

RIDESHARING IN BANGKOK: SITUATION, OBSTACLES, AND OPPORTUNITY

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ABSTRACT

This paper presents the situation and obstacles of ridesharing in Bangkok with the proposed strategies to make these programs successful. In this paper, ridesharing in Bangkok for daily commuting were separated into three main pooling groups, i.e., 1) carpool, the shared use of a personal car by the driver and one or more passengers to commute together, 2) buspool/vanpool, the shared use of a bus or a van by a large group of working community in an organization, and 3) school bus, a share use of an organized bus or a van for students in a particular school. The data for each pool group were collected through several methodologies such as surveys, in-depth interviews, experiments, questionnaires, etc. from pooling participants, organizers, policy makers, government officials, and other relevant stakeholders. These data suggest that some policies would be developed to encourage more actual ridesharing programs. Lastly, the paper summarizes strategic plans to encourage sustainable ridesharing programs for each type of ridesharing programs in Bangkok.

KEYWORDS

Ridesharing, Carpool, Buspool, School Bus, Travel Demand Management, Transportation Policy.

INTRODUCTION

This paper reviews the situation of ridesharing programs in Bangkok, investigates their obstacles in implementation, and proposed the strategies to make these programs successful. Ridesharing is defined as the shared use of a vehicle by the driver and one or more passengers, usually for daily commuting. Ridesharing programs are done through encouraging commuters who simultaneously have the same trip origin-and-destination pairs, or share the same trip paths, to form a group and share the same vehicle for commuting. Today, ridesharing is considered to be one of popular programs to promote sustainable transportation in most urban areas around the world. Ridesharing programs would reduce travel costs and the need to build parking spaces, alleviate traffic congestion during peak hours, and save inefficient energy usage and reduce greenhouse gas emissions. However, the government needs to support the programs along with the recognition from the business organizations and local community.

Although there have been several ongoing ridesharing programs in Bangkok and some attempts to promote them, no research papers have reviewed current situations in a comprehensive manner. This study herein is thus putting the whole pictures together with some policy recommendations. In Bangkok, common ridesharing programs can be classified by their distinct characteristics into three categories, i.e., 1) carpool, the informal shared use of a personal car by the driver and one or more passengers to commute together, 2) buspool or vanpool, the formal shared use of a bus or a van by a large group of working community in an organization, and 3) school bus, a share use of an organized bus or a van for students in a particular school. Since the forms and travel behaviors of these three categories are different by its nature and regulation, the following discussions are separated into three main sections.

The remainder of the paper is organized as follows. Sections 2 to 4 describe the situations and obstacles of carpool, buspool or vanpool, and school bus in Bangkok, respectively. In each section, the reviews of current situations, research and analysis of data, and recommendations, are presented accordingly. Then, the fifth and final section contains concluding remarks as well as areas of further research.

CARPOOL

Review of Situations

Before 1990s, carpool has been little known by Bangkok residents and there was no evidence of formal promotions by government agents or large organizations in Thailand. However, the ads appeared shortly after the 1997 Asian Financial crisis started in Thailand with the financial collapse of the Thai baht caused by the decision of the Thai government to float the baht and reduction of government budget. During that period in 1997, the National Energy Policy Office (NEPO), Ministry of Energy, Thailand, issued a carpool campaign under the slogan “Carpool is a new Thai culture. Go the same way; use the same car to save energy” (National Energy Policy Office, 1999). This campaign was widely recognized and well-praised by several government agencies, private companies, and local community. The National Energy Policy Office reported that the percentage of Thai residents who understood the meaning of “carpool” had increased from 2% in 1997 to 12% in 1998.

With advertising popularity, many commuters were initially interested and joined the carpool activity. In 1998, NEPO initiated a 5-month carpool trial program in seven organizations with 4,070 employees. The initial survey results show that 414 employees, or about 10% of total employees, participated in the program. Then, the NEPO expanded the program to eight more organizations with 4,845 employees and found that 12% of them joined the program as well. Nevertheless, later in 2000, Thai economy has rebounded and NEPO had de-emphasized the campaigns and eventually stopped all ads. The campaign was returned in 2008-2009, when the gas prices were at peak. However, the later campaign did not implement on any specific organization. Therefore, there was no evidence of increase in carpool activities in Bangkok. In addition, the organizations that previously joined the carpool program in 1998-1999 had discontinued the program for several years ago.

During 2000-2010, carpool programs were initiated among some small organizations with limited success. For example, in 2003, Bodin Decha School, one of the biggest high schools in Bangkok with about 4,284 students and 279 school personnel, tried to campaign the carpool program among students and their parents by asking parents who have a car and pick up their children to school to pick up other students along the way to school. This school is large but located inside a small road, with approximately 1 kilometer from the main road with extensive public transportation. Therefore, this program will actually help students who come to school by public transportation on the main road to catch other student parents’ cars to get to school for free. However, this kind of carpooling did not reduce vehicle trips to school. In addition, it created traffic congestion on the exit of the small road and the travel expense was not shared among riders. Therefore, this school’s carpool program might not actually be a carpool program and few years later, the program was finally discontinued.

Without government and big organization support, people in Bangkok are less likely to match the trips among themselves and participate in carpool program. However, Friend in Car (<http://www.Friendsincar.com>), a private-owned website, was created in 2007 for ride matching among Bangkok residents. This website facilitates carpool participants who are interested to match their trips. The website allows registration and trip data exchanges among web users without any service fee. To ease in ride matching, the website has subtopics for each Bangkok zone. If a user wants to offer or join a ride to a particular place, the person will create a title in the respective subtopic and others who are interested will post comments and exchange their information for trip appointment. From the observations in 2008-2009, the website had 2,000-5,000 viewers per month with 100-200 titles created to find a ride. However, less than ten titles had responders and no evidences that this website brought any real carpool activities at all. Lastly, in early 2010, the website was terminated.

Carpool Experiment at the Bangkok Government Complex

To understand how Bangkok residents thought about carpool campaigns and how to create a successful and sustainable carpool campaigns. In 2008, the research team did a carpool experiment at the new Bangkok Government Complex (the Complex) by creating a carpool program for two government organizations inside. The Complex is located in suburb Bangkok area at the size of 0.6 sq.km. The construction of the Complex was started since late 2005 and not yet fully completed in 2010. However, some government departments have relocated to the Complex since August 2008. Since most government officials who relocated to the Complex have been living near their old offices in central Bangkok, it is difficult for them to use public transportation to the Complex since it could take more than 90 -120 minutes during the peak hours with multiple connections. Also, the area has insufficient and unreliable public transportation to serve commuters. Therefore, this site is an ideal location to implement a carpool campaign when the officials were recently relocated.

On October 2008, the Community Development Department and the Office of the Consumer Protection Board are two organizations who experienced the program. These two offices have approximately 600 personnel combined. Initially, the research team contacted the representatives from these two government offices and asked their permission to experiment the carpool program. Then, the research team distributed the ads with carpool plan to all officers and asked whether they are interested to join the program. If they are interested, the research team will group the participants based on their travel paths.

First, 292 out of 600 carpool questionnaires were returned from these government officers. It was shown that only 130 officers (22% of total officers) commute to the Complex by car. Most of the rest took public transportation such as bus, taxi, ferry, etc. The average travel time from their home to the Complex is more than 60 minutes since most of them have their family in the central Bangkok and have no plan to relocate to the Complex area. The survey also asked them regarding the interest to join the carpool program and about 213 persons (or 70% of them) were interested. The remainder was not interested since they live close to the Complex and might be more flexible to use public transportation.

Regarding the 213 officers who were interested in joining the program, only 24 officers owned a car and were willing to drive their car and pick up others. Since the demand to be carpool passengers outweighed the number of carpool drivers. Therefore, each driver was asked for his/her driving route to work. Each route was matched with carpool passengers who live along the way from the same department if available. With this process, only 30 people were set into 12 groups for this carpool experiment.

To evaluate the program's sustainability, two months later, the depth interviews were conducted for all of the participants. It was found that only nine of them are still sharing their cars. The interview results show that most participants view that the program can save their travel costs and create departmental interpersonal relationships. However, the sustainability of the program is based purely on the mutual benefits of both driver and carpool passengers. If they reach an agreement regarding how to share the travel costs, how long to wait at the meeting points, and how to behave well inside a car, etc, they would likely use carpool for a long period. Unfortunately, some officials are unpunctual because of their different work duty and/or family matters. With few participants, the department leaders still feel that the program might not really benefit the organizations; therefore, they could not officially support the program by rewarding the carpool participants or allocating some carpool parking spaces.

Summary and Recommendation

In summary, although carpool has been introduced in Bangkok for more than a decade, the concept is very new to most Thai people. Most of them might not well understand that they might need to forgo some privacy to join the program. In addition, the carpool campaigns issued by government or other organizations are very few and sporadic. The campaigns seem to follow economic or energy crises. Therefore, the actual carpool activities in Bangkok only happen naturally due to personal relationship rather than organized carpool campaign.

To increase carpool participants, several policies would be implemented. The leaders of large organizations would support carpool programs officially and financially. They might reward the participants by reserved or free parking spaces. In addition, it is proposed that each organization should set a permanent carpool coordinator for ride matching. The coordinator would register all carpool participants for references, mediate the share of travel costs, and settle the problems among participants. The government might induce more carpool participants through designating an HOV lane on freeways during peak hours or reducing expressway toll charges for an HOV. Most importantly, the carpool campaigns should be permanent regardless the state of economy or energy prices.

BUSPOOL/VANPOOL

Review of Situations

Bangkok is one of the world's most crowded cities with insufficient public transportation system. The current reliable mass transit system is limited and does not cover an area outside the central business district. The only extensive public transportation mode in Bangkok is the public bus. However, the current bus system is very slow and inefficient since buses must stop at every stop sign and passengers might need to transit several times to reach their destinations. This brought the idea of buspool (or vanpool) for large business organizations. Buspool is a service organized by large agencies for their employees to facilitate commuting between the

workplace and their living places. This service is a great way to save time and hassle as it ensures a timely arrival of employees resulting in better productivity.

According to Rudjanakanoknad, *et al.* (2009), buspool system has been developed in Thailand for more than 30 years although there has been no Thai law forcing the organizations to provide transportation services for their employees. The organizations with buspool services in Bangkok are usually located in suburb Bangkok. These organizations were mostly state-enterprise organizations or big public companies originally located in the central Bangkok and then moved to suburb due to expansion. Therefore, the employees (or their unions) at these organizations forced their managers to provide buspool services for them. However, each organization has developed their own system resulting in different service characteristics.

Survey of Buspool Operations

To understand the characteristics of buspool services in Thailand's large organizations, the research team selected ten organizations with buspool services for in-depth study. The research was done through observations and interviews of key personnel as well as buspool users in the government office, state-enterprise, as well as independent organizations during late 2008. Table 1 below shows the list of ten surveyed organizations with buspool and/or vanpool services for their employees

Table 1 List of surveyed organizations with buspool and vanpool

No.	Organization	Type	# Employees @ hq	# Buses	# Vans
1	Water Supply Authority	State Enterprise	2,000	6	-
2	CAT Telecom	State Enterprise	2,900	16	2
3	National Housing Authority	State Enterprise	2,500	4	-
4	Thailand Tobacco Monopoly	State Enterprise	7,000	24	-
5	PTT, Co., Ltd.	Public Company	3,000	12	3
6	TOT Public Company	State Enterprise	7,000	22	-
7	NSTDA	Independent Agency	2,000	15	-
8	Directorate of Transportation, RTAF	Government	9,500	20	-
9	Metropolitan Electricity Authority	State Enterprise	8,800	26	36
10	Port Authority of Thailand	State Enterprise	2,500	16	16

The survey shows that each organization has different buspool management. Before the organization set the number of buses, the organization did their internal surveys to estimate the demand of passengers, routes, and destination locations. Besides the demand side, each organization estimated its own budget to calculate the number of vehicles it would need. Then, it would either hire bus/van operators through e-auctions or buy its vehicles. However, most organizations decided to hire the operators for a few years since the operators are more proficient in training drivers and managing vehicle fleet resulting in better cost saving and quality control for the organizations.

The number of buses and vans in Table 1 are varied among each organization. To compare among organizations, the ratios of the number of total employees to the number of employees using the service are used. These numbers were ranged between 3 and 9. Unsurprisingly, the organizations with high profitability had lower ratios, meaning that they tried to serve more employees with more vehicles and routes. The interviews show that buspool services of most organizations in Table 1 are not free. The employees are currently paying approximately 25-30% of actual costs and the organizations subsidize the rest. This would ensure that most vehicles were operated at almost-full capacity.

Regarding the service, buspool passengers from some organizations reported that drivers do not behave well and the vehicles' conditions are generally old. This problem is lesser for some organizations with clearly prescribed contract and regular monitoring by the organization's coordinator. Even with poor service, most buses and vans in all organizations are nearly full on every working day. This implies that the service is highly popular and can serve the demand well.

For the organizations' coordinators, they report that buspool/vanpool costs high budget since the vehicles used for this service could not be used for other purposes during the day. Some organizations are interested in having more vans instead of buses since vans are more flexible to use for work during the day and better serve dispersed demand. However, most buspool management among organizations is similar since the organizations

are mostly state-enterprise, which must rely on government policy and labor union. The differences among their quality of service are due to organization size and their profitability.

Summary and Recommendation

In summary, Bangkok’s buspool services are mainly found in state-enterprise organizations or large public companies located in suburb Bangkok. Buspool management for each organization could be different depending on the organizations’ size and profitability. However, the buspool initiation among the organizations is mostly due to the request from labor union negotiation. There is no government policy or law regarding buspool services for large organizations in Thailand.

From the survey and observations of buspool operations, it is recommended that a new law or some financial subsidization from the government may be needed for large organizations in an area with insufficient public transportation to encourage them to provide some transportation services for their employees. The buspool initiation could be done by surveying the employees regarding the demand and routes and later hire operators. For the service fare, it is unnecessary that the organization needs to subsidize the whole cost since it may be unfair for some employees who could not use the service.

SCHOOL BUS

Review of Situations

School bus is one of the ridesharing modes for commuting to schools by children. School bus, if successfully implemented, would reduce peak-hour automobile travels by parents and alleviate congested public transportation system while increasing student’s travel safety. According to Road Safety Center (2008), although school bus system has been introduced in Bangkok, Thailand for more than 30 years, the popularity among Thai students and their parents is limited and the school bus’ supportive programs by several agencies are considered to be unsuccessful. The Department of Land Transport (Not specified Year) had determined the preliminary problems of school bus’ low usage in Thailand. Examples of some of these problems are: expensive school charges due to high standard of legal operating vehicles, risk awareness from students’ parents towards school bus drivers and vehicles used, and students’ inconvenience in waiting for school bus schedule either at their home or at school. With these obstacles, from time to time, the Department of Land Transport, the Ministry of Education, and Bangkok Metropolitan Authority issue campaigns to reward schools with good school bus service.

In Thailand, school bus can be grouped into two categories based on their vehicle type, i.e., a minibus or a van. Each type is enforced by different Thai law (Land Transport Act of 1979 and Vehicle Act of 1979) based on its size; however, there is no regulation to enforce that every school must provide school bus to facilitate students. Currently, a van is more popular to be used as a school bus than a minibus since it is smaller and easier to maneuver in Bangkok congested traffic. Also, most residential areas in Bangkok are located on long and narrow streets with substandard turning radii where a minibus is inaccessible. Most importantly, the cost of using a school bus van per student is lesser. Both laws have slightly different requirements as shown in Table 2 below.

Table 2 Summary of School Bus Legal Requirements in Thailand

Characteristic	Land Transport Act of 1979	Vehicle Act of 1979.
Seating	12 people or more	8-11 people
Exterior Color	Yellow background with black strips	Not specified
Label	“school bus”	“school bus”
Sign Dimension	35 × 85 cm.	25 × 60 cm.
Text Height	25 cm.	15 cm.
Tools	Extinguisher	Extinguisher
	Break glass hammer	Break glass hammer
	Iron crow bar	

Numerous research publications in Thailand are concerned about school bus; however, most researches focus on the safety aspects only. The examples are Karuhadech, *et al.* (2004) and Kanitpong (2007), etc. There exist some studies which focus on the parents’ decision regarding school bus. For example, Manomaipibul (2003) investigates the factors of school trips that could result in students’ traffic accidents. It reveals that students’ mode of travels, travel times, and grade significantly relate to student safety. However, students who use school

buses generally experience fewer accidents than other travel modes even with substandard school bus vehicles. It claims that if school buses are improved, 40 percent of students' parents would likely opt for the service. In another study, Chintapitak (2009) analyzes the travel behaviors of students in Chiang-Mai Municipal Area (Northern Thailand). Their study covers school trips surveys from 357 high school students. The survey was analyzed by Chi-Square method at the level of significance of 0.01. It reports the main student characteristics that result in their mode selection. Among them are student gender and age, parents' occupations and education, household size, income and expenditure, location, number of workers, licensed drivers, and auto-ownership relates choice decision. This study does not explicitly describe what causes parents to choose school bus service. Also, the study area is in Chiang-Mai, where the traffic as well as the sociocultural condition are different from Bangkok, Thailand's Capital and one of the world's most congested cities.

Survey of Elementary Schools in Bangkok

To understand the problems of managing school buses in Bangkok and what influences parents to allow their children to use school bus for commuting from/to their schools, the research team conducted interviews of key managing teachers and distributed survey questionnaires to Grade-4 (Age 10-11) students' parents (or guardians) at selected schools in Chatuchak District, one of the business districts of Bangkok. Chatuchak has several schools, as well as, large companies, shopping and commercial areas. It is one of the most congested areas in Bangkok. The area enjoys a variety of public transportation options such as buses, vans, taxis, and two main heavy rail transits.

Many elementary (Grade 1-6) schools in Chatuchak District operate school bus services. The schools either own buses themselves or hire contractors to operate under the school's supervision. The schools that allowed the research team to collect complete data during late 2009 are Prachaniwet School, Tubtong School, Yaemsaard School, Chindanukul School, and Darathorn School. These schools own and operate school buses themselves. Only Prachaniwet School is a public school while the rest are private.

Regarding profitability of school bus operations, all schools reported that school bus operations are unprofitable or nearly break-even. The school bus fares charged to student parents are usually calculated by a fixed cost plus a variable cost (based on distance from school to students' pick-up/drop-off locations). Generally, the collected fares can cover barely daily operating costs (labor and fuel costs). The maximum chargeable fares are regulated by the authority; however, schools have to purchase vehicles by their capitals. (Prachaniwet, the only public school in this study, receives government support on school buses purchases.) Being unprofitable, schools continue operating the service as part of the student support program to campaign rideshares and reduce traffic congestion at their gates. Due to government control on fares, the effects from school bus charge in each school can not be distinguished.

Table 3 shows the number of students using school bus and total students in each school. It shows that Yaemsaard, Tubtong, and Chindanukul have high school bus usage levels of 45.0%, 44.5% and 40.0%, respectively. This is followed by Darathorn (22.1%). Prachaniwet has the lowest usage level of 7.7%. The average of school bus use is 20.1% of all students.

Table 3 School Bus Profile and Questionnaires

School	School bus type	No. of buses	# students using school bus	Total students	% School bus usage	#Questionnaires (Returned/Distributed)
Prachaniwet	Minibus	6	132	1,718	7.7%	103/160
Tubtong	Van	7	144	323	44.5%	67/99
Yaemsaard	Van	11	180	400	45.0%	101/150
Chindanukul	Van	5	68	170	40.0%	89/130
Darathorn	Van	1	19	86	22.1%	59/80

These schools authorized the research team to distribute questionnaires to their students' parents. 619 questionnaires were distributed and 419 of them were returned (represented 68% of the total population) as shown in Table 2. The students of interest in this study are fourth grade students (Grade 4) only. They are approximately at the ages of 10. At this young age in Bangkok, they cannot take public transportation by themselves. They generally walk (in case that their houses are in close proximity to school), are picked-up/dropped-off by their parents through private autos/taxis, or use school bus. Note that bikes are not popular among children in urban Bangkok area due to safety concerns since inner Bangkok has no sufficiently safe bike paths for daily commuting.

The questions in the survey include three main categories: general household data, student's travel mode to and from school, and factors affecting their decision whether to opt school bus service for their children. The analysis of the data based on these questionnaires is shown here.

Parents' Profile

The parents' profile, their occupations and highest level of education, showed a noticeable effect in the decision to allow their child to use school bus or not. The data show that parents who are business owners and employees use school bus the most (38% and 35%, respectively). This might be due to the punctuality and strictness of their working hours. Also, this group has the highest income among all to pay for service charge. This is followed by independent workers and government officers (26% and 25%, respectively). These two occupations have less strictness of their working hours. Independent retailers use school bus less (14%) since the opening hours of most retailers are late in the afternoon. In addition, the data point that parents with Bachelor's degree or higher generally use school bus (significantly higher than average). These parents commonly have busy working schedule, have more income to pay for the service, or are confident in the school service.

Comments from Parents

To understand how parents decide whether to choose school bus, the questionnaires are separated into two groups of parents: the ones who use school bus and the ones who do not.

The parents using school bus were asked to rank the top-three characteristics of school bus operations that affect their decision. The results show that top school bus characteristics that affect parents' decision in most school are driver's skill and manner, and closely followed by the vehicle standard. These two characteristics reflect parents' strong attitudes towards their child safety. Teacher's close monitoring is also important. However, teachers have limited control over safe school bus operations as drivers and vehicles. Punctuality, fare pricing, and drop-off/pick-up location seem to matter the least.

The parents who drop-off/pick-up students themselves were asked to answer why they are not currently using the school bus. The data reveal that the reasons can be grouped into three categories by their importance. First, students living close to their schools are less likely to use school bus and parents might feel convenient to pick-up/drop-off students themselves. Next, Thai parents (as well as most Asian countries) feel responsible, attentive, and protective to their children. Lesser important reasons are fear of traffic accidents, high school bus fares, and no school bus route offered. The data also showed that child's unpunctuality, child's preference, and inconvenient school bus schedule are unimportant to their decision since children have enough free time to wait for possibly inconvenient school bus schedule.

Following from the above questions, the parents were also asked what the school should improve in the school bus service such that they are likely to choose the service for their students. The results show that parents are more likely to choose school bus if the school bus fare is cheaper and/or school bus condition is better. The exception is Yaensaard School, which its vans are in very good condition. Safer driver is a bit less concerned. This reflects their school bus drivers are already well-trained and do not require close or strict control by teachers. Schedule adjustment seems to receive the least attention.

Summary and Recommendation

Although school bus system has been found in Bangkok for several decades, it has little attention for most parents due to poor vehicle condition, expensive fare, short school trip distance and Thai-cultural parental care. Currently, there is no law forcing schools to provide school bus system for their students in Thailand; however, two laws provide school bus specifications and safety guidelines. The cost of operating school bus is expensive due to strict regulation and the maximum school bus fare is mandated by the authority such that most school bus operations are unprofitable or nearly break-even. Even so, most schools continue operating the service as part of the student support program to campaign rideshares and reduce traffic congestion at their school gates. With insufficient funding, school bus quality is mediocre and the parents then choose to pick up children by themselves.

To increase school bus ridership, it is important that the government would take a serious look to support school bus system. The current government campaigns regarding school bus are inefficient and temporary. The government would provide a long-term fund for school or partially subsidize schools to purchase or hire school

buses for their students. This would assist schools in offering lower school bus charges and/or improving their school bus condition to finally increase the school bus ridership.

CONCLUDING REMARKS

In conclusion, data from these three aforementioned groups describe the existing ridesharing situations and obstacles in Bangkok. They suggest that policy changes and additional supports are needed from government, business organizations, and local community to encourage more actual ridesharing programs. Most importantly, the government would spend a larger amount of budgets to educate Bangkok commuters and seriously support ridesharing programs. The support (especially for carpool campaign) would be permanent independent of economic or energy crises since ridesharing programs will take time to change Bangkok commuters' travel behaviour. In addition, the government would seek a way to force or subsidize large organizations or to provide transportation services for their employers or their students, e.g., provide some loan, issue tax incentives, for schools and large organizations schools in an urban area. In fact, the costs associated with ridesharing programs would create much greater traffic congestion relief benefit than the costs of building urban transportation infrastructure.

This research paper is a starting point to explore Bangkok ridesharing situations. Future research is needed in several aspects to make the study regarding ridesharing in Bangkok more complete. For carpool, the official programs with organization support might be implemented to see if this will bring sustainable participants. Also, the research would investigate into all benefits and costs of carpool campaigns and buspool services. Such benefits would not only include travel time and cost savings to participants, but also the organization' benefits due to increase in employees' working efficiency as well as other social and environmental benefits. This might result in concrete evidence whether the government and organizations would subsidize the program permanently. For school bus, more data are needed from more schools in other Bangkok areas, such as Central Business District (CBD), suburb Bangkok, etc. In addition, this research included only elementary schools' teachers and parents with children at the age of 10-11. Other children with different ages could possibly yield different parents' decision criteria. Lastly, school bus regulations and management at each school should thoroughly be studied to determine school bus improvement alternatives as well as their benefits and costs to both providers and users.

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