# SAFETY AND SECURITY IMPROVEMENT IN PUBLIC TRANSPORTATION BASED ON PUBLIC PERCEPTION IN DEVELOPING COUNTRIES

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Public transportation poses a higher risk of safety and security since there happen to be more passengers in one car. The problem becomes worse in developing countries, because of the lack of suitable and integrated approaches.

The aim of this research is to explore the perception of safety and security problems on the part of those parties involved in the operation of public transportation. This perception is used as a base to develop an improvement agenda for the particular context of developing countries. The research employs a questionnaire survey to collect the perception data. This paper explains the perception of users and drivers of paratransit as well as that of non-users and civil servants, concerning safety and security of paratransit in the city of Bandung, Indonesia. The rank of importance for each factor is analyzed by applying the factor analysis. Analysis shows that the user is the most important party involved. The understanding and awareness of the user (including the driver) is the most important variable to improve the condition.

Three aspects of an improvement agenda are proposed based on the perception data, namely technology, management, and institution. This agenda is clarified by a set of action plans incorporating the responsible parties and a time frame. The action plan is divided into three terms to define a clear goal for each step. The short-term action focuses on the hardware and on preparing further steps, whereas the medium-term action focuses on developing and improving the standard of safety and security. The long-term action focuses on advancing safety and security practices. The effectiveness of this agenda and action plan rests upon a set of assumptions, such as the degree of seriousness from the authoritative institution, fair distribution of information, the availability of reasonable resources, and coordinated and collaborative action from all parties involved to reach the objective.

**Key Words:** Paratransit, Safety, Security, Improvement, Perception

## 1. INTRODUCTION

Safety and security may be general terms in our daily life, but the study of these in the transportation sector has been very limited, especially in developing countries. Worldwide, there are estimated to be approximately one million road accident fatalities and ten million people injured annually, many with long-term disabilities. Almost 70% of these occur in the developing or emerging world[1]. Many people agree that the safety and security aspect in public transportation operation is very important, as public transportation closely relates with human lives on a larger scale or in greater numbers as many passengers happen to be riding in one car.

Research into public transport safety undertaken by TRL has shown that public transport vehicles in African and Asian countries are frequently poorly maintained and often overloaded, whilst the drivers themselves receive inadequate training. Public transport in many African cities is provided not only by the conventional bus but also by paratransit vehicles such as *mammy* wagons (converted trucks) and *Matatu* (converted vans and the like). Such forms of public transport are poorly regulated and controlled, with many operating illegally. These vehicles currently have a reputation of being particularly dangerous[2]. One important mode of transport in many cities in Indonesia is *Angkutan Kota*. *Angkutan Kota* has 12-14 passenger seats and is classified as paratransit. This mode shares 61.24% of the total public transportation available in Bandung, Indonesia[3]. This minivan operates around 46% of the total public transportation in many cities in Indonesia, and 52% of the total public transportation in the Province of West Java[4]. Many people depend on this transport mode, especially students and people from the middle to low economic strata. Although the existence of paratransit has been accused as the main cause for traffic

disturbance, its important role in providing mobility for captive riders can not be neglected.

However, many people and experts agree that congestion in urban areas is worsening, especially in developing countries. They believe that the existence of public transportation is a key to solve the problems. There are two options to overcome these problems, namely high capital intensive and low capital intensive. The latter means that the improvement should be conducted using existing resources to solve the problems at low cost. The approach takes more time to produce the expected impact, although in the long run the impact will be more effective. Low capital intensive seems more feasible in terms of financial and economic aspects for developing countries. The concrete term of this approach is to improve the existing urban transport mode's performance rather than implementing new transport modes with more advanced technology which is also capital intensive. In addition, the provision of public transportation faces a challenge to maintain the passengers and to attract the potential users. The improvement of public transport performance requires comprehensive planning, where safety and security are two of the important aspects. Valuable lessons learned from Western European and Canadian experience show that ensuring the safety of public transport riders and maintaining the perception that riding on transit is safe are of particular importance to transit operators in Western Europe and Canada[5].

As a contribution to improve the safety and security conditions in the operation of public transportation in developing countries, this research has been conducted to contribute a new approach to deal with the problem by incorporating public perception. In many instances, customer perception of safety and security are as important to understand as the actual conditions; a customer satisfaction survey can assist in uncovering these perceptions[8, 9]. Perception from the parties involved reflects their attitudes. Attitudes, represented by the factors that are in fact composite variables, contribute significantly to the explanatory power of the model. The experience of risk, as well as orientation in traffic, is expected to be influenced by personality characteristics[22]. Reducing the individual to simple socio-demographic variables involves a loss of information on the decision-maker's preference and consequent choice[6]. The so-called socio-economic or demographic variables, which are commonly used to describe the decision-maker in discrete choice models, are too narrow to represent the person[6].

This research aims to explore the public perception concerning the safety and security problems in the operation of public transportation. The rank of importance for each factor has been analyzed by applying the factor analysis to reveal the most important variable. The result of this factor analysis is used to develop an improvement agenda for the context of developing countries. The suggestions described here include only the possible, practical, and the most suitable ones to meet the requirements of the parties involved. The proposed improvement will act as a complement to the existing road safety action plans.

## 2. SAFETY AND SECURITY IN PUBLIC TRANSPORTATION

Public transportation provides a mobility service to the user, as well as producing a wide impact on the system. Consequently, it should be operated in such a way as to achieve an efficient and effective transportation system. To achieve this, there is a need to measure the quality of service as a way to evaluate its performance. The hierarchy of quality determinants in public transportation in Europe, which is proposed by the European Commission[7] as cited in the Transportation Research Board[8], consists of several classes, in which safety and security have been included. In that hierarchy of quality determinants, security is defined as the actual degree of safety from crime or accidents and the feeling of security resulting from that and other psychological factors. The security class consists of three aspects, namely[7, 8]:

a. Safety from crime: Staff/police presence; lighting; visible monitoring; layout; identified help points;
b. Safety from accidents: Presence/visibility of supports; avoidance/visibility of hazards; active safeguarding by staff;
c. Perceptions of security: Conspicuousness of safety measures; "mastery of network"; press relations.

Safety and security measures evaluate the likelihood that passengers will be involved in an accident, be it vehicular or otherwise (safety) or become the victim of a crime (security). They can also measure various aspects of workplace safety. Most safety and security measures can be calculated straight away, and require little more than careful record keeping. Measures reflecting actual incidents should be reported more frequently (e.g. monthly), while indirect measures reflecting potential levels of safety and security, such as the ratio of transit police officers to transit vehicles, can be reported annually[8, 9].

To show the risk involved in the activity of road public transportation, the data from the case of Indonesia is described. Indonesia is a developing country with a GDP growth rate of 5% per year. This growth is followed

by an increasing number of cars (5% per year) and motorcycles (73%)[10]. The Police of the Republic of Indonesia has stated that the number of accidents over the last 20 years has decreased by 69%, while the number of cars has increased by 225%. The reduced number of accidents has reduced the fatality rate to 4%[10]. This statement should be observed carefully by comparing it with other sources of data. An illustration of the different numbers of recorded accidents by different institutions is shown in Figure 1. By way of comparison, the Global Road Safety Partnership (GRSP) study can also be used to show the regional share of fatalities, population, and motor vehicles world wide as shown in Table 1.

The predicted number of accidents in Indonesia is shown in Table 2. The formal record by the Police showed that the number of reported road accidents and deaths has decreased, while in reality there were only the reported accidents. As a matter of fact, there were many unreported accidents. Recent research by TRL has highlighted the extent of under-reporting road deaths in the developing world. However, it is also appreciated that the extent of under-reporting of serious and slight injuries from road crashes is even greater and that fatalities represent only the top of the injury pyramid[2].

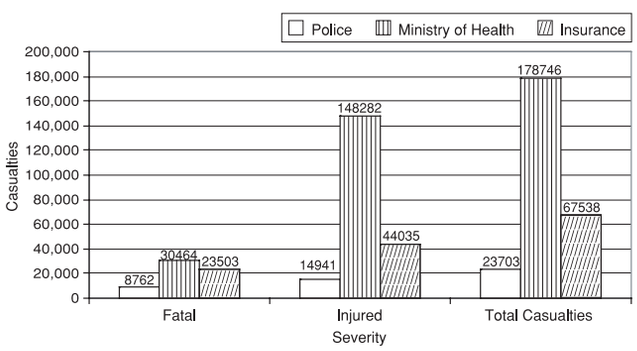


**Fig. 1 Number of road accident casualties in Indonesia[10]**

Road accidents involved many types of cars, which were dominated by motorcycles (47%), passenger cars (24%), trucks (22%), and other cars (7%)[10]. The distribution of the type of car involved in accidents in Bandung, Indonesia is shown in Table 3, which also describes the number of public transportation vehicles. The cost of accidents involving public transportation in 2003 is shown in Table 4.

90% of road accidents were caused by the human factor, so user awareness was the best way to reduce the risk[10]. The distribution of actors in road accidents by age was 0-15 years (4%), 16-21 years (26%), 22-30 years (42%), and 31-40 years old (28%)[10]. The profession and education of the actors in accidents in Bandung in 2003 are shown in Table 5.

The main actor causing safety problems in road activity is the driver. Drivers tend to satisfy their motives in traffic as well as in other areas of life[11]. This pushes them to drive faster and more hazardously. However, in reality car drivers adapt to the risks involved in driving to such a level that they do not generally feel any risk in a given traffic situation, or their subjective risk assessments approach zero. Drivers avoid the feeling of risk just as they avoid pain, which is known as the zero risk theory[12, 16]. The assumption is that there is a risk threshold above which the risk is experienced as aversive. A driver feels the risk

**Table 1 Distribution of estimated road deaths, motor vehicles, and population[2]**

| Region | Fatalities (%) | Motor Vehicles (%) | Population (%) |
|---|---|---|---|
| Sub-Saharan Africa | 10 | 4 | 10 |
| Developed World | 14 | 60 | 15 |
| Asia/Pacific | 44 | 15 | 54 |
| Central & Eastern Europe | 12 | 6 | 7 |
| Latin America/Caribbean | 13 | 14 | 8 |
| Middle East/North Africa | 7 | 2 | 5 |

**Table 2 Profile of predicted number of road accidents in Indonesia[10]**

| | Fatal * | Accident | Total Cases | Total Accident |
|---|---|---|---|---|
| Reported | 8,762 | 14,944 | 23,703 | 12,267 |
| Predicted | 30,464 | 1,083,577 | 1,114,041 | 918,471 |

* The predicted number of fatalities was reported from a pamphlet by WHO/MOH World Health and the predicted number of accidents came from an exploration by hospital survey in Yogyakarta, Indonesia.

**Table 3 Types of car involved in accidents in Bandung, 2003[15]**

| Area | Type of Car | | | | | | |
|---|---|---|---|---|---|---|---|
| | Passenger Car | | Freight Car | | Bus | | Motor-cycle |
| | Public | Private | Public | Private | Public | Private | |
| The Metropolitan Police of Bandung City | 7 | 37 | - | 8 | 1 | 3 | 27 |
| The Resort Police of West Bandung | 15 | 44 | 2 | 6 | - | - | 29 |
| The Resort Police of Central Bandung | 2 | 19 | 3 | - | - | - | 4 |
| The Resort Police of East Bandung | 6 | 16 | - | 2 | 2 | - | 17 |

**Table 4 Accidents involving public transportation in Bandung, 2003[15]**

| Area | Number of Accidents | Number of Victims | | | Cost (Rupiah) |
|---|---|---|---|---|---|
| | | Death | Serious | Slight | |
| The Metropolitan Police of Bandung City | 47 | - | 3 | 2 | 79,550,000 |
| The Resort Police of West Bandung | 52 | 2 | 3 | 2 | 76,300,000 |
| The Resort Police of Central Bandung | 18 | 4 | 1 | - | 38,000,000 |
| The Resort Police of East Bandung | 31 | 9 | 5 | 4 | 18,650,000 |
| | | | | | 212,500,000 |

**Table 5 Actors in road accidents in Bandung, 2003[15]**

| Area | Profession | | | | | Education | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Civil servant | Army | Student | Driver | Others | Elementary | Junior | Senior | Univ. |
| The Metropolitan Police of Bandung City | 2 | 1 | 19 | 19 | 39 | 2 | 6 | 40 | 23 |
| The Resort Police of West Bandung | 2 | 1 | 10 | 12 | 27 | - | 15 | 26 | 7 |
| The Resort Police of Central Bandung | 1 | 1 | 4 | 1 | 7 | - | 3 | 12 | 4 |
| The Resort Police of East Bandung | 1 | - | 11 | 7 | 16 | - | 6 | 23 | 1 |

of a collision as an emotional and immediate experience, which has been called ostensive risk[17]. A risk factor is defined as any factors related to traffic that have been shown to increase the risk of traffic accident or is suspected to increase traffic accident risk. Several risk factors in traffic during working hours are saving time, fatigue, using a mobile telephone, or health problems[11].

When the zero risk theory is applied to traffic during working hours, it is necessary to identify extra motives affecting driver behavior. As the term 'extra motives' is not directly related to traffic accidents but to drivers' decision making, then the term used is 'risk factor'. Both excitatory and inhibitory motives influence the decision making of a driver. The most hazardous excitatory motives are 'extra motives', e.g. those outside the traffic, such as saving time and effort, which prompt the driver to increase speed. The increased risk of an accident is related to the strength of these extra motives[12]. It has been suggested that work habits accepted by one's co-workers and the need to vary actions are similar extra motives in work life[13]. The pressure of the work community that was operationalized as the influence of co-workers, foremen, and customers was not such an extra motive[14].

## 3. ROAD SAFETY MANAGEMENT

In this section, several action drafts and road safety and security reviews from Indonesia, Africa, Australia, Europe, and the USA are described. It can be inferred from the available documents concerning road safety in Indonesia, Africa, and Australia, that road public transportation is treated as a general road user without special attention or treatment. Attention devoted to public transport can be found in the European Road Safety Action Program, while a larger amount of attention can be encountered in the USA.

### 3.1 Action draft of road safety in Indonesia

On April 7th, 2004, the Memorandum of Understanding about the Action Draft of Road Safety was signed by several ministries from the Indonesian government, which was sponsored by many institutions, including the private sectors. This action draft is a component of the ADB/ASEAN Regional Road Safety Project. It has several key targets, namely a) to secure road users in five-year periods by anticipating the death rate per year; b) to reduce the death rate (deaths per ten thousand vehicles) by reducing death rates in 2010 compared to death rates in 2003; c) to step up the use of safety belts to 90% in all regions; and d) to increase the use of crash helmets up to 90% in all regions[10]. These targets will take place as a reference to observe the success of the plan in reducing the impact of road accidents. The plan will be discussed after two years and its revision should assure the fulfillment of the target. The existence of national road safety is in line with the objective to strengthen the institution of road safety activity and the improvement of security. At the regional level, the activity will be watched by the Coordinating Board of National Road Safety (BKKJN/*Badan Koordinasi Keselamatan Jalan Nasional*) from the ASEAN secretary.

The action draft consists of 15 sectors. Each sector consists of a set of activities in the short (less than 12 months), medium, and long term (4-5 years). In addition, each sector explains the background, several key points of implementation, a time frame, a major institution (i.e.

the most responsible one), organization coordination (or involved organization), and yearly cost (from 2004 to 2008). The list of sectors in the action draft are 1) coordination and management of road safety; 2) a data system of traffic accidents; 3) funding for road safety; 4) planning and design of road safety; 5) improvement in hazardous locations; 6) education and road safety for children; 7) training and testing for drivers; 8) a campaign and socialization concerning road safety; 9) standards for motorized safety; 10) traffic regulations; 11) traffic police and law enforcement; 12) victim's first aid in traffic accidents; 13) research into road safety; 14) the cost of traffic accidents; and 15) collaboration[10].

### 3.2 Africa road safety review

Following the setting up of the Global Road Safety Partnership (GRSP), the Transport Research Laboratory (TRL) UK was asked to undertake a review of road safety worldwide. In this worldwide safety review, it was possible to draw on the results of detailed studies undertaken of the road safety situation in the Asia-Pacific region, the Latin America-Caribbean region, and in Eastern Europe[2]. The Africa road safety review was published in December 2000.

A summary of the work to be undertaken in Sub-Saharan African countries is as follows, 1) review and summarize existing literature relating to road safety and identify existing databases or other information in these countries concerning road crashes, fatalities, and injuries. The review is to encompass literature in English, French, Portuguese, and Arabic but will be summarized in English; 2) contact identified sources of information to obtain detailed data by country; 3) based on material collected from the various sources available, prepare summary tables presenting available data about motorization, fatalities, injuries, economic losses, and trends by country and sub-region; and 4) prepare a final report on road safety in Sub-Saharan African Countries which makes full use of data prepared and which identifies data gaps that need to be filled. The 42 countries specified in the study have been grouped into several sub-regions, which have been used to facilitate the data analysis, namely Southern Africa, East Africa, West Africa, and Central Africa[2]. Key findings from the literature review are summarized as follows 1) development initiative; 2) road safety management; 3) funding; 4) road safety partnership and community participation; 5) crash data system; 6) crash costs; 7) road safety engineering; 8) traffic regulation and law enforcement; 9) traffic safety education for children; 10) road safety publicity; 11) medical services; 12) impaired road use; 13) research; and 14) motor vehicle insurance[2].

### 3.3 National road safety action plan, Australia

This is the third Action Plan presented under the National Road Safety Strategy 2001–2010 (the National Strategy). It identifies the main issues expected to influence road trauma levels in the foreseeable future, and sets out the priority areas for action in the calendar years of 2005 and 2006. The Action Plan was developed jointly by all Australian jurisdictions, with input from the National Road Safety Strategy Panel, which represents a broad range of organizations with a stake in road safety. It has been endorsed by Ministers of the Australian Transport Council (ATC). This new Action Plan deliberately builds on previous work. It recognizes that many of the measures contained in the last Action Plan (for 2003 and 2004) were well researched, cost-effective, and continue to be highly relevant to the goals of the National Strategy. However, changes have been made to reflect recent developments and new information – and as they move into the second half of the 10-year strategy period, greater attention has been given to actions that will influence road safety beyond 2010. An important aim of this Action Plan is to highlight the *Safe System* concept as an overarching framework for road safety intervention. The Safe System approach emphasizes the way different elements of the road transport system combine and interact with human behavior to produce an overall effect on total road trauma. The key components of the system are safer roads and roadsides (infrastructure), safer speeds, and safer vehicles[20].

The Action Plan comprises a wide range of specific initiatives grouped into five broad areas, namely 1) safer roads and roadsides; 2) safer speeds; 3) safer vehicles; 4) safer road users – managing road user behavior through education, enforcement and system entry; 5) other supporting measures. The mix of measures adopted in individual jurisdictions, and the details of specific measures, will vary to reflect local circumstances and priorities. The Action Plan cannot pre-empt the administrative or legislative processes required before implementation of many of these measures. However, all jurisdictions agree that planning and implementation should focus on these priority areas[20].

The Safe System perspective (illustrated in Figure 2) provided an overarching framework for the preparation of the new Action Plan. This perspective is intended to promote a more integrated approach to the development and implementation of road safety policy. The safe system framework focuses on the interaction between road infrastructure, speed, and vehicles. The combined

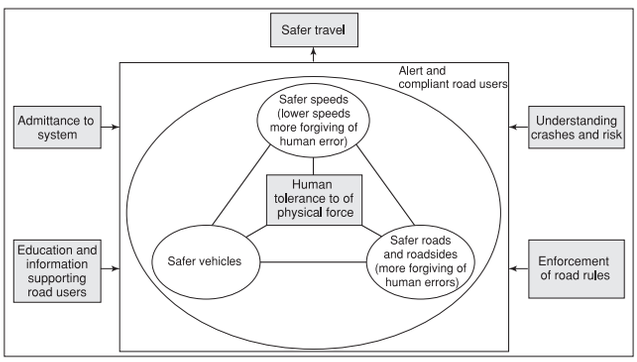


**Fig. 2 The safe system framework[20]**

effects of action taken in these areas will critically influence the number of road fatalities and serious injuries over the rest of this decade – and beyond[20]. The key components of the Safe System are the areas where safety countermeasures can be developed and implemented to significantly reduce risk. System thinking focuses attention on how these elements interact to produce a total level of risk, and what complementary actions could be taken to lower the resulting overall road trauma outcome. The prime task for transport designers, regulators and policy-makers is to minimize the total risk in the system by i) determining the relevant risk factors in a given situation; ii) determining which factors can be effectively manipulated; and iii) determining which countermeasures will produce the desired outcomes[20].

### 3.4 European road safety action program[21]

In its White Paper on European Transport Policy, the Commission has therefore proposed that the European Union should set itself the target of halving the number of road deaths by 2010. This communication also describes a number of direct and accompanying measures which the Commission plans to implement in order to enhance the benefit of the activities undertaken by the European Union, in particular the development of new safety technologies under the research framework programs to add value to the efforts made by the Member States. This action program aims to 1) encourage road users to improve their behavior, in particular through better compliance with the existing legislation, basic and continuous training for private and professional drivers and by pursuing efforts to combat dangerous practices; 2) make vehicles safer, in particular through technical harmonization and support for technical progress; the aspects concerning electronic technologies ('eSafety') will be covered by a forthcoming Commission communication on information and communication technologies for intelligent vehicles'; and 3) improve road infrastructure, in particular by defining best practices and disseminating them at local level and by eliminating accident black spots. It describes in particular specific measures for establishing a methodological framework to identify and disseminate best practices, through the drafting of technical guides, improving the collection and analysis of data on accidents and physical injuries, and pursuing research and development to find solutions for the future.

There is intentionally one chapter dealing with heavy-duty vehicles traveling, whose title is "Safe Commercial Goods and Passenger Transport." The European Parliament and the Council adopted the following actions for all vehicles over 3.5 tonnes and all vehicles carrying eight or more passengers, namely speed-limiting devices; seat belts to be worn; a proposal for a directive on the initial and continuous training of commercial drivers; improving and tightening up the rules in force concerning the monitoring of and compliance with driving rest periods; introduction of the digital tachograph and load securing. Other provisions of this proposal for a directive are aimed at encouraging systematic exchanges of information, the coordination of control activities, especially as regards cross-border transport, periodic consultations between the national administrations and the training of inspectors to ensure better compliance with the various pieces of legislation. The EU will assign special importance to the application of the measures described above to the commercial transport sector, notably the technical and training measures and the development of new traffic safety/management technologies. In the near future, it will also be necessary to address the possible consequences of the growing use of small commercial vehicles and company vehicles.

### 3.5 Federal Transit Administration (FTA) safety action plan, USA[23]

The goal of FTA's Safety and Security Program is to achieve the highest practical level of safety and security for all modes of transit. In order to protect passengers, employees, revenues, and property, all transit systems are encouraged to develop and implement a proactive system safety program plan. FTA supports these efforts by developing guidelines and best practices, providing training and by performing system safety analyses and reviews. The strategic goal concerning safety and security is to promote the public health and safety by working toward the elimination of transit-related deaths, injuries, property damage and the improvement of personal security and property protection. The resulting goal is the success in

achieving the safety and security goal, which will be measured by the following goals, namely a) reducing the number of transportation related fatalities, injuries and incidents; and b) reducing the vulnerability of the transit infrastructure to consequences of intentional harm to the system, its employees and its users.

These outcome goals reflect FTA commitment to ensuring that public transit is made safe and secure for its users and operators. The strategy for reducing the number of transportation related fatalities, injuries and incidents is to implement policies and activities (such as: research, training, technical assistance, information dissemination, and oversight) that encourage transit decisions, practices, programs and operations that will have a direct impact on reducing these statistics; to improve and maintain the condition of the transit infrastructure (vehicles, tracks and facilities), which has an impact on overall system safety and performance; and to promote activities that increase the attractiveness of transit as a modal choice instead of other modes of transportation with higher accident and fatality rates. The strategy for reducing the vulnerability of transit infrastructure to the consequences of intentional harm to the system and its users is to engage in activities that will assist transit properties in making design and operational decisions that will lower these statistics. Specific annual performance goals and measures, and activities are contained in the Performance Plan.

## 4. DATA COLLECTION

This research employs a questionnaire survey to collect perception data from the user and driver of paratransit as well as the non-user and civil servants. The questionnaire was distributed directly to the respondents using a simple random sampling method. The data from users and drivers was collected by on-board survey. All car passengers have been asked to fill out the questionnaire, but some passengers or drivers refused to answer. A special circumstance concerning the drivers ought to be mentioned, namely that the drivers asked the interviewer to read out the question, so that the driver was driving the car while simultaneously answering the questions. Responses from non-users and public officials were collected off-board, for instance in parking lots, malls, or offices. The location and route of paratransit to distribute the questionnaire was chosen simply at random, without particular purpose. The number of answered questionnaires amounted to 85, 88, 91, and 77 for users, drivers, non-users, and civil servants, respectively. The number of questionnaires distributed for each group was 100. The survey was distributed in the third week of February, 2005. General characteristics of the respondent are shown in Table 6.

**Table 6 General characteristics of the respondents**

| Characteristics | Respondent | User | Driver | Non-user | Civil servant |
|---|---|---|---|---|---|
| Mean Age | | 28.7 | 38.9 | 26.8 | 43 |
| Age Range | | 11-56 | 21-60 | 15-62 | 22-65 |
| Sex | Female | 57.6% | 0% | 51.6% | 42.9% |
| | Male | 42.4% | 100% | 48.4% | 57.1% |
| Marital Status | Single | 54.9% | 11.8% | 70.3% | 6.6% |
| | Married | 45.1% | 88.2% | 29.7% | 93.4% |
| Education | Not Educated | - | 1.1% | 1.1% | - |
| | Elementary | 4.7% | 28.7% | 1.1% | - |
| | Junior | 11.8% | 48.3% | 2.2% | 1.3% |
| | Senior | 42.4% | 17.2% | 59.3% | 28% |
| | Bachelor | 36.5% | 4.6% | 26.4% | 61.3% |
| | Postgraduate | 4.7% | - | 9.9% | 9.3% |

Each questionnaire for each group of respondents contained three sections, namely covering general, safety, and security aspects. In the general section, the respondents were asked about their travel characteristics in making use of paratransit, such as personal data, purpose of the trip made, transport mode, number of trips, insurance, and so forth. In the safety and security section, the respondents were asked whether they had experienced accidents and criminal incidents when riding the paratransit. In addition, they were asked to rate the seriousness of the accident or security on the so-called *Likert*-scale from 1 to 5. The respondents were asked to state their perception concerning the most important reason for the existing condition, the most responsible party involved, and the most important aspects that needed to be improved. Finally, the respondent was asked whether he/she would make use of paratransit in the future when there is an improvement in the safety or security aspect.

In this research, the respondents' experiences were divided into two types, namely direct and indirect experiences. Direct experience means that the respondents experienced the incident directly by themselves, while indirect experience means that the respondents heard about the incident from family, friends, or other people. The indirect experience was intended to capture the complete occurrence of the accident or criminal incident, especially for the respondent who had not experienced it himself. Because this research explores the perception of the parties involved, it was beneficial to inquire into the respondent's real experience (meant for whom has experienced it) or what the respondent heard about other people's experience (for whom has not experienced it). The

perception was influenced by past experience, including other people's experiences. These direct and indirect experiences are shown in Table 7 and 8 regarding safety problems. The types of incident comprise car collision, car grazing, car breakdown, car sliding, or passenger falls when the car is moving. Table 7 shows that the driver experienced more accidents than the user when riding the paratransit. This is understandable, as the driver spent more time and happened to be more frequently inside the car. The number of accidents ranged from once up to three times. The seriousness of the accident was light (around 44%). Table 8 shows that more people had heard about the accidents when riding paratransit. The number of accidents was approximately once, while the seriousness was light to fair.

Direct and indirect experiences of criminal incidents are presented in Table 9 and 10. Types of security incidents that happening in paratransit include pickpocketing (pilfering), robbery, forcing by the passenger recruiter, inflicting bodily harm, and misunderstanding. In newspaper publications, other criminal cases in paratransit can be found, such as raping, killing, or sexual harassment; although the number was low, these crimes really happened. Table 9 shows that the user experienced more criminal incidents compared with the driver. This situation occurred because the position of the driver was much safer than that of the passenger. There was a separator in the car between driver and passenger, so the criminal actor felt freer to perpetrate his crime of attacking the passenger. The position of the passenger's seats made the latter more vulnerable to criminal incidents such as pickpocketing (pilfering) or robbery. The other problem was that the passenger could not do anything when the criminal incident took place, especially when the criminal actor got into the car in a group. The majority users only experienced this once, rated light to fair. Table 10 sheds light on other people's experiences. The number of criminal incidents amounted to approximately once, and the seriousness of the incidents was rated light to fair.

One important aspect in safety and security problems was the financial scheme to cover the impact of incidents. The present practice is that the victim should cover the costs resulting from a given accident/criminal incident, which many times turned out to be very high. In this research, the respondents were asked whether they know about the insurance available, realize the importance of insurance, and who should pay the insurance premium. The data is described in Table 11. The respondents generally know about the insurance and do realize that insurance was important. However, the respondent did not agree to pay the insurance premium.

**Table 7 Respondent's direct experience of safety**

| Respondent | | | User | Driver |
|---|---|---|---|---|
| Did you experience the accident when riding paratransit? | | Yes | 10.7% | 39.5% |
| | | No | 89.3% | 60.5% |
| Number of accidents | Once | | 44.4% | 45.7% |
| | 2-3 | | 44.4% | 42.9% |
| | More than 3 | | 11.2% | 11.4% |
| Seriousness | Very Light | | 22.2% | 29.4% |
| | Light | | 44.4% | 44.1% |
| | Fair | | 22.2% | 11.8% |
| | Serious | | 0% | 5.9% |
| | Very Serious | | 11.2% | 8.8% |

**Table 8 Respondent's indirect experience of safety**

| Respondent | | | User | Driver | Non-user |
|---|---|---|---|---|---|
| Have you heard that other people experienced an accident when riding paratransit? | | Yes | 36.5% | 80% | 56% |
| | | No | 63.5% | 20% | 44% |
| Number of accidents | Once | | 80.8% | 61.5% | 51% |
| | 2-3 | | 19.2% | 25.6% | 27.5% |
| | More than 3 | | 0% | 12.8% | 21.5% |
| Seriousness | Very Light | | 8% | 13.2% | 2% |
| | Light | | 28% | 36.8% | 25.5% |
| | Fair | | 16% | 39.5% | 54.9% |
| | Serious | | 16% | 7.9% | 11.8% |
| | Very Serious | | 32% | 2.6% | 5.9% |

**Table 9 Respondent's direct experience of security**

| Respondent | | | User | Driver |
|---|---|---|---|---|
| Did you experience any criminal incident when riding paratransit? | | Yes | 63.5% | 12% |
| | | No | 36.5% | 88% |
| Number of accidents | Once | | 63.6% | 72.7% |
| | 2-3 | | 27.3% | 18.2% |
| | More than 3 | | 9.1% | 9.1% |
| Seriousness | Very Light | | 4.5% | 38.5% |
| | Light | | 18.2% | 46.2% |
| | Fair | | 40.9% | 7.7% |
| | Serious | | 18.2% | 0% |
| | Very Serious | | 18.2% | 7.7% |

**Table 10 Respondent's indirect experience of security**

| Respondent | | | User | Driver | Non-user |
|---|---|---|---|---|---|
| Have you heard that other people experienced any criminal incident when riding paratransit? | | Yes | 57.7% | 43.6% | 79.1% |
| | | No | 42.3% | 56.4% | 20.9% |
| Number of accidents | Once | | 68.8% | 48% | 38.9% |
| | 2-3 | | 31.3% | 44% | 18.1% |
| | More than 3 | | 0% | 8% | 43.1% |
| Seriousness | Very Light | | 9.1% | 19.2% | 1.4% |
| | Light | | 33.3% | 53.8% | 5.6% |
| | Fair | | 21.2% | 19.2% | 36.1% |
| | Serious | | 30.3% | 0% | 27.8% |
| | Very Serious | | 6.1% | 7.7% | 29.2% |

**Table 11 User and driver perception of insurance**

| Aspects | | User | Driver |
|---|---|---|---|
| Do you know that there is safety insurance? | No | 31.8% | 21.8% |
| | Yes | 68.2% | 78.2% |
| Do you think that safety and security insurance is important for passengers? | No | 10.7% | 12.5% |
| | Yes | 89.3% | 87.5% |
| Do you think that passengers should pay for safety and security insurance? | No | 53.6% | 66.7% |
| | Yes | 46.4% | 33.3% |

# 5. PERCEPTION OF SAFETY AND SECURITY

Factor analysis was applied to identify the loading of each response from the respondent concerning perception of safety and security. Factor analysis techniques can achieve their purpose from either an exploratory or confirmatory perspective[18]. There is one major difference between exploratory and confirmatory factor analysis. The former finds the one underlying factor model that best fits the data; whereas the latter, in contrast, allows the researcher to impose a particular factor model on the data to see how well that model explains responses to the set of measures[19]. To test the suitability of application of this method, Bartlett's test of sphericity was applied. Because the number of variables for each research object was not so great, a *priori* criteria were used as the criteria to extract the number of factors. If the ultimate goal of the factor analysis is to obtain several theoretically meaningful factors or constructs, an oblique solution is appropriate[18]. In this research, the oblique rotation method was applied, especially using the OBLIMIN approach, where oblique rotation allows correlated factors instead of maintaining independence between the rotated factors[18]. Hair et al suggested that factor loading 0.65 needed sample size 70 for significance, where significance is based on a 0.05 significance level[18]. The reported results in this paper are based on the factor pattern matrix.

To establish the weight of each variable involved in several factors related with paratransit safety and security, the loading factor was elaborated. Factor loading is the means of interpreting the role of each variable plays in defining each factor. Factor loadings are the correlation of each variable and the factor. Loading indicates the degree of correspondence between the variable and the factor, with higher loadings making the variable representative of the factor[18]. The importance of the variable is shown by its loading. Variables with higher loadings are considered more important and have greater influence on the name or label selected to represent a factor, where the signs of loading are interpreted just as with any other correlation coefficients[18].

## 5.1 Factor analysis of safety perception

The result of loading for each element based on civil servant perception is shown in Table 12. Bartlett's test of sphericity of civil servant perception of safety showed a p-value as zero for all factor analyses, which means a high suitability test of the data. Moreover, the analysis gave the result that all loading is larger than 0.65, which means the variable was significant at 0.05 levels. The most determinant reason that plays a role in paratransit safety is the driver's education, followed by the quality of the car. Table 12 also shows that the most responsible party involved in paratransit safety is the local government, followed by the car owner and the driver. The lowest loading of the Bureau of Traffic and Road Transport (DLLAJ) can be understood from the fact that

**Table 12 Loading factor for civil servants' perception of safety**

| Variable for Each Factor | Loading |
|---|---|
| *Factor: Determinant reason for paratransit safety problems* | |
| Driver education | 1.000 |
| Car quality | .997 |
| Passenger awareness | .972 |
| Driver skill | -.954 |
| Law enforcement | .678 |
| *Factor: Responsible Stakeholder* | |
| Local Government | 1.008 |
| Car owner and driver | .981 |
| Other community members | .958 |
| Police | .945 |
| Passenger | -.783 |
| Bureau of Traffic and Road Transport (DLLAJ) | .743 |
| *Factor: Aspects to be improved to increase paratransit safety* | |
| Safety education for passenger | .982 |
| Improve driving skill of driver | .977 |
| Improve car quality | .960 |
| Safety education for driver | .921 |
| Improve law enforcement | .661 |
| *Factor: Party involved that should cover accident costs* | |
| Only government | 1.009 |
| Only passenger | .989 |
| Only operator (driver and owner) | .973 |
| Operator and passenger | .969 |
| Passenger, operator, government, & insurance | .851 |
| Passenger, operator, & government | .713 |
| *Factor: Government Role* | |
| Provide and improve standard and regulation for public transport service | 1.012 |
| Provide public transportation services as a change from private services | .978 |
| Implement law enforcement | .973 |
| Educate driver about road safety | -.950 |
| Cover accident costs | .885 |
| Educate user about road safety | .763 |
| Provide traffic infrastructure and its equipment to support road safety | .662 |

this is a government bureau, so its importance should be interpreted as a part of local government responsibility. This also explains that civil servant perception yielded the highest loading in local government as the most responsible party involved, where almost all parts of paratransit operation are coordinated by the local government.

Respondents from the civil servant sector said that the most important variable to improve safety in the operation of paratransit is safety education, followed by improving the driver's skill in operating the car. Furthermore, respondents stated that the government should cover accident costs. The answer from civil servants produced low loading for collaboration of parties involved when it comes to covering accident costs. The respondents' answers from the civil servant sector was a good way to reveal their role, because their daily activity happens to be in that area. Their answers gave the highest loading for the role of the government as provider and improver of standards and regulations for public transport service. The second highest loading for the government's role was the task to provide all public transportation services.

The loading factor for passenger perception is shown in Table 13, which shows four relevant factors. The four factors have significant value for Bartlett's test of sphericity in a range from 0.008 up to 0.065. The main reason for making use of paratransit was the financial motive, while the safety and security aspects were not the main consideration. As for the aspect of the reason for bad safety conditions in paratransit operation, the highest loading factor was the low awareness of the users. This answer was rather surprising, as they had identified themselves as the main reason for the bad safety conditions. However, this answer can be understood from the fact that the driver stops wherever the passenger wants to get on or get off. The passengers might be asking the driver as many times as they want to stop directly without giving the driver proper time to decelerate. This causes the driver to stop the car immediately, thereby exposing himself (and other road users) to great risk. That answer is in line with the other two factors. Firstly, the user was the most responsible party involved in the safety problems. Secondly, education about road safety was the most important initiative to improve the safety of paratransit operation.

As the main actor in the operation of paratransit, the driver's perception seems to be very important in exploring safety conditions. The loading factor is shown in Table 14, which contains five factors. The value of sig-

**Table 13 Loading factor for passenger perception of safety**

| Variable for Each Factor | Loading |
|---|---|
| *Factor: Reason for still using paratransit, despite having experienced or heard of an accident in paratransit* | |
| Paratransit is cheap | .996 |
| Paratransit is comfortable | .988 |
| Paratransit is safe and secure | .970 |
| Paratransit is available everywhere | .856 |
| Has no private car in his/her family | -.814 |
| *Factor: Reason for bad safety quality* | |
| Low awareness of the user | -1.000 |
| Low awareness of the driver | .984 |
| Low law enforcement | .964 |
| Low car quality | .845 |
| Low education of the driver | .823 |
| *Factor: The most responsible party involved in the safety of paratransit operation* | |
| User | 1.001 |
| Police | .997 |
| Local government | .941 |
| Bureau of Traffic and Road Transport (DLLAJ) | -.928 |
| Operator (owner and driver) | .569 |
| *Factor: Improvement aspects to increase the safety of paratransit operation* | |
| Safety education for user | .955 |
| Safety education for driver | -.942 |
| Improve car quality | .903 |
| Improve law enforcement | -.634 |

**Table 14 Loading factor for driver perception of safety**

| Variable for Each Factor | Loading |
|---|---|
| *Factor: The main cause of accident when the driver drives paratransit* | |
| Other paratransit drivers' traffic behavior | 1.010 |
| The existence of pedestrians | .987 |
| Low car quality | .967 |
| Tiredness | .958 |
| Other road users' traffic behavior | -.925 |
| Limited human ability | .557 |
| *Factor: The main cause of accident based on other drivers' experience (for respondent who had no accident)* | |
| The existence of pedestrians | 1.005 |
| Other paratransit drivers' traffic behavior | .999 |
| Low car quality | .975 |
| Tiredness | .973 |
| Other road users' traffic behavior | .960 |
| Limited human ability | .497 |
| *Factor: The main cause for bad safety in paratransit* | |
| Low law enforcement | .958 |
| Low user awareness | -.915 |
| Low car quality | .834 |
| Low education and skill of paratransit driver | -.607 |
| *Factor: The most responsible party involved in managing safety in paratransit operation* | |
| Passengers | -1.011 |
| Bureau of Traffic and Road Transport (DLLAJ) | -.915 |
| Police | -.912 |
| Local Government | .910 |
| Operator (owner and driver) | .801 |
| *Factor: The most important factor to improve safety in paratransit* | |
| Conducting training sessions in driving skills and knowledge | .991 |
| Improving car standard of quality | .975 |
| Improving law enforcement | .940 |
| Conducting safety education for the user | .711 |

nificance for Bartlett's test of sphericity ranges from 0.000 to 0.327. The highest loading for the main cause of accidents is the bad behavior of other paratransit drivers, which seems like putting the blame on others when giving attention to the three highest loading factors. This answer was not different from the answer of respondents who experienced the accident themselves and who had just heard from other drivers' experiences. The highest loading factor based on the driver's perception of the main cause for the bad safety conditions was the low degree of law enforcement. The interesting thing here is that the driver stated the user as the main responsible party involved in paratransit safety. This answer tallies with user perception. Conducting training sessions in driving skills and knowledge was the most important initiative to improve the safety conditions of paratransit.

As an independent party involved in paratransit operation, non-users are potential users of paratransit. The loading factor for non-user perception is presented in Table 15. It contains three factors and all factors have very low values of significance. The highest loading factor for non-user perception concerning the cause of bad safety in paratransit is the low awareness of the passenger. This answer was in line with the highest loading for the next factor, namely the most responsible party involved in paratransit safety. Non-user perception stated that the most important initiative to increase safety was providing safety education for the driver. The last factor showed that safety education for the user has the lowest loading.

**Table 15 Loading factor for non-users' perception of safety**

| Variable for Each Factor | Loading |
|---|---|
| *Factor: The main cause for bad safety in paratransit* | |
| Low passenger's awareness | -1.006 |
| Low car quality used as paratransit | -.931 |
| Low driver's awareness | .913 |
| Low law enforcement | .834 |
| Low driver's education | .667 |
| *Factor: The most responsible party involved in managing safety in paratransit operation* | |
| Passengers | .984 |
| Police | -.968 |
| Operator (owner and driver) | .965 |
| Local Government | .945 |
| Bureau of Traffic and Road Transport (DLLAJ) | .677 |
| *Factor: Improvement aspects to increase the safety of paratransit operation* | |
| Safety education for driver | .973 |
| Improve car quality | .949 |
| Improve law enforcement | .935 |
| Safety education for user | .613 |

## 5.2 Factor analysis of security perception

The result of the loading factor for each variable based on civil servants' perceptions is presented in Table 16. Only two variables in Table 16 have a loading factor below 0.65 at a level of significance of 0.05. All factors have values of significance according to Bartlett's test of sphericity of 0.000. The loading factor for civil servants' perception of the most determinant factor in security was user awareness. The most responsible party involved was also the passenger. If there was a criminal incident, then the government should cover all costs resulting from the criminal incident. The highest loading factor for the improvement aspect to improve security conditions was by certification of the driver, including the increasing number of police/security officers. The civil servants stated

**Table 16 Loading factor for civil servants' perception of security**

| Variable for Each Factor | Loading |
|---|---|
| *Factor : Determinant factor in the security of paratransit operation* | |
| User awareness | .994 |
| Standard of car quality | -.990 |
| Availability of communication devices | .952 |
| Law enforcement | -.863 |
| Police guidance | .689 |
| *Factor: The most responsible party involved* | |
| Passenger | 1.011 |
| Operator (owner and driver) | .940 |
| Local government | .935 |
| Bureau of Traffic and Road Transport (Department of Communication) | .881 |
| Police | .860 |
| Other community members | .492 |
| *Factor: The party that should cover the cost of criminal incidents* | |
| Only government | 1.013 |
| Only passenger | -1.006 |
| Passenger and operator | .932 |
| Passenger, operator, government, and insurance | .905 |
| Passenger, operator, and government | .843 |
| Only operator (owner and driver) | -.736 |
| *Factor: Improvement aspects to enhance paratransit security* | |
| Certification for driver | 1.000 |
| Increasing number of police/security officers | -1.000 |
| Improving law enforcement | -.999 |
| Improving car quality | -.936 |
| Installing communication devices | -.930 |
| Security education for passengers | .923 |
| Security education for drivers | -.829 |
| *Factor : The Role of the Government* | |
| Provide equipment for security (e.g. communication devices) | 1.003 |
| Educate driver about security | -.994 |
| Covering criminal incident costs | .983 |
| Increase number of police/officers | -.955 |
| Provide and improve standard and regulation for public transportation | .937 |
| Educate passengers about security | -.912 |
| Provide all public transportation services (as a change from private services) | .854 |
| Implement law enforcement | -.401 |

that the most important role of the government was to provide equipment (e.g. communication devices) and education to avoid criminal incidents.

Table 17 shows that the loading factor for three factors related with the security in paratransit operation is based on passenger perceptions. All factors have a value of significance ranging from 0.000 up to 0.013 according to Bartlett's test of sphericity. The highest loading factor for the reason for the existing security conditions was the low quality of the car used as paratransit, followed by the small number of police/security officers. Passenger perception showed that the improvement of the quality of the car yielded the highest loading, which means this ranks as the most important task to accomplish to improve paratransit security.

Table 18 shows the result of factor analysis of driver perception for five factors. It has a value of significance ranging between 0.000 and 0.042. There is one factor that is not significant concerning the answer of a driver regarding his first action when experiencing a criminal accident, which was not reported in this paper. The highest loading factor for the first driver's action when experiencing a criminal incident was to help the passenger, while the second highest loading factor was to do simply nothing. The main reason for the existing security conditions was the low compliance with law enforcement. The drivers stated that the most responsible party involved in this aspect was the Bureau of Traffic and Road Transport, which was under coordination of the Department of Communication. The second important party to be identified was the local government. The driver stated that the increasing number of police/security officers was the most important initiative to take to improve security conditions in the operation of paratransit.

Table 19 describes variables for three factors of non-user perception concerning security. The value of significance based on Bartlett's test of sphericity has a range between 0.001 and 0.325. Although the significance values seem less than satisfactory, they are still included in this report because the loading factor for each

**Table 17 Loading factor for passengers' perception of security**

| Variable for Each Factor | Loading |
|---|---|
| *Factor: Reason for bad quality of paratransit security* | |
| Low quality of car used | .994 |
| Lower number of police/security officers | .964 |
| Low law enforcement | -.904 |
| Lack of communication devices | .630 |
| *Factor: The most responsible party involved in the security of paratransit operation* | |
| Local government | -.991 |
| Police | .975 |
| Bureau of Traffic and Road Transport (Department of Communication) | .922 |
| Passenger | .909 |
| Operator (owner and driver) | -.687 |
| *Factor: The main factor to increase paratransit security* | |
| Improve car quality | .998 |
| Install communication devices | .942 |
| Add more police/security officers | .832 |
| Improve law enforcement | -.772 |

**Table 18 Loading factor for drivers' perception of security**

| Variable for Each Factor | Loading |
|---|---|
| *Factor: First action taken when experiencing a criminal incident (based on others drivers' experience)* | |
| Help the passenger | .986 |
| Do nothing | .948 |
| Go to the police office | .919 |
| Appeal for help to other paratransit driver | .785 |
| *Factor: The main reason for low security in paratransit operation* | |
| Low law enforcement | .918 |
| Limited or no availability of communication devices | .850 |
| Low quality of the car | .716 |
| *Factor: The most responsible party involved in the security aspect of paratransit operation* | |
| Bureau of Traffic and Road Transport (Department of Communication) | -1.003 |
| Local government | .994 |
| Passengers | .987 |
| Police | .950 |
| Operator (owner and driver) | -.843 |
| *Factor: The main activity to improve the security in the operation of paratransit* | |
| Increase number of police/security officers | .962 |
| Improve the quality of the car | -.952 |
| Improve law enforcement | .928 |
| Install communication devices | .877 |

**Table 19 Loading factor for non-user perception security**

| Variable for Each Factor | Loading |
|---|---|
| *Factor: The main reason for bad security conditions in the operation of paratransit* | |
| Lower number of Police/security officers | -1.000 |
| Unavailability of communication devices | .993 |
| Low law enforcement | -.821 |
| Low car quality | .760 |
| *Factor: The most responsible party involved in the security aspect of paratransit operation* | |
| Passenger | .860 |
| Operator (owner and driver) | .857 |
| Bureau of Traffic and Road Transport (Department of Communication) | -.808 |
| Local Government | -.772 |
| Police | .685 |
| *Factor: The main activity to improve the security in the operation of paratransit* | |
| Improve law enforcement | .946 |
| Improve the quality of the car | .908 |
| Install communication devices | .833 |
| Increase the number of police/security officers | .647 |

variable in each factor seems to bear a similarity with other groups of respondents. The most important party involved in security problems is the passenger. The most important thing to improve security could be accomplished by improving law enforcement, while the reason for the bad security conditions in the operation of paratransit is the small number of police/security officers.

## 6. IMPROVEMENT AGENDA

These action drafts in general proved to be a valuable draft, which was a first collaborative step toward road safety action. Generally speaking, the action draft focused on infrastructure, the user, supporting policy, and on a general approach to road/traffic safety. As a draft that was composed by many parties involved, the document started with an improvement and building the hardware, constructed software including human resources, various kinds of research, including collaboration of parties.

Meanwhile, public transportation was not mentioned explicitly in those drafts. It can be interpreted that public transportation safety and security problems were treated as general car or usual road users. Although road-based public transportations show a lot of similarity to other road-based vehicles, to some extent the approach to public transportation safety and security cannot be generalized as the approach to general cars. The design and requirements for road-based public transportations is different from those of general road-based cars, in terms of size, operation characteristics, and the number of passengers. The driver of public transportation should possess a higher degree of skill and knowledge regarding safety and security. Another aspect is that the improvement in public transportation safety involves different parties, such as operators, owners, users, drivers, or local governments, not only the Police or Department of Transportation. Improvement in safety and security is not a single approach but involves commitment from all parties responsible.

Moreover, public transportation requires an action plan regarding safety and security, specifically in the standardization of design and equipment, operation, and management. In this research, the perception from users, drivers, civil servants, and non-users of paratransit are employed as a base to develop the action draft, especially for road-based public transportation. Since paratransit is used in wide areas of development, which share similar characteristics, it seems that paratransit can be used as a representative mode.

Based on the ranking of prioritization, an improvement agenda can be proposed. The concept of low cost is applied, because of the limitation of resources allocated for public transportation in developing countries. The improvement agenda cannot stand alone, so it must work in partnership with all levels and broader scopes of road safety and security programs. Within a global scope, it was reflected in the recent establishment of the GRSP. This has been set up in the framework of the World Bank's Business Partners for Development Programs and consists of a partnership of private sectors, civil society, and government organizations collaborating to improve the road safety situation in developing and transitional nations. Partnership needs to be built between the public and private sectors and civil society and community partnership ought to be encouraged. Links need to be strengthened between sectors, especially with the health sector in order to obtain more accurate estimates of the road casualty burden[2]. This agenda is divided into three parts, namely technology, management, and institutions. Each part focuses on one specific area, so the implementation can be more specific even though the connection between parts is required. The description of the agenda is presented in Figure 3.

Factor analysis shows that the most responsible party involved in safety and security is the passenger. It means that the passenger is the most important subject, whom should be informed, trained, and educated. As the most important party, the passenger has the power to shape the image of public transportation operation. However, it needs a coordinating institution to shape the power in an effective way. In Figure 3, the management aspect focuses on how to improve passenger knowledge, which hopefully will create better traffic behavior. The other important human factor is the driver, whom needs to be trained and provided with information about how to operate the public transportation in safe and secure ways. The supporting element in organizational and legal aspects can be found in institutions. As for the institutional aspect, the collaborative network of those parties involved is proposed, as well as the Legal Aid institutes for the user of public transportation. Factor analysis also revealed that the quality of cars and infrastructure have a high loading factor, which means that the technology aspect also needs to be improved. The scheme in Figure 3 shows several things points of importance when it comes to improving the cars and infrastructure for public transportation.

The above agenda scheme should be clarified by a set of action plans, including the responsible parties involved and a time frame. Table 20 explains the action plan as a clarification of the above agenda. The action plan should be treated as an implement to the available action draft for road safety. At least this suggestion can be used as

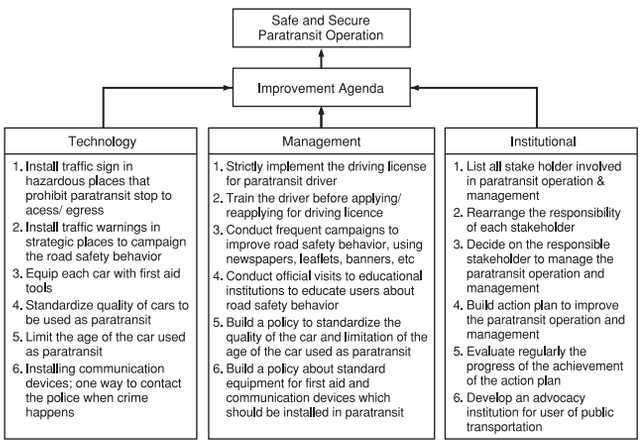


**Fig. 3 Proposed improvement agenda for public transportation safety and security**

a way to focus the operation and management of public transportation. The action plan was developed by considering the improvement agenda, which originates from the analysis of the perception. The action draft was divided into three terms to define a clear goal in each step. The short-term action focused on the hardware and on preparing further steps, which tried as much as possible to adhere to the available law and regulations. This short-term action was the urgent action to take based on the available regulations. In this short term, the education and distributing of information about safety and security in public transportation are started, which will be continued as a continuous action. The medium term focused on developing and improving the standards of safety and security, which need a longer period of time and careful study. The long-term action focused on advancing the safety and security practice.

The effectiveness of this plan rests upon a set of assumptions, namely a) seriousness in attitude from the authoritative institution to make a first step to start this action legally and nationally; b) unceasing distribution of information to the community about the importance of safety and security in public transportation; c) a provision of reasonable resources to implement the plan; d) coordinated and collaborative action from all parties involved to reach the objective. The importance of communication about safety and security in public transportation will improve the awareness of the community. The research institute and university conduct research to provide the scientific background and powerful plans to accelerate the authoritative institution in reaching the objective of safety and security in public transportation.

## 7. CONCLUSION

This paper has explored the perception derived from paratransit users and drivers, as well as that of non-users and civil servants concerning safety and security in public transportation. The perception of the parties involved was used to develop an improvement agenda. Using the factor analysis, the ranking of importance for each factor can be revealed. It is revealed that the user proves to be the most important party involved in safety and security aspects. The understanding and awareness of both users and drivers of road safety and security is the most important variable in improving safety and security, which can be reached by training and education. In the case of road-based public

**Table 20 Proposed action draft for public transportation safety and security management**

| Activity | Deadline | Main institution | Coordinated institution |
|---|---|---|---|
| Short Term (less than 12 months)<br>1. Improve law enforcement of the traffic law in Indonesia<br>2. Employ the existing minimum standard for cars and their equipment to be used as public transport mode more strictly, to make ensure safety and security<br>3. Organize collaborative workshops on safety and security in public transportation to identify the needs, specifications, and integration with all parties involved<br>4. Organize education and distribute information about safety and security in public transportation | 2006 | Ministry of Transport | Department of Health, Police, Department of Public Works, University, Research Center, Automotive Industry, NGO, Users, and Communities |
| Medium Term (2-3 years)<br>1. Collect standards, regulations, and law about public transportation safety and security<br>2. Evaluate standards and assess the need for safety and security in public transportation in Indonesia<br>3. Collect and evaluate standards, manuals, and regulations about safety and security in public transportation from abroad | 2007 | | |
| Long Term (4-5 years)<br>1. Develop minimum standard requirements for public transportation to ensure safety and security<br>2. Develop a guidance manual to measure safety and security for public transportation<br>3. Develop certification to evaluate safety and security for public transportation<br>4. Develop certification to operate the public transportation mode<br>5. Develop mechanisms to ensure the implementation of safety and security in the operation of public transportation | 2009 | | |

transportation, where there is no fixed place to access and egress, the role of user and driver is really significant for the safety aspects. The awareness of users coupled with suitable availability of police or security officers are the most important ways to overcome the security problems.

Based on the perception of the parties involved in paratransit, an improvement agenda has been developed. The improvement agenda consists of three aspects, namely technology, management, and institutions. This agenda has been clarified by a set of action plans, including the responsible parties involved and a time frame. The action plan could be treated as an implement of the available action draft for road safety. At least this suggestion can be used as a way to focus the operation and management of public transportation. The action draft was divided into three terms to define a clearer goal for each step. The short-term action focused on the hardware and on preparing further steps, while the medium-term action focused on developing and improving standards of safety and security. The long-term action was focused on advancing the safety and security practice. The effectiveness of this agenda and action plan rests upon a set of assumptions, such as seriousness on the part of the authoritative institution, unceasing information distribution, the availability of reasonable resources, and coordinated and collaborative action from all involved to reach the objective.

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