ROAD SAFETY PERCEPTION TOWARDS SUSTAINABLE TRANSPORT (A CASE OF ROAD SAFETY PROGRAMS IN YOGYAKARTA, INDONESIA)

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Abstract

The **Aims** of this study is suggests a set of scheme on road safety policy improvement in Yogyakarta by firstly understanding the road user perception on current road safety programmes related to the ongoing problems, then analyse it along with other actor's role in achieving sustainable transport. "The Five Pillars" as current road safety action plan are followed to actualize safe mobility and "zero accident". Using Yogyakarta as a case study within the **Research Design**, this qualitative study are conducting triangulation technique in data collection. The Study Empirically describe the present situation and gain the road user perception by marriage with The Theory of Planned Behaviour, Sustainability, Value Creation and Hongkong's Transport Policy in theoretical part. It indicates according the **Results,** there still existed a gap of perception between road users and road safety officer due to the existence of irregularities within the road safety programs implementation.

Kata kunci: *road safety, The Five Pillars, perception, transport policy, sustainable transport.*

INTRODUCTION

Road traffic accident which causing fatality injury has attained worrying levels in the world to date. WHO (2013) stated that road traffic injuries are among the eighth leading cause of death nowadays and predicted will be even worse in the future. According to this scheme, the middle-income countries play a significant role on this phenomenon since its road traffic fatality rates are above on average, reached at 20.1 per 100.000 populations. For Indonesia case, the number of fatalities due to traffic accidents itself has reached 32.657 people each day in 2011 (WHO, 2013). Aside from damaged roads and vehicles unworthiness, one of the reason most substantial comes from the human error such as violation of traffic law or regulations i.e. over speeding; helmet cases; violate an opposing line etc. Thus, the government start rethink on currently road safety action plan by actively followed a Decade of Action for Road Safety (DoA) 2011-2020.

By its total population of 3,514,762 inhabitants, area 3,185.80 km square, Yogyakarta known as one of mega cities in Indonesia divided into five regencies: Kulonprogo, Bantul, Gunungkidul, Sleman, and Yogyakarta (*D.I. Yogyakarta in Figure*, 2013). The city has 1,749,738 units of motorized vehicles registered in 2012, mostly dominated by motorcycle (1.537.534 units, increase 8,04% from 2011). Apart from motorcycles and private cars, thetype of daily mode of transport for the citizens in this city are TransJogja buses, authorised buses (bus kota), cycle rickshaws (becak),traditional horse-drawn carriages (andong), taxi, and motorcycles cab services (ojek). the city also provides national road

networks of 168,81 km, province road networks of 690,25 km and district roads of 3.968,88 km (mostly two lanes-two ways type) (RPJMD 2009-2013). Currently, Law 22 of 2009 are mainly used as reference to regulate road traffic management. Yet The response of legislation and the public awareness regarding the current condition is still enhanced since the low level of the road user's willingness to obey the traffic enforcement. Moreover, the lack of knowledge among road user, poor driver, vehicle standard and insufficient accident data adds to road safety problems.

THEORETICAL FRAMEWORK

The accident occurrences which lead to fatality, bases on its exposure, the accident rate on that area and the injury severity level. Contextual to this, there are several component that influence mainly on these occurrences, the human behaviour and engineering matters (Elvik, 2004). Much research also supported the three elements on traffic safety: *the road user, vehicle, and infrastructure* (Wang *et al*., 2013). The most common framework within road injuries identification is "Haddon Matrix" (Haddon, 1980).

Human factors aspect encompass commonly road user behaviour on travelling such as distraction (cell phone, display screen), wearing personal protective equipment (seatbelt, safety helmet, etc.), speed of travel (avoid over the speed limit), driving behaviour, alcohol and drugs influence (Elvik *et al*., 2009). While Surounding factors such as economic and demographic variable (age, gender, family composition, the number of inhabitants, education, the income level) are also considered as the affecting factors on road safety, particularly on risk and exposure (WHO, 2004; Elvik *et al*., 2009).One of the most common theory to explain more about human behaviour is Theory of Planned Behaviour (TPB) (Ajzen, 1991). These theories were differentiated three types of beliefs. There are *behavioral*, *subjective norm* and *control*. According to the theory, when a person's intention directly used together with the behavioral control perception, it will lead to behavioral achievement (Ajzen, 1991). Thus, personal feelings on norm are perceived as moral responsibility in conducting the activity.

As part of engineering factors, vehicles and safety equipment are affecting directly to the road safety since it can create a lasting, sustainable occurrences such as length, weight, electronic stability, safety equipment, and stopping distance. Environmental zones also substantially contributeing in supporting the road safety since it encompass traffic (speed, traffic density, traffic flow, traffic congestion) and road characteristic (geometry design, infrastructure, land use and network planning) (Wang *et al*., 2013). Road infrastructures encompass the road construction and design (i.e. speed zone, junctions, intersections), signing and marking (i.e. rumble strips, Variable Message Signs (VMS), road maintenance and the road quality assurance (road safety audits and road safety inspection activities) (Elvik *et al*., 2009).

Perception of road safety

In addition, there are certain factors that related to both engineering and human behaviour such as risk compensation and physiological theory. It states that drivers would adopt that physiological behaviour in lower risk perception such as reducing attention or speed management. As well as the role of perception of behavioral control on the behavior achievement, the genesis of perception on road safety is closely linked to the risk in traffic

accident cases (Methorst, 2005). According to Wildervanck (1988), perception can be seen within chains on a cyclical process of human information which involving assessment, decision and action. Moreover, There are three levels of road safety perception: subjective risk, traffic menace and traffic liveability. Traffic liveability and traffic menace were strongly influenced by the general safety perception of both the road user and the policy makers (Wildervanck, 1988).

Sustainability and Transportation

The conceptualization of sustainability has become in general and used broadly for both of the environmental sphere and transportation sphere. Mobility as the basic human need is demanding on the system's accessibility such as infrastructure and public facilities through sustainable way. The primary definition of sustainability is mostly referencing the triple bottom line: *social* equity, *economic* efficiency and *environmental* responsibility (Elkington, 1998).

According to Kemp (2005; cited in Enquist *et al*., 2007) there are five dimensions to sustainability (ethical, social, nature-philosopic, economic and legal). These five dimensions reflected the philosophical thinking on sustainable development which jointly with road safety efforts through public policy can be used as the driver values to create sustainable safety. Sustainable development is widely accepted as a desired policy goals which provide an opportunity for each stakeholder concerned with future perfection. The sustainable way of thinking involves whole actors in the system network, including local stakeholders and society (Enquist *et al*., 2007).Since sustainability system encompasses whole actors in the system network, the value creation process is occurring within this part.

This part is representing the integration of sustainability and stakeholders's thought regarding road safety which causing a high fatality rate. Since it encompasses negotiation, accommodation from various interests during the process of decision making of policy, the political effect is generally occur within the system through some decision's flow, organisational dependencies, and programmes (Rose, 1976). For the urban area, the indicators of sustainable transportation are accessible; health and *safety*; cost effectiveness; impacts on competitiveness and wealth generation; natural capital consumption; pollutant's production. Furthermore, five sustainable safety principles (functionality, homogeneity, forgivingness, predictability, state awareness) are formulated towards "zero vision" (Wegman, 2006).

For learning lesson in policy improvement within road safety, Hongkong is the one of the rapidest cities which successful on providing an effective, efficient, reliable and safety of transport system so as meet the sustainable transportation and development (Transport and Housing Bureau of Hongkong, 2013). Thus, the local government designing Hongkong as "*living streets, walkable city*" which concentrated on three approach: Transport infrastructure improvement and land use planning; Public transport enhancement and integrated with the other mode of transport; Road uses management.Regarding these approach, Hongkong strategy were lead to the five "Better" (land use planning and integrated transport system; rail network as the back-bones of Hongkong's citizen; public transport system, facilities, and services; modern, high and advanced technologies in transport system; and transport management that environment-friendly)(Transport and Housing Bureau of Hongkong, 2013).

METHODOLOGY

Since qualitative method has been chosen to describe the root of the problems within this research, non-numerical data and related indicators or categories have provided in understanding the 'What', 'When', 'Where', 'How' and 'Why' of the reason behind the findings. The case study method has been adopted in generating a research question includes the descriptive and explanatory questions regarding the research (Yin, 2003). The case study of this research is the road user perception on road safety programs to date in the Yogyakarta region as one of the pilot projects Global Road Safety (WHO, 2013) and the first county for the Road Safety Partnership Action (RSPA). This research is presents single case study which using comparison case study (Hongkong) as a whole holistic case sudy to observe the determinant factors on how Hongkong conducts their road safety programs heading to sustainable transport.

Data Collection

During the research, the Author used multiple sources of evidence documentation approach or called *triangulation* such as archival records, participant-observation, and interviews (Yin, 2003). An online questionnaire was launched to those participants in several categories (senior high school students, college students and workers), included core material and equipped with additionally itemized questions.For sample strategy for qualitative research, , *judgement sampling* or *purposive sampling* is used for selected informant to help the researcher to respond the research question in the case study. Furthermore, qualitative research had focus on perception, expectation, subject's meanings and followed by actions (Berg and Lune, 2004). Thus, the subject and victim that mostly involved in road traffic accident such as workers, civil servant and students (RUNK, 2011). While for the sampling conducted by *snowball technique* or "best friend control,".

The data followed are represented the percentage of road user who mostly involved in a road traffic accident as subject (RUNK, 2011): Workers (55%); Civil servant (17%); Student (10%); College Student (7%); Driver (10%); and Police Officer and Military (1%). The author also conducts tele-interviews with some of officer stakeholders in order to get the development of the case study and reliable source information. The interview (Regional Police Officer, Regional Land Transport Officer, Public Works Officer) and questionnaires were launched within two months (started from April till May 2014). This research also conducts observation based on online source, social communities such as facebook community, Official Website each stakeholder, Google Scholar, and Global Plan for DoA (2011-2020).

The qualitative data within this paper were analysed using *content analysis* for road safety evaluation. The analysis process involves reading and re-reading related data in oder to explore the similarity and dissimilarity. The categories in the analysis part were referenced *The Five Pillar Approach*, and conducted by *Microsoft Office Excel software*. Each of response (questionnaires, interviews) on performance indicators were analysed and presented through chart using *pivot table* and *pivot chart*. For some of variable such as gender, age and occupation were also presented by *pivot chart* and correlated with other variable such as driver license matters, resulted on which variable of perception causing the emergence of road safety problems. For reliable test, Yin (2003) stated that reliability on designing cases studies uses replication logic, ensured by developing a case study protocol and database.

EMPIRICAL STUDY

According to current research result (Sahabudin *et al.*, 2011), poor driving behaviour is the main cause of road traffic accidents in Yogyakarta Municipality, particularly for motorcyclist cases. In most cities of Indonesia including Yogyakarta, motorcycle purchase is easy to obtain through credit system and known as the most compatible mode transport by its speed and flexibility. These problems were getting worse with the number of "ojek," "andong," and "becak" that provide services with lower safety level. Due to the economic reason, many people in this city willing to provide urban transportation as "ojek," "andong," "becak" drivers. Road safety problems such as mixed traffic, motorisation, driver distraction, over speed limit, driving license, low of safety devices usage, taking over of the pedestrians and cyclist's facilities, road infrastructure, and vehicles emission are part of most cities in Indonesia.

According to the Regional Polices data showed that 431 people per day were died due to crash an accident on the roads in 2012. Ironically, more than half of those numbers who were killed in road accident were the vulnerable road users among the age of 15 until 44 years old, and 73% of those were male (RUNK 2011). It has been investigated previously that the human factor is the main cause of road traffic accidents, since its percentage in comparison with other factors is excessively high (77%) (Sutomo, 2000).By referencing Law 22/2009 about road traffic regulation and transportation, The Police Regional Command of Yogyakarta (Polda) launch "the shared commitment on five pillar approach" within Decade of Action (DoA) programmes: (1) road safety management; (2) safer roads and mobility; (3) safer vehicles; (4) safer road users; (5) post-crash management as a guide for the road safety strategy.

RESULTS AND DISCUSSIONS

Motorisation and car ownership is the root of current problems since its number was rising by 10,9% and 7,7% annually respectively (Global Works, 2011). For Yogyakarta, the number of motorcycle shows the increase growth of 8,04% from 2011. Total of 120 questionnaires were collected with effective samples since represent the active road user including the vulnerable road user (motorcyclists, cyclists, pedestrians). The survey items of the questionnaire encompass individual characteristics, driver license attributes, and present road safety perception.

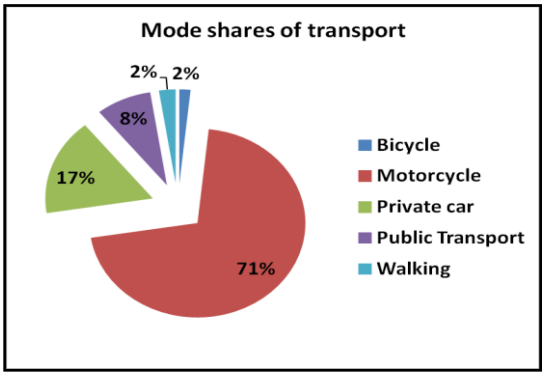

Figure 1 The mode shares of transport in Yogyakarta

Field Observations

Human behaviour – According to Dirlantas Polda DIY Kombes Pol Nasri Wiharto statement, the biggest cause of accidents due to human behaviour in Indonesia, is the driver by using the phone while driving as much as 2,037 cases (738 cases of phoning, 255 cases of texting, and 197 cases of watching TV car. Moreover, there are existed various advertisements installation in all the way. Riding a motorcycle without basic knowledge (low of safety-helmet-wearing) of road traffic regulation is often encountered. Until January 2012 there are 1,006 cases of lawbreaking helmet usage (D.I Yogyakarta in Figure, 2013).

Vehicles and Safety Device – To date, vehicle safety policy was still in progress to enhanced such as vehicle testing (Pengujian Kendaraan Bermotor) in both of safety design and emission level. According to UPTD PKB of Yogyakarta the average life of "bus kota" (Kopata, Kobutri Aspada, Puskopar, and Damri) is more than 15 years. Yet, its, not in accordance with the facts and leads to pollution. Those buses were still in used due to the limited fund for bus vehicle renewal.

Environmental Influence – Yearly, the number of motorised vehicles in Yogyakarta is increasing on average about 9,7% by the number of 1.053.482 units (925.445 motorcycles; 128.027 units private car) per October 2012(D.I Yogyakarta in Figure, 2013). The survey result also shows that more than 50% respondents by the age group of 16-30 years old are using the motorcycle for the daily modes of transport.

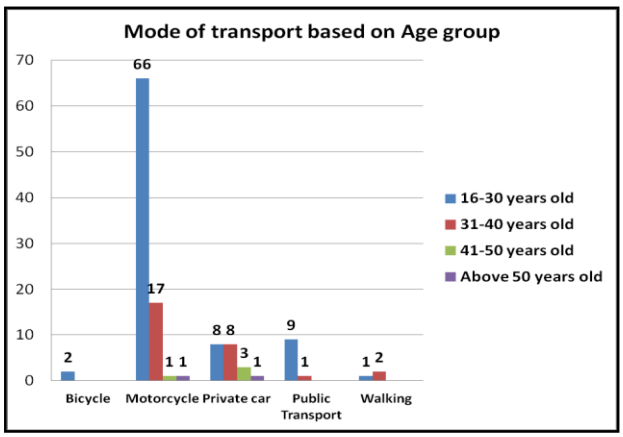

Figure 2 Mode of transport based on age group

Survey Results

In this paper, road users and stakeholders perception on the Five Pillars will be assessed as the reason of road safety problems as above.

Pillar 1: Road safety management

1. 45% respondents perceive that new technology innovation are still not involved on road safety programmes;
2. 52% respondents perceive that road user survey are still not periodically conducted;
3. 84% respondents perceive that bribery action of the officers in charge (police, PKB officers) is a common matter occurs within their experience.

Pillar 2: Safer roads and mobility

1. 55% respondents perceive that the forgiving road environment yet unavailable.

2. 61 respondents perceive that the current road condition still exists potholes, puddles, slippery, uneven patching, manhole covers, which affecting road safety.
3. 60% respondents perceive that the pedestrians facilities were still few in numbers.

Pillar 3: Safer vehicles

1. 42% respondents perceive that the law enforcement of vehicle's equipment safety (rearview mirror, lamp, etc.) was not strictly conducted as their experience.
2. 85% respondents perceive that current public transport vehicles were not cautious enough as their experience.

Pillar 4: Safer road users

1. 36% respondents perceive that road safety education and campaign were not already held periodically through various media (banner, flyer, poster, internet, tv).
2. 48% respondents perceive that current road safety education and campaign are not strongly affecting the road user behaviour.
3. 54% respondents acquired their driver license through a formal procedure, while 46% respondents acquired their driver license through broker or "calo".
4. 80% respondents admitted not having a driving certificate; only 20% respondents having a driving certificate.

Pillar 5: Post-crash response

1. 57% respondents perceive that the scheme on handling of post-crash emergencies such as an insurance claim is not clear

While for theStakeholders perception are presented in Table 1.

Table 1. Stakeholders perception on road safety programs

Perception towards road safety programmes	
Pillar 1	New technology innovation still in the phase of the procurement phase. The road user survey will be conducted by a cooperation with several universities. To date, particular action plan was proposed in order to reduce bribery action.
Pillar 2	The Ministry of Public Works still in progress on road rehabilitation project to improve road condition. The Ministry of Transportation cooperate with Local Government were in progress to propose "Walkability city for Yogyakarta" plan.
Pillar 3	The Regional Police of Yogyakarta still proposes an effective strategy on that operation. The Ministry of Transportation cooperate with Local Government were in progress to propose an improvement on BRT system.
Pillar 4	The Regional Police of Yogyakarta was still in progress to conducted more often through various media. Since current road safety programmes still not synchronized into education curriculum started from elementary school level. The Regional Police of Yogyakarta was still in progress to eliminate that occurrence. The Regional Police of Yogyakarta was already put the requirement of driving certificate within driving license process.
Pillar 5	The Regional Police of Yogyakarta cooperates with PT Jasa Raharja already put the scheme at the hospital in Yogyakarta.

Discussions

Aside from "road safety triangle," human factors; vehicles and safety devices; and environment (Elvik et al., 2009), surrounding factors also important for road safety, particularly demographics, economics, weather and climate. According to the survey respondents (120), the participants were asked to complete the demographic questions (e.g., gender, age group, and occupation) in an online questionnaire form.

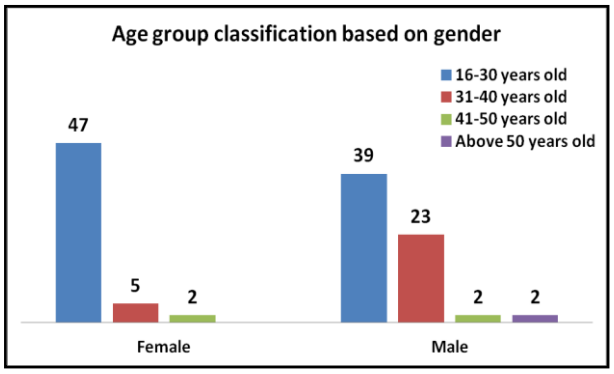

Figure 3 Age group classification

According the survey, the number of age group of 16-30 years old who acquired their driver license through broker is quite high are presented in Table 2.

Table 2. Driver License Process

Age Group	Via Broker
16-30 years old	**40**
31-40 years old	11
41-50 years old	-
Above 50 years old	1

Human factors and low of law enforcement are seen as legal view of responsibility within traffic accidents. These riders can be seen as a rider who has low perceived behavioural control towards subjective norms (police, another road user, family, friends) so as generate in such behaviour (not willing to use a helmet, or other safety devices) (Ajzen, 1991). By acquire the driver license from broker, the driving ability for a driver considered doubtful since it related with the cognitive skill in detecting hazard situation on the road. Moreover, the use of standard helmet, safety belt, vehicle testing, flat tire, broken braking system, vehicle testing, renewal and emission level permission needs to be improved based on current issues through new policy which more effective and efficient.

As the middle-income and developing countries, the rise of economic growth also increase traffic fatality rate. The more complex of traffic volume composition, the more increased the trend of road traffic fatality and casualty. These conditions are predicted will be increased each year and causing the more of congestion problems and road safety accidents which ended on the declining of the per capita income. Meanwhile, weather and climate also indirecting affecting the road peformance and driver awareness. Traffic characteristic as environment factors affecting road safety are considered as road safety supporting

(Elvik *et al*., 2009). Based on the empirical findings, most of road user perceive some action plan still not achieved. Their perception are reflected as the cause of road safety problem emergences, such as traffic offences.

Road Safety Management – Fund or budgeting on road safety were analysed as the reason of gap occurences within this pillar. The role of the Lead Agency is noteworthy and needs to be formed to improve the road safety management system.

Safer Roads and Mobility – More than 50% of respondents perceived that the current road condition is far away from those criteria. It occur due to the system contract of road rehabilitation sector project which conducted yearly through tender.

Safer Vehicles –Aside from the inhibiting factors of those institution (funds, organization structure, socialization and awareness level on vehicles test), its quality services also needs to be assessed such as human resources, equipment or infrastructure facilities, and management information systems (Elvik *et al*, 2009).

Safer Road Users –According to the survey result, its indication that road safety education, campaign was not yet held periodically through various media and less effective due to knowledge and skills of road user that need to be improved and educated.

Post-crash Management – Since the scheme on handling of post-crash emergencies such as an insurance claim is not clear, the role of Local Government, Regional Police Authority, and Public Health institution should be carried out a post care diagnostic, promote vehicle insurance and set Road Accident Fund.

The Role of Road Users on Sustainability

Road safety is for all of actors within a transportation network. Thus, road safety is all of actor's responsibility (stakeholders, public, private, road user, and policy decision makers) which used to stabilise and reduce the number of road traffic accident (fatalities, minor and serious injuries).Road safety is produced, generated, created and delivered like other goods or services. Under an effective policy framework, road safety action plans be expected achievable even with a limited resource through value creation process and resource integration so as sustainable safety can be attained (Lusch *et al*., 2010).

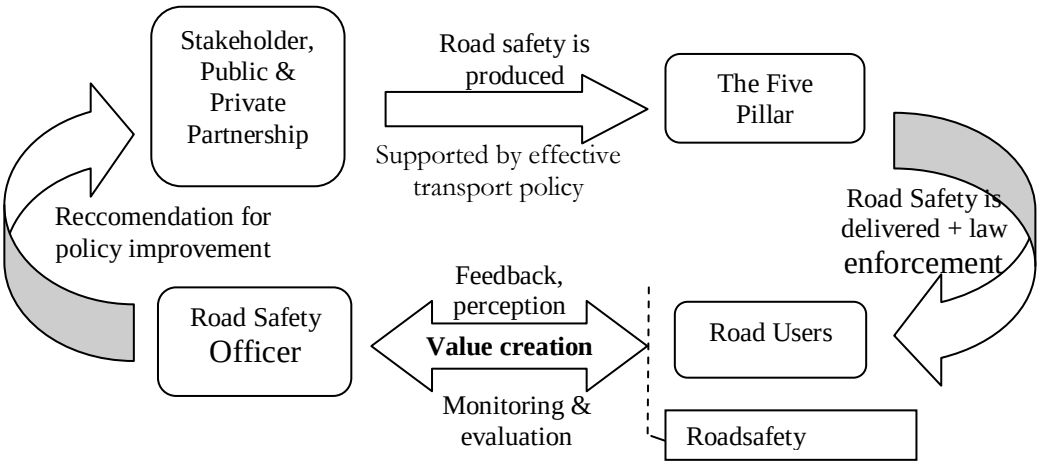

Figure 4 Road Safety Delivery Process

CONCLUSIONS

Facing a serious road safety problem, the Local Government of Yogyakarta actively support the national programmes "*The Five Pillar*" to solvethe common road safety problems such as low of safety devices, the taking over of the pedestrian's facilities and cyclist's lane, poor road condition and vehicle problems. The main cause of road safety problems are human behaviour, vehicle, environment, economic, demographic, and weather or climate. Yet there is existed a gap between road user and stakeholder perception which led to the emergence of road safety problems, such as human resource management which determined on road safety officer integrity, an absence of the Lead Agency in the province level, periodical survey of road user as targets, and the involvement of new modern technology). The following managerial implication are made to actualize the Walkable City of Yogyakarta: Improve coordination among stakeholders; public transport system; the public facilities, services, infrastructure; the transport information system; andthe traffic law enforcement implementation.

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