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Gito Sugiyanto, Jajang, and Mina Yumei Santi

The Impact of Lowering Speed Limit on Mobility and the Environment

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Abstract. Speed limit is one of the traffic problems in developing countries due to the influence of speed on roadway safety. The actual speed is often higher than the legal speed limit indicating that many road users don't consider the speed limits seriously. Speed limits value should be posted to reflect the maximum speed considered to be safe and reasonable by the majority of drivers. One of the methods to determine the speed limit is 85^{th} percentile. The aim of this research was to determine the impact of speed limit increases on mobility and the environment in urban areas. The results show that a large number of road users' drive above speed limits. There are 4.75% of pick-up and light truck users, 10% of passenger car users and 12.25% of motorcycle users exceed the speed limit. Reduced speed has a positive impact on accident severity and number of accidents. The results show that the effects of a 5 km per hour reduction in travel speed are greater at lowers speeds and reduction over 50 km per hour bring dramatic decreases in crash risk. Reduction in vehicle speed will be followed by the reduction in fuel consumption and vehicle operating cost of vehicle. Vehicle operating costs such as tire wear, lubricating oil, and spare parts that tend to increase with increasing the speed. Effect of the lowering speed limit was reduction in nitrogen oxides emission and carbon monoxide emission.

INTRODUCTION

One of the traffic problems in developing countries is traffic accident. Data from Traffic Corps Republic of Indonesia State Police, road transport accidents in 2014 recorded 95,906 cases of accidents with 28,297 people died, 26,840 people seriously injured, 109,741 people slightly injured, and IDR 250,110,380,000 in property damage. In 2015, an increase in the number of road transport accident recorded 98,970 cases with 26,495 people died, 23,937 people seriously injured, 110,714 people slightly injured, and IDR 272,314,014,600 in property damage. In 2016 recorded 106,129 cases road traffic accident with 26,185 people died, 22,558 people seriously injured, 121,550 people slightly injured, and IDR 226,883,000,000. In 2017 there is a decreased of traffic accident, recorded 101,778 cases accident with 25,452 deaths from road traffic accident [1]. With the very high loss of property damage and lives, the efforts are needed to improve the traffic safety. Speeding is one of the traffic problems in traffic safety, especially in developing countries [2-4]. "The length of paved roads is unexpectedly the source of higher crash rates in mainland China; speeding is probably the reason" [5]. "Reductions in casualties in the order of 8% overall and 12% in fatalities were reported in Queensland with mean travelling speeds dropping by approximately 5 km/h" [Walsh and Smith in [6]. "The establishment of speed limits in urban areas in Victoria has successfully reduced traffic accidents by 12%" [7].

"Speed limits had been increased and decreased in various countries and the observed changes in speeding, injuries, fatalities, and property damage which followed these changes" [8]. Studies in Australia in relation "effects of lowering speed limits in urban and metropolitan areas, reduction of the default urban speed limit from 60 km/h to 50 km/h, indicated only minimal impact on individual travel times and large benefits to society as a result of the reduction in crash trauma" [9]. "Higher vehicle speeds contribute to increased greenhouse gas emissions, fuel consumption and noise and to adverse impacts on quality of life especially for people living in urban areas" [10].

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Carsten and Tate [11] used Intelligent Speed Adaptation (ISA) system combination to prediction of accident reduction. “The best prediction of accident reduction was found for variable mandatory system. This system could save up to 36% of all crashes involving injury and up to 59% of fatal crashes”. ISA system helped drivers to follow the speed limits and to drive more comfortably [12]. “Effects of the Active Accelerator Pedal (AAP) in the city of Lund showed that test drivers’ compliance with the speed limits improved considerably” [13].

The aim of this research is to analysis the impact of lowering speed limit of vehicles on urban roads on mobility and the environment. Reduced speeds of vehicles have a positive impact on the number of road accidents and traffic accident severity.

MATERIALS AND METHODS

There are “number of factors affecting road safety which lies beyond the reach of actual road safety work. An example of such an external factor that can have a direct impact on road safety is weather”. External factors that affecting road safety are number and composition of traffic volume, age structure of the population [14], road pavement [15,16]. Speed is the main risk factors for the occurrence of crashes [17-19]. High speed increases the risk of accident [2], more serious crashes [20], and crash frequency [21]. “Drivers have a tendency to drive at speeds that they regard as socially acceptable” [22]. “Speed limit was set at or below the 85th percentile speed” [23,24]. Speed management and speed limits enforcement represent strategy to improve road safety [25-27]. Elvik [28] analyzed the relationship between speed limit and the severity of injuries, fatal crashes increase of 1.58 if speed increased 1 km/h. The severity of crash also increases with speed [10]. Speed limit was introduced to reducing the severity of crashes [7], accident cost [29,30], and generalized cost [31,32] and increased efficiency in transportation cost [33].

Reducing the speed limit will reduce the average speed of driving, the number of accidents and the severity of injuries. Research in Queensland on evaluating the application of speed limits at 50 km/h concluded that the change in average speed for each 1 km/h would change the risk of accidents by 3%. The severity of injuries and fatality changed with changes in average speed [7]. “There is a positive relationship between speed and injury accidents-the higher speed, more accidents-indicating that 5% change in accidents was associated with 1 mph change in average speed” [34]. ”Australia has reduced the speed limit for urban areas from 60 km/h to 50 km/h proven to reduce the risk of traffic accidents. Speed limitof urban streets in Great Britain were designated 20 mph” [35]. ”Almost 30% of casualty crashes occur on residential streets [36]. Higher access density tended to increase crash occurrence on suburban arterials” [37]. In Japan, “the highest accident rates occur when speed is reduced from 110 km/h to 85 km/h” [38]. “In Hungary the speed limit in force inside built up areas was reduced from 60 km/h to 50 km/h and resulted in a reduction of 18.2% in accident fatalities in the following year” [10]. In Sweden, effect reduced the speed limit from 90 km/h to 80 km/h, decreased the number of fatalities by 14/year [39]. In Sweden, “the target for average speed corresponds to a reduction by 5 km/h. Lowered speeds is deemed to be among the indicators that have the greatest potential for reducing road deaths” [14]. “A warning system based on bus speed on mountainous roads and dynamic profile improves bus safety level” [40].

“Within the Charging Zone (CZ), the Wilcoxon test has shown that the difference in speed between pre and post London’s Congestion Charging Scheme periods has increased on average 2.1 km/h and that these changes are significant at the p = 0.05 level”. “Three vehicle types that analyzed is a Euro II LGV, a Euro III diesel car and a Euro IV petrol car, but showed that driving characteristics in central London have a relatively small effect on emissions of NO_X and CO_2 compared with the average vehicle speed. However, for PM_{10} emissions from the Euro II LGV the opposite was found and for this vehicle the driving characteristics were more important than the average speed in estimating exhaust emissions. For this vehicle, emissions increased between pre- and post-Congestion Charging Scheme periods by 4%. For the Euro IV petrol car NO_x emissions also increased by 6% between pre and post Congestion Charging Scheme periods” [41].

”The human tolerance to injury by a car will be exceeded if the vehicle is travelling at more than 30 km/h. For the speed of vehicle 30 km/h, the probability of fatal injury for a pedestrian is 10%. If the speed of vehicle 50 km/h, the probability of fatal injury for a pedestrian is 85%. For car occupants, wearing seat-belts and using well-designed cars generally can provide protection to a maximum of 70 km/h in frontal impacts, and 50 km/h in most side impacts” [Tingvall et al., 1999 in [2]. ”Probability of fatal injury for a pedestrian colliding with a vehicle” shown in Fig. 1.

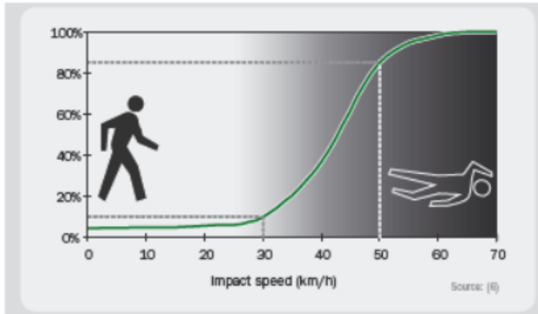

FIGURE 1. Probability of fatal injury for a pedestrian colliding with a vehicle [2]

Massachusetts Highway Department [24] stated that the determining speed limit based on driver's understanding about the speed. Distribution of normal speed at 85th percentile can be seen in Fig. 2.

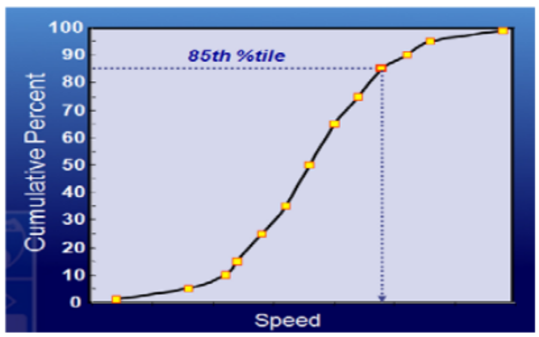

FIGURE 2. Distribution of normal speed at 85th percentile [24]

RESULTS AND DISCUSSIONS

Speed of Vehicle in Magelang Street km 4, Yogyakarta

Magelang street km 4, Yogyakarta is an arterial road in urban area consists of four lanes two directions undivided road (4/2 UD) with the maximum speed limit of vehicle is 60 km/h. Width of this road is 14 m with the capacity of road is 5,712 passenger car unit per hour. The number of vehicles has taken in Magelang Street km 4 as many as 717 vehicles, with an S-curve of vehicles speed in the field as shown in Fig. 3 [27]. Almost 55.79% of vehicles type is motorcycles followed by passenger cars (27.89%). Characteristics and statistical analysis of vehicle speed can be seen in Table 1.

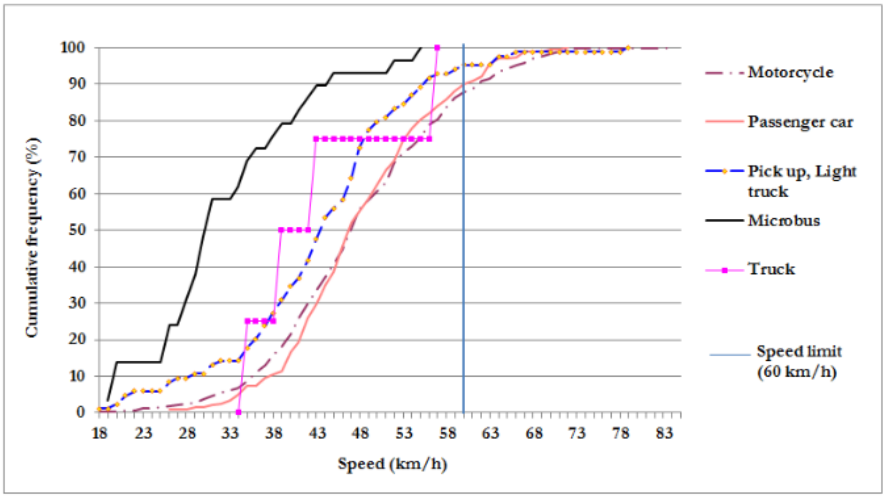

FIGURE 3. S-curve of vehicle speed in Magelang street km. 4, Yogyakarta [27]

TABLE 1. Characteristics and statistical analysis of vehicle speed in Magelang Street km.4, Yogyakarta [27].

Analysis of statistical		Motor cycles	Passenger cars	Pick-up, Light truck	Microbus	Truck	Total
Mean (km/h)		48.3	48.3	43.6	33.1	43.5	47.1
Modus (km/h)		47.0	46.0	48.0	20.0	N/A	47.0
Median (km/h)		47.0	47.0	44.0	33.0	41.0	47.0
Variance (km/h)		105.8	75.2	116.9	79.8	91.7	107.4
Standard deviation (SD)		10.3	8.7	10.8	8.9	9.6	10.4
Amount of data (n)		400	200	84	29	4	717
Percentile (km/h)	15	38.0	40.0	35.0	26.0	36.8	37.0
	50	47.0	47.0	44.0	33.0	41.0	47.0
	85	59.0	58.0	53.6	41.8	50.7	58.0
	98	70.0	67.0	64.7	53.3	56.2	68.7

Based on Table 1, the average speed of total of vehicles (717 vehicles) in Magelang street km. 4, Yogyakarta at 47.1 km/h [27]. "Average speed value is smaller than the maximum speed limit in the field (60 km/h). Standard deviation value of vehicle speed varied between 8.7 for passenger car up to 10.8 for pick up and light truck". "The speed limits chosen must be credible in the light of the road and road environment characteristics and the public authorities have the responsibility of ensuring this credibility". The speed limit in Magelang street km. 4, Yogyakarta on 85th percentile at 41.8 km/h for microbus, 50.7 km/h for truck, 53.6 km/h for pick-up and light truck, 58 km/h for passenger car and 59 km/h for motorcycle [27].

Exceeding speed limit

Excessive speed means speeds above a prescribed speed limit (i.e. driving above the speed limits). Based on Fig. 3, it can be seen that 4 vehicles (4.75%) of pick-up and light truck users, 20 vehicles (10%) of passenger cars users and 49 motorcycles (12.25%) of motorcycle users exceed the maximum speed limit in the field (60 km/h). The maximum speed limit in Magelang street km 4, Yogyakarta is reduced from 60 km/h to 50 km/h. The proportion of drivers exceeding the speed limit in urban road by category of road users illustrates in Table 2. Based on Table 2, 17 vehicles (20.25%) of pick-up and light truck users, 75 vehicles (37.50%) of passenger cars users, 157 motorcycles (39.25%) of motorcycle users, 2 vehicles (6.90%) of microbus, and 1 truck (25%) exceed the maximum speed limit at 50 km/h. "Speeding occurrences between 5 km/h to 34 km/h above the speed limit".

TABLE 2. Speed at 85th percentile and the proportion of drivers exceeding speed limit 60 km/h and 50 km/h

No.	Vehicle type	Speed at 85th Percentile (km/h)	Proportion of drivers exceeding Speed limit (%)		Δ driver exceeding speed limit (%)
			Speed limit 60 km/h	Speed limit 50 km/h	
1.	Motorcycle	59	12.25%	39.25%	+27.00%
2.	Passenger cars	58	10.00%	37.50%	+27.50%
3.	Pick-up, Light truck	53.6	4.75%	20.25%	+15.50%
4.	Microbus	41.8	0.00%	6.90%	+6.90%
5.	Truck	50.7	0.00%	25.00%	+25.00%
	Average all vehicle	58 km/h	10.18%	35.15%	+20.37%

Based on Nilsson Power Model "A 5% increase in average vehicle speed leads to approximately a 10% increase in all injury accidents and a 20% increase in fatal accidents. A 5% decrease in average vehicle speed leads to approximately a 10% decrease in injury accidents and a 20% decrease in fatal accidents" [17].

Effect of lowering speed limit in gaseous emissions

"Emissions from road vehicles contain a variety of pollutants which are produced in different quantities at the different speeds" [42]. The major air pollutants include:

(i) Carbon monoxide (CO).
(ii) Hydrocarbons (HC).
(iii) Oxides of nitrogen (NO_x). NO_x are produced particularly at high engine operating temperatures or in steady high speed driving condition and a reduction in speed leads to a significant reduction in these emissions.
(iv) Particulate matter (PM).

"Speed of vehicle has important impacts on the environment as it is strongly related to the emissions of greenhouse gases (mainly CO_2) and of local pollutants (CO, NOx, HC, PM)" [10]. Higher speeds result in higher emission levels [9]. "CO and NOx are at a minimum around 40 km/h, while particulate matters are minimal at around 50 km/h". "Emissions models to describe the interaction between various types of emissions and varying speed levels based on" [42] can be seen in Fig. 4.

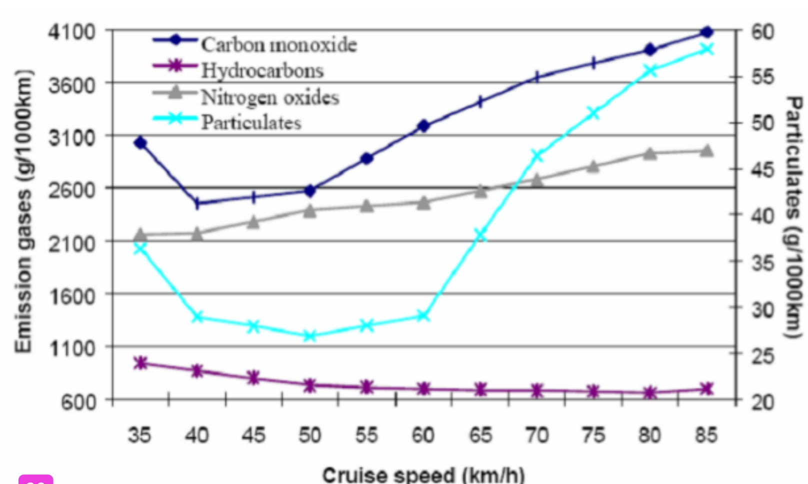

FIGURE 4. Gaseous emissions and particulate matter as a function of vehicle speed [42]

Based on OECD [10] "the effects of speed reduction strategies on carbon monoxide and hydrocarbons are less clear. Hydrocarbons emissions reduce with lower speed, whilst carbon monoxide and particulate matter have the lowest emission levels at medium speeds". "The optimum speed, i.e. the speed at which emissions are minimised, varies according to the type of emission. Typically, pollutant emissions are optimised for constant speeds of 40 km/h to 90 km/h". In steady driving conditions, CO and CO_2 emissions in terms of g/km travelled are highest at very low travel speeds (15 km/h or less). Effect of the lowering speed limit was reduction in nitrogen oxides emission and carbon monoxide emission.

CONCLUSIONS

Based on the results, the following conclusion can be drawn 4.75% of pick-up and light truck users, 10% of passenger car users and 12.25% of motorcycle users exceed the speed limit. Reduced speed has a positive impact on accident severity and number of accidents. The results show that the effects of a 5 km per hour reduction in travel speed are greater at lowers speeds and reductions over 50 km per hour bring dramatic decreases in crash risk. Reduction in vehicle speed will be followed by the reduction in fuel consumption and vehicle operating cost of vehicle. Vehicle operating costs such as tire wear, lubricating oil, and spare parts that tend to increase with increasing speed. Effect of the lowering speed limit was reduction in nitrogen oxides emission and carbon monoxide emission.

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REFERENCES

1. Traffic Corps (*Korlantas*) Republic of Indonesia State Police, Accident Data in 2014-2017 (Traffic Corps Republic of Indonesia State Police, Jakarta, 2018).
2. Global Road Safety Partnership (GRSP), *Speed Management (Road Safety Manual for Decision-Makers and Practitioners)*. (GRSP, Geneva, 2008). http://apps.who.int/iris/bitstream/handle/10665/43915/9782940395040_eng.pdf;jsessionid=700C3D0E9CFAA954A1725A2D900799AB?sequence=1.
3. G. Sugiyanto, B. Mulyono and M. Y. Santi, Karakteristik kecelakaan lalu lintas dan lokasi *black spot* di Kabupaten Cilacap, Jurnal Teknik Sipil **12** (4), 259-266 (2014) http://ft.uajy.ac.id/wp-content/uploads/2015/11/4.-Gito-Sugiyanto.pdf.
4. G. Sugiyanto, A. Fadli and M. Y. Santi, Identification of black spot and equivalent accident number using upper control limit method, ARPN Journal of Engineering and Applied Sciences **12** (2), 528-535 (2017) http://www.arpnjournals.org/jeas/research_papers/ rp_2017/jeas_0117_5650.pdf.
5. W. L. Soro, Y. Zhou and D. Wayoro, Crash rates analysis in China using a spatial panel model, IATSS Res. **41** (3), 123-128 (2017) https://doi.org/10.1016/j.iatssr.2016.11.001.
6. J. Wooley, "Recent Advantages of Lower Speed Limits in Australia" in Proceedings of Eastern Asia Society for Transportation Studies (EASTS) **6**, 3562-3573 (2005) http://www.jstage.jst.go.jp.
7. E. Hoareau, S. Newstead, P. Oxley and M. Cameron, *An Evaluation of the 50 km/h Speed Limit in South East Queensland*, Journal Report No. 264 (Monash University Accident Research Centre (MUARC), Monash, 2002). https://www.monash.edu/__data/assets/ pdf_file/0005/216482/muarc264.pdf.
8. British Columbia Ministry of Transportation, *Review and Analysis of Posted Speed Limits and Speed Limit Setting Practices in British Columbia* (2003). http://www.th.gov.bc.ca/publications/eng_publications/speed_review/Speed_Review_Report.pdf.
9. J. Archer, N. Fotheringham, M. Symmons and B. Corben, *The impact of lowered speed limits in urban and metropolitan areas* (Monash University, Accident Research Centre (MUARC), Monash, 2008). https://www.monash.edu/__data/assets/pdf_file/0007/216736/muarc276.pdf.
10. Organization for Economic Cooperation Development, *Speed Management* (Transport Research Centre, Organization for Economic Cooperation Development (OECD) and European Conference of Ministers of Transport (ECMT), OECD Publishing, Paris CEDEX, 2006). https://www.itf-oecd.org/sites/default/files/docs/06speed.pdf.
11. O. M. J. Carsten and F. N. Tate, Intelligent speed adaptation: accident savings and cost benefit analysis, Accid. Anal. Prev. **37** (3), 407-416 (2005) https://doi.org/10.1016/j.aap.2004.02.007.

12. S. M. R. Ghadiri, J. Prasetijo, A. F. Sadullah, M. Hoseinpour and S. Sahranavard, Intelligent speed adaptation: Preliminary results of on-road study in Penang, Malaysia, International Association of Traffic and Safety Sciences (IATSS) Res. **36** (2), 106-114 (2013) https://doi.org/10.1016/j.iatssr.2012.08.001.
13. A. Varhelyi, M. Hjalmdahl, C. Hyden and M. Draskoczy, Effects of an active accelerator pedal on driver behaviour and traffic safety after long-term use in urban areas, Accid. Anal. Prev. **36** (5), 729-739 (2004) https://doi.org/10.1016/j.aap.2003.06.001.
14. J. Strandroth, *Analysis of Road Safety Trends 2014: Management by objectives for road safety work towards the 2020 interim targets* (The Swedish Transport Administration, Sweden, 2015) https://www.unece.org/fileadmin/DAM/trans/doc/2016/wp1/NatDev_ Sweden.pdf.
15. G. Sugiyanto, Marshall test characteristics of asphalt concrete mixture with scrapped tire rubber as a fine aggregate, Jurnal Teknologi (Sciences and Engineering) **79** (2), 55-64 (2017b) https://doi.org/10.11113/jt.v79.6965.
16. G. Sugiyanto. Characterization of asphalt concrete produced from scrapped tire rubber, Engineering Journal **21** (4), 193-206 (2017c) https://doi.org/10.4186/ej.2017.21.4.193.
17. G. Nilsson, *Traffic Safety Dimension and the Power Model to describe the Effect of Speed on Safety*. (Lund Institute of Technology, Sweden, 2004) https://www.motor-talk.de/forum/aktion/Attachment.html?attachmentId=689000.
18. L. Aarts and I. V. Schagen, Driving speed and the risk of road crashes: a review, Accid. Anal. Prev. **38**, 215-224 (2006) https://doi.org/10.1016/j.aap.2005.07.004.
19. E. D. Pauw, S. Daniels, M. Thierie and T. Brijs, Safety effects of reducing the speed limit from 90 km/h to 70 km/h, Accid. Anal. Prev. **62,** 426-431(2014) https://doi.org/10.1016/j.aap.2013.05.003.
20. M. I. M. Imprialou, M. Quddus, D. E. Pitfield and D. Lord, Re-visiting crash–speed relationships: A new perspective in crash modeling, Accid. Anal. Prev. **86,** 173-185 (2016) https://doi.org/10.1016/j.aap.2015.10.001.
21. X. Wang, J. Yuan, G. G. Schultz and S. Fang, Investigating the safety impact of roadway network features of suburban arterials in Shanghai, Accid. Anal. Prev. **113,** 137-148 (2018) https://doi.org/10.1016/j.aap.2018.01.029.
22. J. Fleiter, A. Lennon and B. Watson, How do other people influence your driving speed? Exploring the 'who' and the 'how' of social influences on speeding from a qualitative perspective, Transp. Res. F Traffic Psychol. Behav. **13** (1), 49-62 (2010) https://doi.org/10.1016/j.trf.2009.10.002.
23. Institute of Transport Engineers (ITE), *Speed Zoning Information* (2004). http://www.ite.org/standards/speed_zoning.pdf.
24. Massachusetts Highway Department (MHD), *Procedure for Speed Zoning on State and Municipal Roadways* (Traffic Engineering, Highway Department, Massachusetts, 2012) https://www.town.billerica.ma.us/DocumentCenter/View/5881/Procedures-for-Speed-Zoning-on-State-and-Municipal-Roadways?bidId=.
25. M. G. Augeri, P. Cozzo and S. Greco, Dominance-based rough set approach: An application case study for setting speed limits for vehicles in speed controlled zones, Knowl.-Based Syst. **89**, 288-300 (2015) https://doi.org/10.1016/j.knosys.2015.07.010.
26. M. H. Hosseinlou, S. A. Kheyrabadi and A. Zolfaghari, Determining optimal speed limits in traffic networks, IATSS Res. **39,** 36-41 (2015) doi:10.1016/j.iatssr.2014.08.003.
27. G. Sugiyanto and S. Malkhamah, Determining the maximum speed limit in urban road to increase traffic safety, Jurnal Teknologi (Sciences and Engineering) **80** (5),67-77 (2018) https://doi.org/10.11113/jt.v80.10489.
28. R. Elvik, A re-parameterisation of the power model of the relationship between the speed of traffic and the number of accidents and accident victims, Accid. Anal. Prev. **50**, 854-860 (2013) https://doi.org/10.1016/j.aap.2012.07.012.
29. G. Sugiyanto and M. Y. Santi, Road Traffic Accident Cost using Human Capital Method (Case study in Purbalingga, Central Java, Indonesia), Jurnal Teknologi (Sciences and Engineering) **79** (2), 107-116 (2017) https://doi.org/10.11113/jt.v79.5375.
30. G. Sugiyanto, The cost of traffic accident and equivalent accident number in developing countries (case study in Indonesia), ARPN Journal of Engineering and Applied Sciences **12** (2), 389-397 (2017a) http://www.arpnjournals.org/jeas/research_papers/rp_2017/jeas_0117_5631. pdf.
31. G. Sugiyanto, The impact of congestion pricing scheme on the generalized cost and speed of motorcycle to the city of Yogyakarta, Indonesia, Journal of Engineering and Applied Sciences **11** (8), 1740-1746 (2016) http://medwelljournals.com/abstract/?doi =jeasci.2016.1740.1746.
32. G. Sugiyanto, The effect of congestion pricing scheme on the generalized cost and speed of motorcycle, Walailak J. Sci. & Tech. **15** (1), 95-106 (2018) http://wjst.wu.ac.th/index.php/wjst/article/view/2347.

33. G. Sugiyanto, P. B. Santosa, A. Wibowo and M. Y. Santi, Hub and spoke airport networks in Indonesia based on Herfindahl-Hirschmann Index (HHI), Journal of Engineering and Applied Sciences **11** (8), 1804-1810 (2016) http://medwelljournals.com/abstract/?doi =jeasci.2016.1804.1810.
34. M. C. Taylor, D. A. Lynam and A. Baruya, *The effects of drivers' speed on the frequency of road accidents. Transport Research Laboratory (TRL) Report 421* (Road Safety Division, Department of the Environment, Transport and the Regions, 2000) https://trid.trb.org/view/651648.
35. A. Tapp, C. Nancarrow, A. Davis and S. Jones, Vicious or virtuous circles? Exploring the vulnerability of drivers to break low urban speed limits, Transp. Res. A **91**, 195-212 (2016) https://doi.org/10.1016/j.tra.2016.06.007.
36. Austroads, *Urban Speed Management in Australia AP 118-96* (Austroads, New South Wales, 1996) https://austroads.com.au/publications/road-safety/ap-118-96.
37. X. Wang, Q. Zhou, M. Quddus, T. Fan and S. Fang, Speed, speed variation and crash relationships for urban arterials, Accid. Anal. Prev. **113**, 236-243 (2018) https://doi.org/10.1016/j.aap.2018.01.032.
38. M. Tanishita and B. V. Wee, Impact of vehicle speeds and changes in mean speeds on per vehicle-kilometer traffic accident rates in Japan, IATSS Res. **41** (3), 107-112 (2017) https://doi.org/10.1016/j.iatssr.2016.09.003.
39. A. Vadeby and A. Forsman, Traffic safety effects of new speed limit in Sweden, Accid. Anal. Prev. **114**, 34-39 (2018) https://doi.org/10.1016/j.aap.2017.02.003.
40. H. L. Khoo and M. Ahmed, Modeling of passengers' safety perception for buses on mountainous roads, Accid. Anal. Prev. **113**, 106-116 (2018) https://doi.org/10.1016/j.aap.2018.01.025.
41. S. D. Beevers and D. C. Carslaw, The impact of congestion charging on vehicle speed and its implications for assessing vehicle emissions, Atmos. Environ. **39** (36), 6875-6884 (2005) https://doi.org/10.1016/j.atmosenv.2005.08.021.
42. N. Haworth and M. Symmons, *The relationship between fuel economy and safety outcomes*, Report 188 (Monash University Accident Research Centre (MUARC), Monash, 2001).

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