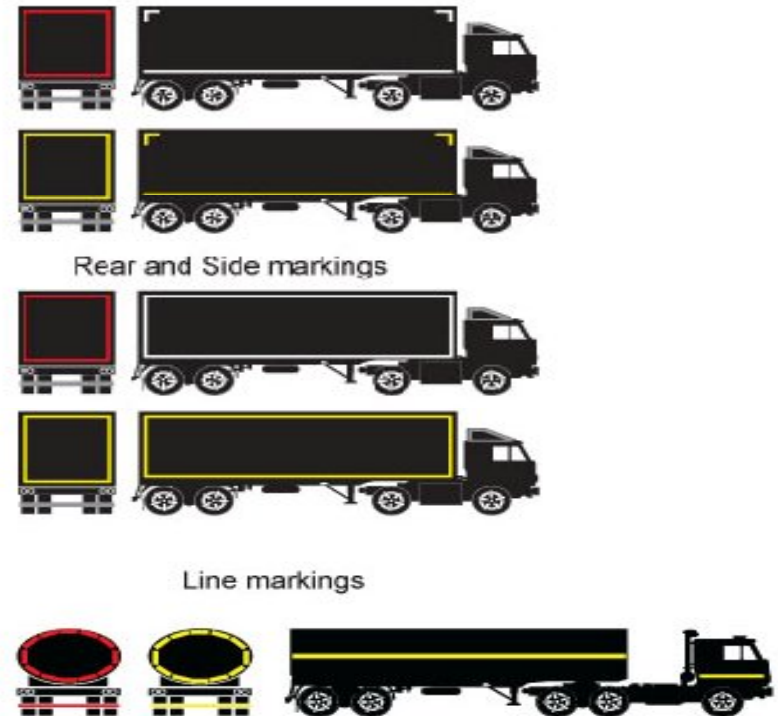
For more information, see the complete regulation at <http://www.unece.org/fileadmin/DAM/trans/main/wp29/wp29regs/r104rev.1.e.pdf>

UNECE R104 Conspicuity is more comprehensive than US DOT-C2 in applicable vehicle categories, layout and reflective material specifications.



UN ECE Regulation 104 (cont'd)

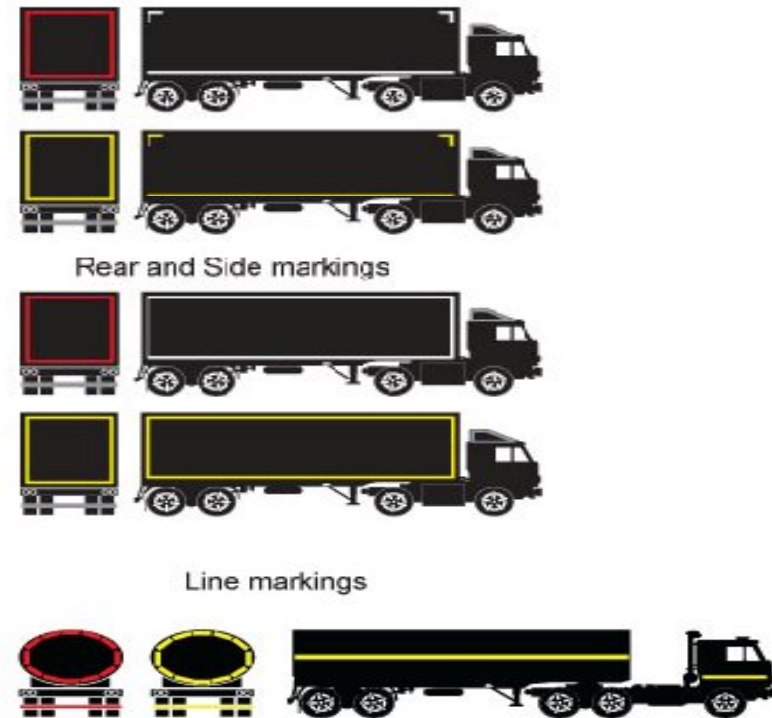
- **Material**
 - The markings shall be made of strips of retroreflective material.
- **Dimensions**
 - The width of a side and/or rear marking material shall be 50 mm +10/-0 mm.
 - The minimum length of an element of a retroreflective marking material shall be such that at least one approval mark is visible.



For more information, see the complete regulation at <http://www.unece.org/fileadmin/DAM/trans/main/wp29/wp29regs/r104rev.1.e.pdf>

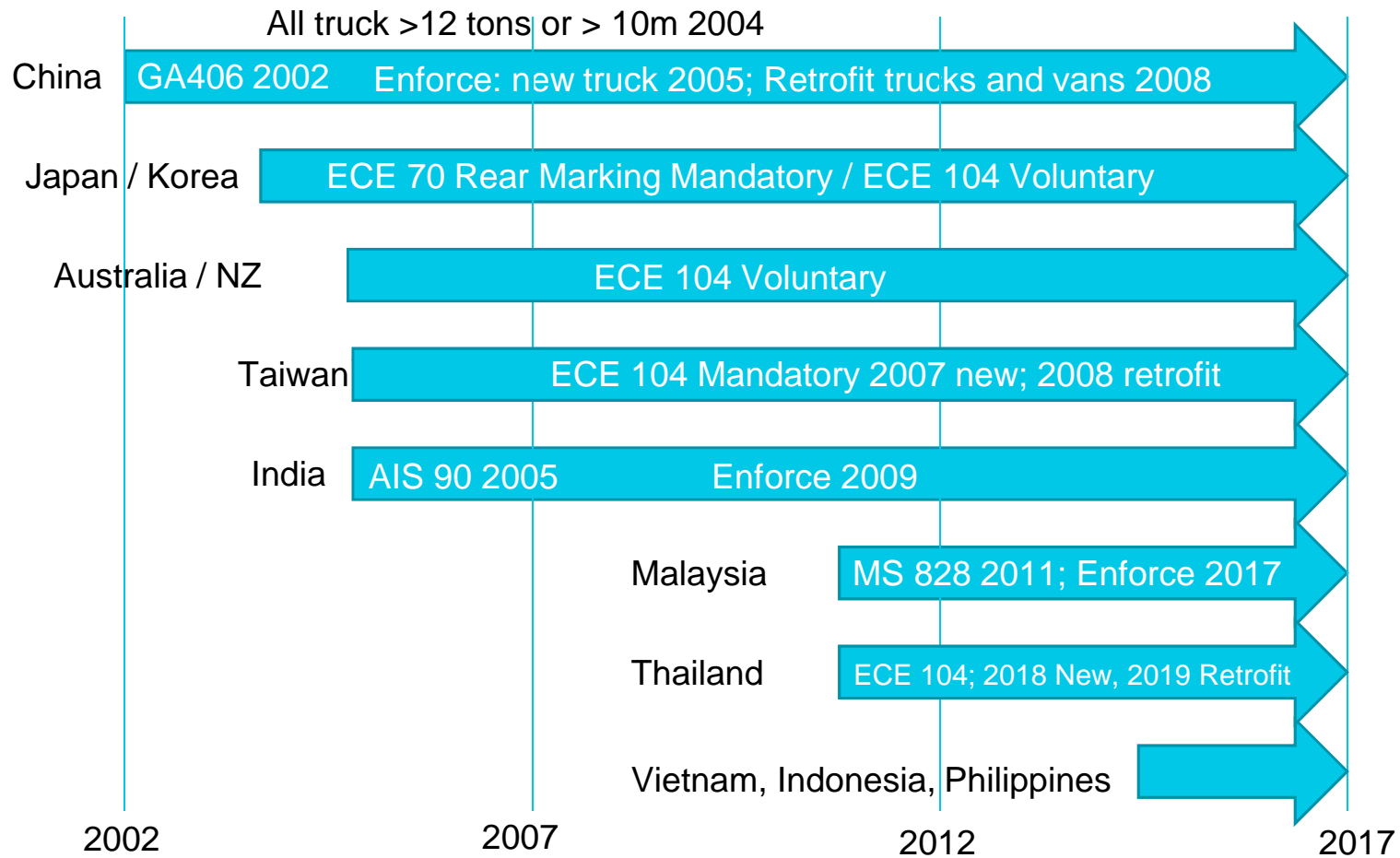
UN ECE Regulation 104 (cont'd)

- **Amount of Material**
 - Continuous line marking mandatory (whenever possible)
 - 80% of the truck length must be covered
- **Colors**
 - Front: white
 - Sides: white or yellow
 - Rear: red or yellow



For more information, see the complete regulation at <http://www.unece.org/fileadmin/DAM/trans/main/wp29/wp29regs/r104rev.1.e.pdf>

Conspicuity Regulations @ APAC Countries



Agenda

APAC/SEA Traffic Fatality Analysis

UN Decade of Action - Safer Vehicles

APAC Conspicuity Regulations

Economic Benefits

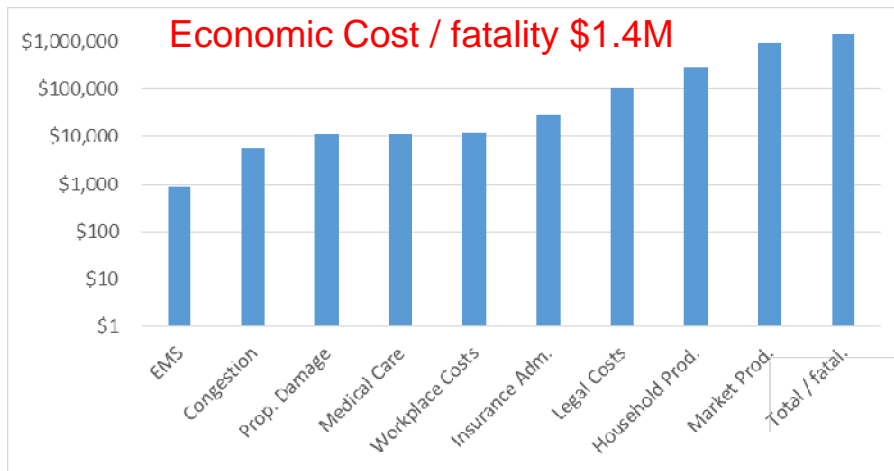
Conclusions

US Economic and Societal Impact Of MV Crashes in 2010

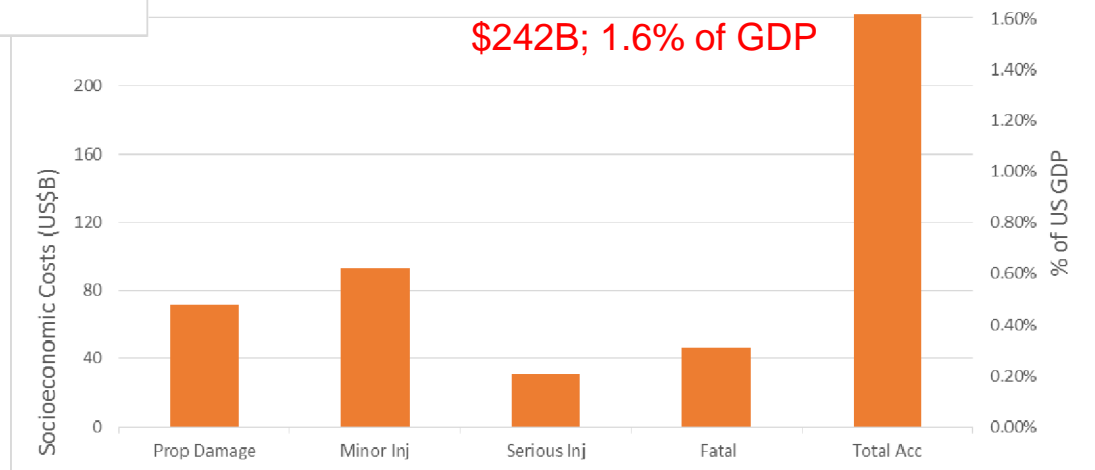
Ref: DOT HS 812 013

2010 US Road Crash Numbers

- 33k fatalities
- 3.9M injuries (non-fatal)
- 24M vehicles involved



2010 US Traffic Accident Economic Costs



Economic Costs:

- 1.6% of GDP
- \$784 loss/capita

Societal Impact Est.

- \$836B (3.5X Econ)

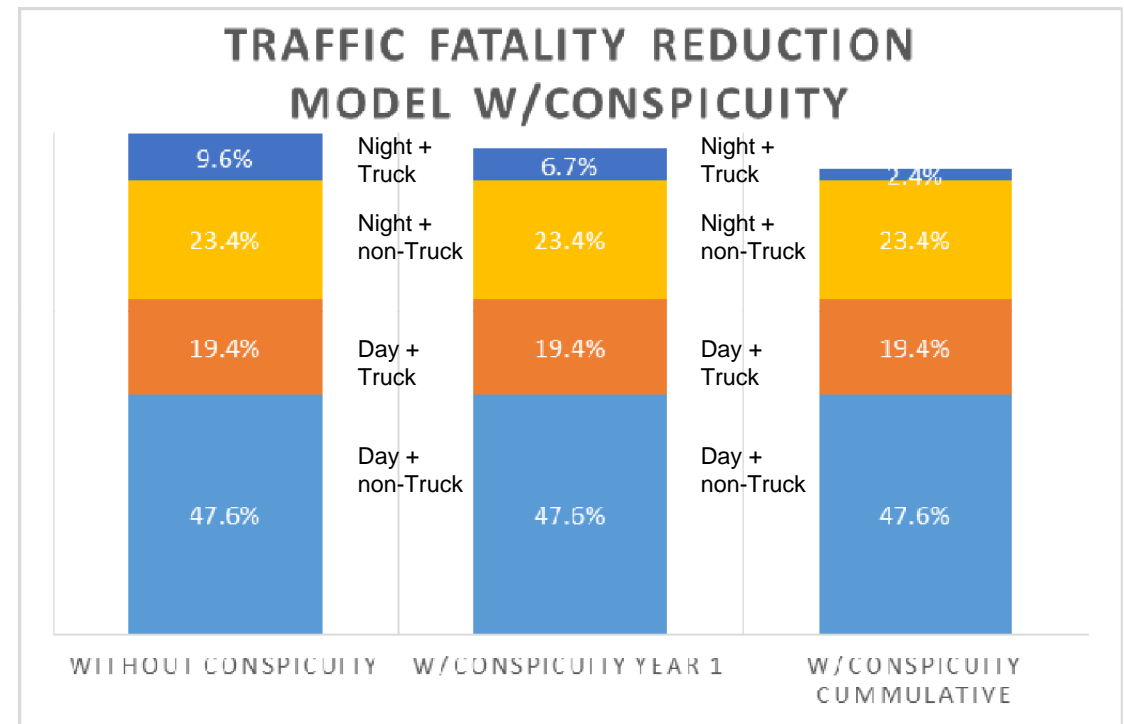
- WHO generally estimates 1~3% GDP loss due to traffic crashes.

Estimating SEA5 Traffic Fatality Cost and Conspicuity Life Saving

- 1/3 fatalities involving trucks.
- 1/3 fatalities occurred at night.
- 1/3 reduction in side and rear impact collisions with conspicuity.
- 1/3 reduction in fatalities involving trucks with conspicuity
- 1/3³ net of lives saved by retrofitting conspicuity on trucks.

SEA5 are: Indonesia, Thailand, Malaysia, Philippines and Vietnam; ASEAN's biggest middle income economies.

Model for Benefit/Cost Computation

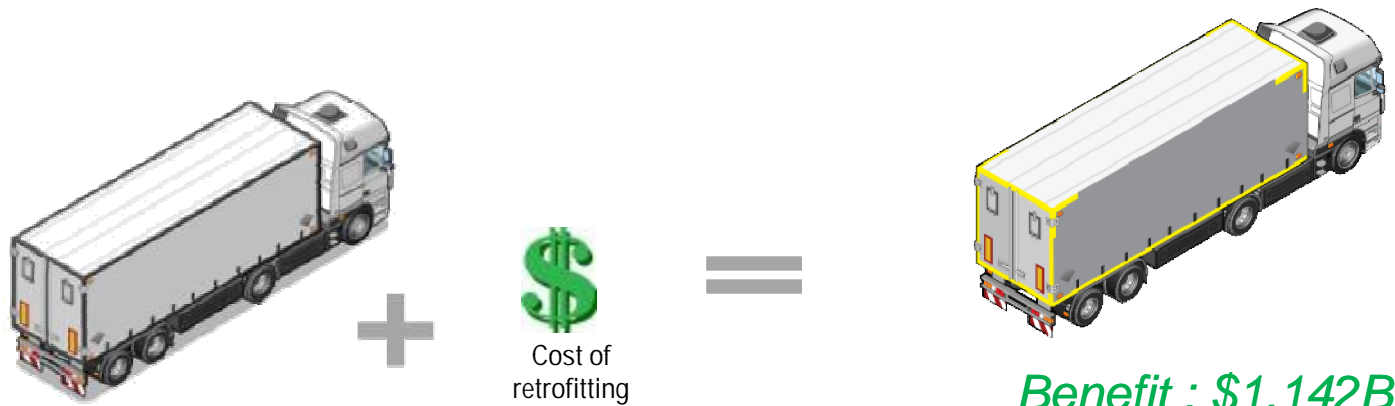


- Methodology is similar to the 2011 Dutch Swov study: 2.9% life saving in year 1 and 2.5X overall.

SEA5: Estimate of Conspicuity Benefit vs Cost

SEA5: Indonesia, Thailand, Malaysia, Philippines, Vietnam	# of trucks > 3.5t involved in accidents/yr ('000)	Repair costs + workplace productivity loss (Mil)	Traffic Fatalities /yr	Fatality Induced Economic Loss (\$M)	Economic Loss: Life + Property + Productivity (\$M)	SEA5 GDP (\$B)	GDP Impact from Traffic Fatalities
Without Conspicuity	300	750	102,443	15,366	16,116	2,113	0.8%
Accidents involving trucks at night	29	72	9,804	1,471	1,542		0.07%
Total trucks > 3.5t population 5.873M in ASEAN-5	# of trucks Spared from Fatal Accidents ('000)	Spared Repair costs and productivity	Spared Traffic Fatalities	Spared Fatality Economic Loss	Spared Economic Loss (\$M)	End User Cost to Fit Conspicuity (\$M)	Economic Benefit/Cost Ratio
W/Conspicuity Year 1	9	24	2,941	441	465	206	2
W/Conspicuity Cumulative	24	59	7,352	1,103	1,162		6
Assumptions for Benefit / Cost Ratio Computations	3.4% Probability of Accident per truck > 3.5t (based on MY 2014 data 38k in accidents vs 1.16M trucks)	Repair cost + loss of productivity \$2.5k/accident	WHO 2015 Est. & 2.9% truck+night fatality reduction	Statistical value of life US\$150k in SEA5 (MIROS 2014 adjusted)	Without adding non-fatal injuries, medical, household, legal, losses, etc	\$35 each truck for 1 sqm conspicuity marking	Ratio of conspicuity program economic benefit to fitting cost

SEA5 Conspicuity: Benefit vs. Cost Ratio



*Cost : \$206M for
5.9M heavy trucks*

Benefit : \$1.142B



7352 lives saved and
16k trucks spared
accidents over whole
program

SEA5 Region Benefit-Cost Ratio: 6 to 2

Conclusions

- Traffic Fatality per 10k vehicles
 - APAC middle income countries ranges 3 to 13
 - OECD average is about 0.8
- UN Decade of Action for Road Safety
 - Safer Vehicle pillar - UN harmonization of vehicle standards
 - **Heavy vehicle conspicuity** is proven to reduce road fatalities
 - In use in for over 20 years in US and EU and over 10 years in China and India
- Fitting conspicuity to about 5.9M trucks
 - Greater than 3.5t heavy goods vehicles are the most unsafe
 - Estimated cost **\$206M** at \$35/vehicle
 - Estimated economic benefit of **\$1.1B** or 6X of cost of conspicuity
- SEA5 traffic safety authorities recognize the conspicuity benefits
 - Actively developing regulations
 - Enforcing existing regulations.

The economic value of life and productivity loss due to traffic fatalities

- Estimated to be **\$16B** in SEA5 countries
- About 0.8% of combined GDP of \$2.1T