Characteristic of Road Traffic Accidents in Magelang City, Indonesia

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1. Introduction

Indonesian Law No. 22 of 2009 states that the main goal of transportation systems is to create safe transportation services[1]. According to this law, every local government must provide safe transportation services.

The objectives of this paper are as follows:

a. To identify gaps between the transport infrastructure planning document and the traffic safety issues in Magelang (**Fig.1**).
b. To identify important accident factors from the perspective of road characteristics.
c. To find better safety traffic programs based on the lessons learned from Japan.

2. Traffic safety issues

A total of 29,544 fatal accidents occurred in 2012[2] in Indonesia. **Fig.2** shows that the number of victims is increasing each years and the majority of accidents involve motorcycles.

Fig.3 demonstrates that the number of accidents in Magelang has been increasing each year whereas, as **Fig.4**[3] indicated, the number of accidents in Japan is decreasing. As such, there might be some lessons to be learned in terms of how to decrease the number of accidents significantly.

Fig.1. Study Area: Magelang City, Indonesia

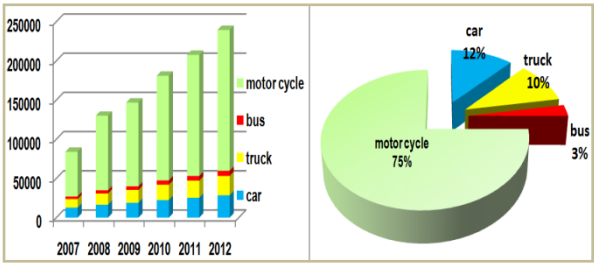

Fig.2. Number of accidents and vehicle types in Indonesia

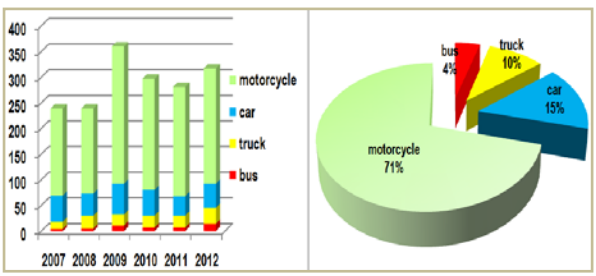

Fig.3. Number of accidents and vehicle types in Magelang

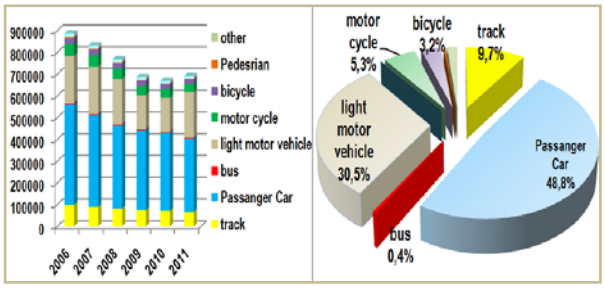

Fig.4. Number of accidents and vehicle types in Japan

3. Data Analysis and Discussion

a. Gap of transport planning and safety issues in Magelang

Transport planning in Indonesia is usually based on demand modeling (Tamin, 2000)[4], meaning the main priority is transport demand rather than safety issues. However, traffic safety is an important issue for consideration in earlier phases of the planning process[5]. To understand the gap between the planning document and traffic safety issues, the Spatial Planning Document of Magelang Planning Board and Long Term Local Transport Planning Document of Transportation Office in Magelang were compared with the accident data from the police report. The map on the left in **Fig.5** highlights the priorities for the infrastructure improvement of Pahlawan Street (blue line), Urip Sumoharjo Street (red line), and Sukarno Hatta Street (green line) in the planning documents[6]. In the map on the right, the yellow lines show roads prone to accident, based on data plotted from accident reports from the local police office of Magelang[7]. Some gaps exist between them, indicating that safety issues are often neglected in road transport planning process.

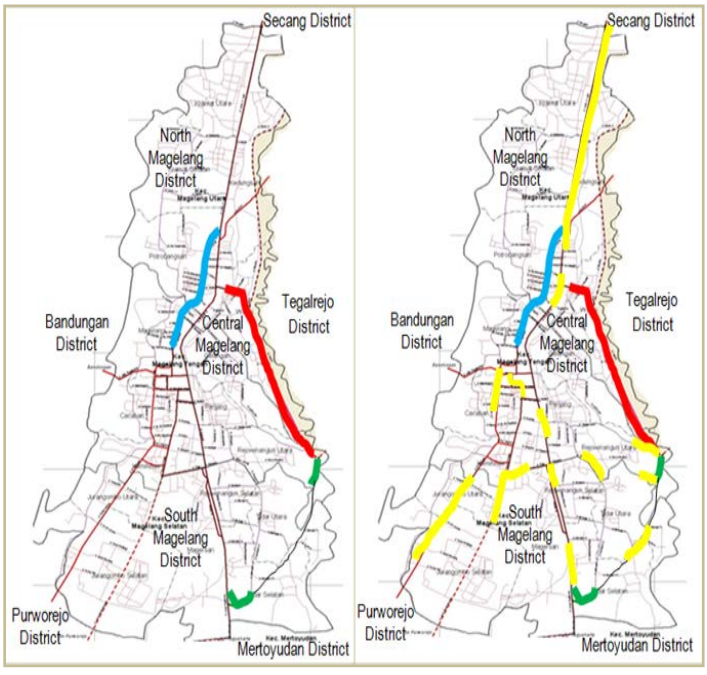

Fig.5. Gap between planning document (left map) and traffic safety issues (right map) in Magelang

b. Accident factors in Magelang

Traffic accident factors are generally classified into human, vehicle, road, and environmental factors[8]. In this paper, only road factors namely, traffic volume, road capacity, and volume-capacity ratio of road sections will be analyzed as independent variables. The number of accidents will be weighted using the Equivalent Accident Number (EAN), depending on the accident's severity level. A fatal accident equates to 8 points for EAN, a serious injury is 3 points, and a minor injury is 1 point[9]. Finally, the dependent variable will be formulated as EAN/km, while the association and correlation between dependent and independent variables will be analyzed using statistical tools.

Table 1 presents the statistical analysis results and shows that the Pearson Chi Square values of the two independent variables are less than 0.05. As for the Spearman Correlation Test, all of the *p* values are less than 0.05, and the correlation coefficients (*r*) are about 0.6. These mean traffic volume and the volume-capacity ratio have a positive and medium correlation with EAN/km in Magelang.

c. Lesson learned from Japan : ITARDA

As shown in **Fig.4**, the number of accidents in Japan has been decreasing. According to MLIT[10], one of the factors contributing to this success is the availability of an integrated database.

Table **2** compares the database management of the Indonesian system and the Japanese system. In Indonesia, data on traffic accidents are reported by local police officers after the accident happens. In Japan, road traffic census data on road conditions, traffic volume, and average speed are collected every five years.

Fig.**6** illustrates the integrated database system in Japan, which is called the Integrated Database for Traffic Accident Analysis (ITARDA). The special responsible institution is the National Institute for Land and Infrastructure Management (NILIM). ITARDA plays a useful role in improving road's physical structures to maintain safety on roads[10].

Table 1. Result of Chi Square Test and Spearman Test

Variable: Dependent : EAN/km		Pearson Chi Square	Spearman Test	
			p	*r*
Independent	Volume	0.000	0.001	0.593
	V/C Ratio	0.039	0.002	0.563

Table 2. Comparison of Accident Database Management[10]

Parameter		Indonesia	Japan
Data Collection	1. Stakeholder	Local Police Local Transportation Office	Prefectural Police Agency MLIT
	2. Data Type	Accident Report Road And Traffic Characteristic	Traffic Accident Data Traffic Census Data
	3. Period	Police : every year (annual report) Transportation Office: unscheduled	Police : every year MLIT : every 5 years
Data Processing	1.Stakeholder	Police : Law enforcement, Criminal Proceeding Transport Office : Traffic Management and policy (Depending on interest and purpose of stake holder)	National Institute for Land and Infrastructure Management
	2. Data Analysis Emphasis	Cross Tabulation Data	Accident Analysis Section

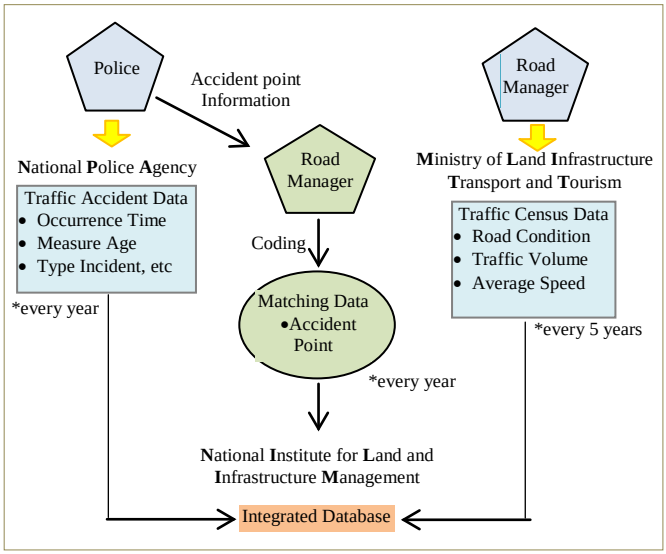

Fig.6. Integrated Database of Traffic Accident Analysis in Japan[10]

Yet no special institution exists that is fully responsible for establishing an integrated traffic accident database in Indonesia. Thus, the Japanese experiences are useful for improving the Indonesian situation.

4. Summary

(1) Gaps exist between the priorities for infrastructure improvement planning and safety issues to be improved in Magelang.
(2) Statistical analyses indicate that the volume-capacity ratio is associated and correlated with the number of accidents.
(3) Lessons learned from Japan give substantial information that the integrated data base system, the comprehensive improvement program in safety issues, and the merging with other long-term infrastructure plans are key points to improve traffic safety in Magelang.

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