

# INTEGRATED ROAD SAFETY APPROACH TOWARDS SAFER ROAD IN INDONESIA

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## Abstract

Safer road is a global issue in the world. Regarding road conditions, traffic conditions, and accident rate in developing countries, including Indonesia, safer road is crucial. Furthermore, the problem is worse because of a number of reasons i.e. data of road geometric, road pavement surface, road furniture conditions, and traffic accident are not well recorded, difference available recorded data among institutions, and beginning level of intelligent transportation systems implementation. Moreover, to reach safer road, all stakeholders involved (road authorities, industries, experts, road users) should work together. In order to reach integrated road safety approach, the aims of this study are to determine steps to decrease number and severity of traffic accident before, during, and after accident occur, and then to recommend road safety scheme towards safer road in Indonesia. Sustainable and consistent implementation of steps and road safety scheme leads to significant improvement of safer road in Indonesia.

**Keywords:** safer road, accident rate, traffic accident, traffic condition

## Abstrak

Jalan berkeselamatan merupakan isu global di dunia. Terkait dengan kondisi jalan, kondisi lalu lintas, dan tingkat kecelakaan di negara-negara berkembang, termasuk di Indonesia, jalan yang lebih aman sangat penting. Selain itu permasalahan lebih diperburuk oleh beberapa alasan, yaitu data geometrik jalan, kondisi permukaan perkerasan jalan, kondisi perlengkapan jalan, data kecelakaan lalu lintas yang tidak tercatat dengan baik, perbedaan data yang tercatat di institusi-institusi terkait, dan implementasi sistem transportasi cerdas baru pada tahap awal. Untuk mencapai jalan yang berkeselamatan semua pemangku kepentingan yang terlibat (otoritas jalan, industri, ahli, pengguna jalan) harus bekerja sama. Dengan memperhatikan pendekatan keselamatan jalan terpadu, tujuan penelitian ini adalah menentukan langkah-langkah untuk mengurangi jumlah dan tingkat keparahan kecelakaan sebelum, selama, dan setelah kecelakaan terjadi serta merekomendasikan skema keselamatan jalan menuju jalan yang lebih aman di Indonesia. Keberlanjutan dan penerapan yang konsisten langkah-langkah dan skema keselamatan jalan akan menghasilkan perbaikan yang signifikan akan jalan berkeselamatan di Indonesia.

**Kata-kata kunci:** jalan berkeselamatan, tingkat kecelakaan, kecelakaan lalu lintas, kondisi lalu lintas

## INTRODUCTION

Road safety is a complex problem. Existing condition in Indonesia indicated that not all of roads fulfill geometric standard, road pavement surface standard, and road furniture standard. Furthermore, accurate, complete, and up to date road accident database is not available. Therefore, available formal record of high road accident data might be less than real road accident. Based on these complex conditions, steps and road safety scheme towards safer road in Indonesia is crucial to be implemented.

In order to reach integrated road safety approach, the aims of this study are to determine steps to decrease number and severity of accident before, during, and after accident occur, and then to recommend road safety scheme towards safer road in Indonesia. Sustainable and consistent implementation of steps and road safety scheme leads to significant improvement of safer road in Indonesia.

Road accident happens because of a number of components including human, vehicle, road network conditions, i.e. geometric design, pavement surface, road furniture, and environment (Sutandi and Gosolim, 2013). Road accident data of countries in the world as presented in Figure 1 and Figure 2 indicated that road accident fatalities happened in developed and especially in developing countries.

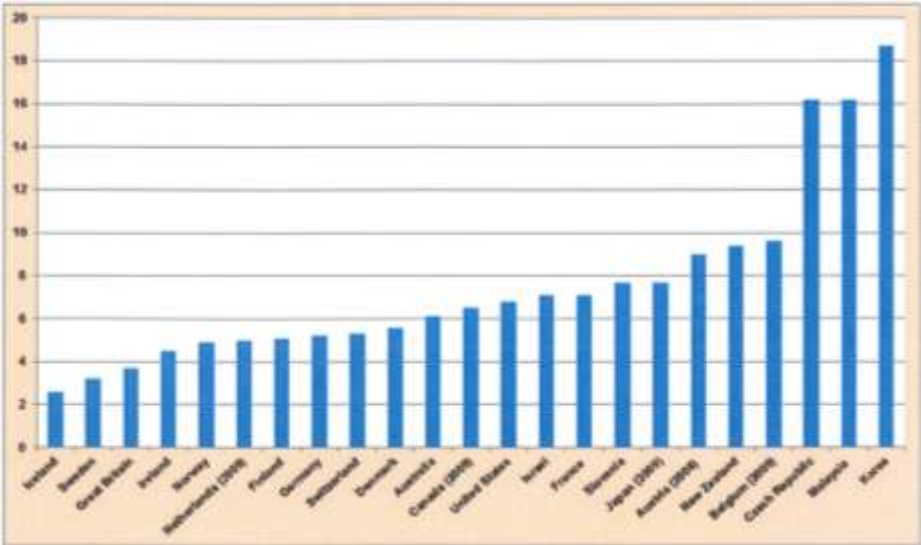


Figure 1 Road Accident Fatalities per Billion Vehicle Kilometres (IRTAD, 2011; Várhelyi, 2013)



Figure 2 Road Accident Fatalities per 100,000 Populations (IRTAD, 2011; Várhelyi, 2013)

## Road Accident Data in Developing Countries

Jordan (2011) and IndII (2010) said that 90 % of more than 1.3 million people died worldwide each year are in low and middle income countries. Moreover, 80 % of the deaths are in middle income countries like Indonesia (IRTAD, 2013). Table 1 shows road fatalities data in Asean countries based on number of population and number of vehicle.

**Table 1** Road Fatalities in Asean Countries

ASEAN	Population	Vehicles	Motorcycle	2010 road fatalities	2007 road fatalities	2010 fatality/100K pop p	2007 fatality/100K pop p	2010 fatality/10K vehicle	2007 fatality/10K vehicle	2010 fatality/10K motorcycle	2007 fatality/10K motorcycle
Brunei	398,920	-	-	46	54	11.53	13.84	1.32	1.77	#VALUE!	44.34
Cambodia	14,138,256	1,372,525	1,372,525	1,816	1,545	12.84	10.70	10.99	100.072	13.23	119.13
Indonesia	239,870,944	60,152,752	60,152,752	31,234	16,548	13.02	7.14	4.30	2.61	5.19	3.58
Lao PDR	6,200,894	812,629	812,629	790	608	12.74	10.38	7.83	9.48	9.72	12.01
Malaysia	28,401,017	9,441,907	9,441,907	6,872	6,282	24.20	23.64	3.40	3.73	7.28	7.94
Myanmar	47,963,010	1,911,040	1,911,040	2,464	1,638	5.14	3.36	10.59	15.67	12.89	24.11
Philippines	93,260,800	3,482,149	3,482,149	6,941	1,185	7.44	1.35	10.46	2.15	19.93	4.48
Singapore	5,086,418	-	-	193	214	3.79	4.82	2.04	2.51	#VALUE!	14.79
Thailand	69,122,232	17,322,538	17,322,538	13,766	12,492	19.92	19.55	4.83	4.88	7.95	7.74
Vietnam	87,848,460	31,452,503	31,166,411	11,029	12,800	12.55	14.65	3.33	5.58	3.51	5.88

(Source: WHO, 2013; Sadullah and Farhan, 2013)

**Table 2** Road Fatalities Data in Indonesia (BPS, 2013)

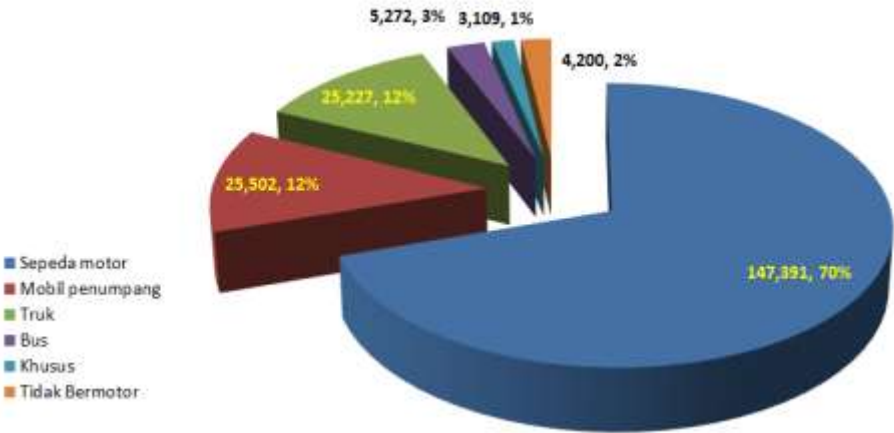
Year	Number of Accident	Fatalities	Percent Fatalities/Accident
1992	19,920	9,819	49
1993	17,323	10,038	58
1994	17,469	11,004	63
1995	16,510	10,990	67
1996	15,291	10,869	71
1997	17101	12,308	72
1998	14,858	11,694	79
1999*)	12,675	9,917	78
2000	12,649	9,536	75
2001	12791	9,522	74
2002	12,267	8,762	71
2003	13,399	9,856	74
2004	17,723	11,204	63
2005	91,623	16,115	18
2006	87,020	15,762	18
2007	49,553	16,955	34
2008	59,164	20,188	34
2009	62,960	19,979	32
2010	99,488	19,873	30
2011	108,696	31,195	29
2012	117,949	29,544	25

## Road Accident Data in Indonesia

As mentioned earlier, existing condition in Indonesia indicated that road conditions and traffic conditions are not good. Furthermore, database of road geometric, road

pavement surface, road furniture conditions, and traffic accident are not well recorded. There is difference of available formal recorded data among institutions. Moreover, implementation of advance technology, i.e. intelligent transportation systems, is still in the beginning level and lack of implementation of road safer management functions in Indonesia is usually taking place.

WHO data indicated that in the last 2 years casualties in Indonesia are the third largest cause of death, below heart attack and tuberculosis (WHO, 2013). Table 2 presents road accident data in Indonesia and Figure 3 presents road accident by vehicle types. Table 2 and Figure 3 shows that although the percentage of fatalities is reduced but number of fatalities is higher from year to year with motorcycle is the largest vehicle type causing accident.



**Figure 3** Road Accidents by Vehicle Types (Korlantas Polri, 2011; Neilson, 2013)

**METHOD AND ANALYSIS**

Figure 1 up to Figure 3, Table 1, and Table 2 show that road accident fatalities are high, especially in developing countries like Indonesia. Based on those data, steps to decrease number and severity of accident and consistent implementation of road safety scheme towards safer road are crucial.

**Steps to Decrease Number and Severity of Accidents**

Steps to decrease number and severity of accidents before, during, and after accidents occur should be developed based on existing conditions. The conditions are road and traffic conditions, implementation of intelligent transportation systems that is in the beginning level, and involve all stakeholders i.e. road authorities, industries, experts, and road users, and also based on regulations (Sutandi and Santosa, 2013).

In order to reach integrated road safety approach in Indonesia, recommended steps to decrease number and severity of accident before, during, and after accident occur are classified into six categories, i.e. road safety management, safer road users, safer road network, safer vehicle, safer environment, and advanced technology (Intelligent Transportation Systems (ITS), Advanced Traffic Management Systems (ATMS) such as Advanced Traffic Control System (ATCS), and Advanced Traffic Information Systems (ATIS) such as Variable Message Signs (VMS) (ITS, 2001; ITS, 2011; Proctor et al., 2003; Smiley, 2007; Sutandi, 2008). Recommended steps to decrease the number and severity of accidents are presented in Table 3.

### **Recommended Road Safety Scheme towards Safer Road in Indonesia**

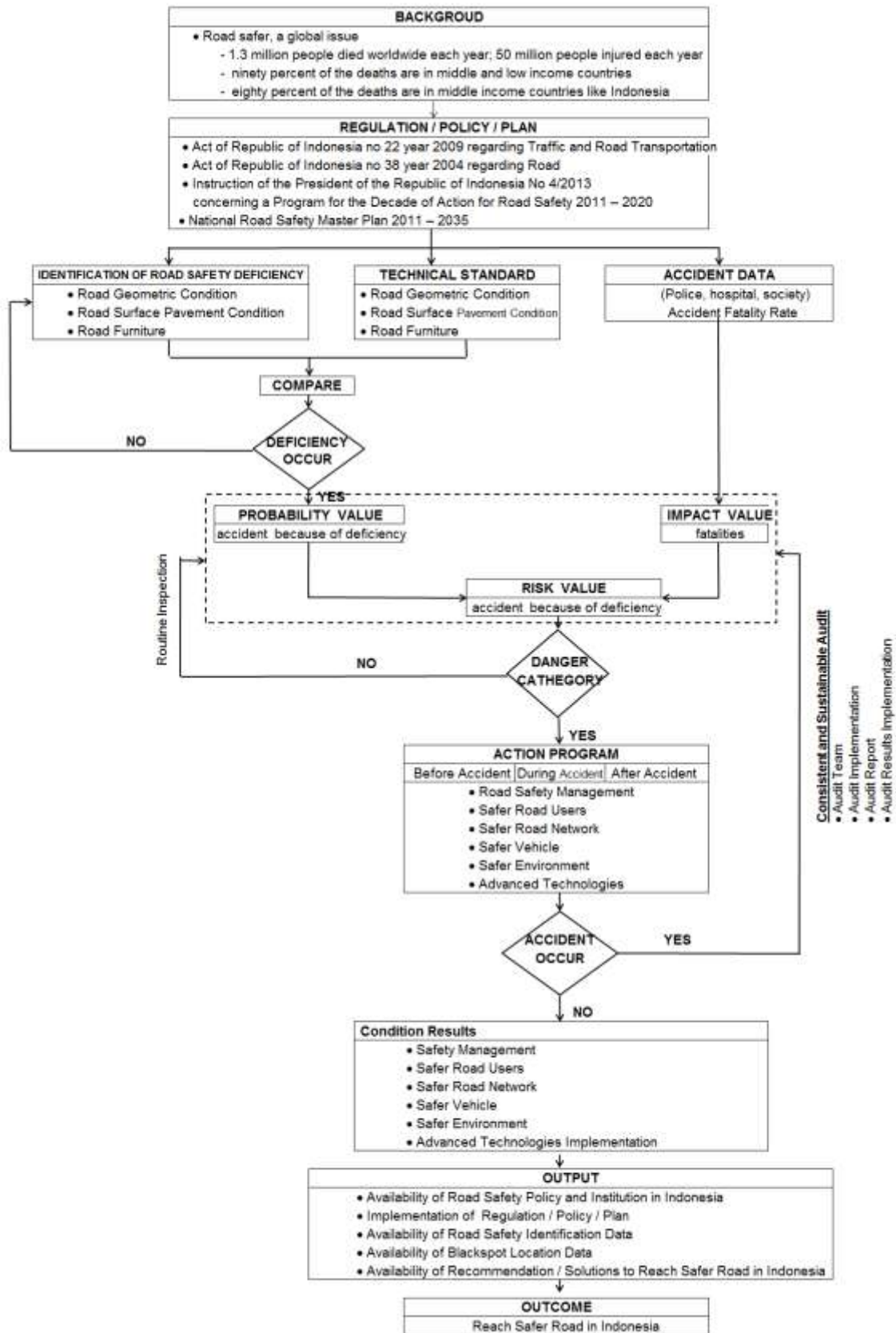
Recommended road safety scheme towards safer road in Indonesia is presented in Figure 4. This figure explains the following:

1. Based on data that show millions people died worldwide each year especially in middle income countries like Indonesia, steps and scheme to reduce the number and severity of accident are crucial;
2. Act, regulation, policy, standard, and national plan are needed as national guidelines;
3. Identification of road safety deficiency, traffic condition, and accident data that are well recorded, are needed to provide accurate, complete, and up to date road, traffic, and accident database;
4. If deficiency occurs then probability value, impact value, and risk value are needed to calculate (Mulyono et al., 2009);
5. If “danger category” is the result of the calculation, then action programs/steps, before, during, after accident should be done. If not, routine inspection is needed;
6. If accident still happen after the action programs/steps, then consistent and sustainable road safety audit should be done. If not, good condition results, Road Safety Policy and Institution, act/Regulation/Policy/Plan, Road Safety Identification Data, Blackspot Location Data, Recommendation/Solutions are available to Reach Safer Road in Indonesia.
7. It is expected that sustainable and consistent implementation of serious and hard effort recommendation in Table 3 and Figure 3 could reduce not only the number but also severity of accident in Indonesia.

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**Table 3** Steps to Decrease Number and Severity of Accident Before, During, and After Accident Occur

CLASSIFICATION	ACTION PROGRAM		
	BEFORE ACCIDENT	DURING ACCIDENT	AFTER ACCIDENT
1. Road Safety Management	Availability of Institution regarding road safety coordination with vision, mission, objectives, strategies, in long, middle, and short term	Implementation of role and action of the Institution	Evaluation of role and action of the Institution
	Act / Regulation / Policy / National Road Safety Master Plan 2011 – 2035	Act / Regulation / Policy /Implementation of National Road Safety Master Plan 2011 – 2035	Evaluation of implementation of Act / Regulation / Policy / National Road Safety Master Plan 2011 – 2035 (including sustainable and consistent implementation of road safety audit and imolementation all results of road safety
	Integration development of urban and rural transportation infrastructure using road and rail public transport modes Public Private Partnership (PPP) investment in developing transport	Availability of integration of urban and rural transportation infrastructure using road and rail public transport modes Availability of transport infrastructure as the result of PPP investment	Evaluation of integration of urban and rural transportation infrastructure using road and rail public transport modes Evaluation of Public Private Partnership (PPP) investment in developing transport
2. Safer Road Users	Early dissemination regarding the importance of road safety through education at kindergarten and primary school	Understand about safer road	First rescue and evacuation of casualties as soon as possible to avoid more fatalities
	Increased awareness to road safety and traffic rules to all road users Adherence to traffic regulation Adherence to right procedure driving licence implementation (improving the quality of training, testing and managing drivers)	Inform to the police about accident happened as soon as possible	Rehabilitation / assistance to casualties / Trauma Center
	All stakeholders road authorities, police department, society, and academic expert have responsibility to make safer	Implementation of responsibility of all stakeholders to make safer road	Evaluation of responsibility of all stakeholders to make safer road
3. Safer Road Network	Identification of road safety deficiency regularly to support accurate, complete, up to date data Well recorded data of road and traffic conditions, and road accident in order to provide accurate, complete, and up to date data Determination of blackspot locations Reducing/deleting of road safety deficiency, especially at blackspot locations	Using road accident database system to assist casualties	Updating road accident database system to provide accurate, complete, and up to date road accident database and implement action plan. PDCA: Plan (Guideline), Do (Implementation), Check (Control Implementation), Action (Improving Target)
	Increase of road safety facilities (sidewalk, pedestrian push-button, pedestrian overpass, kerbside, median, motorcycle lane, bicycle lane, guardrail, lane strip, marking, road furniture, road lighting)	Using self informing road and road facilities	Evaluating, maintenance, and fixing road and road facilities conditions regularly as standard and as road safety audit result report
4. Safer Vehicle	Enhancement of vehicle standard and safety (including vehicle of public transport)	Using safer vehicle	Evacuation of vehicle to reduce traffic congestion, minimize losses caused by traffic accidents, and produce good traffic condition
	Quality of inspecting motor vehicles Maintenance of vehicle safety		Evaluation safer vehicle as standard and implement action plan
5. Safer Environment	Plan to limit the environmental pollution, saving energy, having applications of advanced transport technologies	Availability of safer environment	Evaluation of safer environment and implement action plan
6. Advanced Technologies	Implementation of advanced technology (ITS, ATMS, ATIS, ATCS, VMS)	Using advanced technology (ITS, ATMS, ATIS, ATCS, VMS)	Evaluation of existing advanced technology used and improve to other advanced technologies implementation
	Dissemination of emergency phone number to a number of media / internet	Using emergency phone number to inform police / hospital as soon as possible	Evaluation the dissemination and using of emergency phone number to a number of media / internet and improve the



**Figure 4** Recommended Road Safety Scheme towards Safer Road in Indonesia (Sutandi and Santosa, 2013b)

## CONCLUSIONS

This study analyzes road safety problems. In Indonesia, steps to decrease number and severity of accident, before, during, and after accident occur, and recommend road safety scheme should be develop based on existing road and traffic conditions, and also accident data. The steps can be classified into six categories i.e. road safety management, safer road users, safer road network, safer vehicle, safer environment, and advanced technology. All stakeholders involved i.e. road authorities, industries, experts, road users should work together to reach safer road. Sustainable and consistent implementation of steps and road safety scheme leads to significant improvement of safer road in Indonesia.

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