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Title: The Influence of Push and Pull Strategies on a Modal Shift
from Private Vehicle Use to Trans Jogja
in Yogyakarta, Indonesia

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**The Influence of Push and Pull Strategies
on a Modal Shift from Private Vehicle Use to
Trans Jogja in Yogyakarta, Indonesia**

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Summary

Being aware of the urban transportation problems in Yogyakarta, and wanting to minimize their negative impact, the government of Yogyakarta Special Region (the equivalent of provincial government) has introduced several transportation programs, and Trans Jogja is one of the programs for providing urban public transport in Yogyakarta. However, the existence of Trans Jogja has still not managed to make it the alternative main transportation option for people in Yogyakarta. Private vehicle use in Yogyakarta still increased during the period (2008-2016), showing that dependency on private vehicles in Yogyakarta is still high.

Using the concept of Transport Demand Management (TDM) with the implementation of push and pull strategies, the main objective of this research is to explain how push and pull strategies influence a modal shift from private vehicle use to public transportation (Trans Jogja) in Yogyakarta, Indonesia. To support the research objective, the main research question of this study is *“How do push and pull strategies influence a modal shift from private vehicle use to public transportation in the case of Trans Jogja in Yogyakarta, Indonesia?”*

This research used survey (questionnaire), interview, and secondary data as research instruments. The questionnaire in the survey was used to gather primary information of actual behavior of commuters in making a modal choice that could be influenced by TDM policy (implementation of push and pull strategies); and what respondents preferably need to do to make a modal shift from private vehicles to public transportation. The interviews were conducted to gather in-depth information from the government as policy-maker, policy-developer, and operator of Trans Jogja. Last, secondary data were used to support the explanation about push and pull strategies as TDM policy implementation in Yogyakarta, and its relationship with a modal shift from private vehicle to public transport.

Based on the findings of this research, current Trans Jogja users do not use Trans Jogja for all their trip purposes. Some only use Trans Jogja for certain trip purposes, and most of those are trip purposes with a high degree of flexibility. Moreover, the findings in the field survey reveals that quality of service is more important than travel costs in getting them to make a modal shift. Respondents would still use their private vehicles even if they could travel free of charge, if this is not in combination with the provision of a good service. The quality of Trans Jogja's services need to be improved, especially with regard to waiting environment; reducing waiting time; reducing the number of public transport interchanges; providing adequate operational hours and affordable ticket fare; and also ensuring safety of passengers when using Trans Jogja to attract more people to use Trans Jogja based on the data analysis.

Three transportation policies were implemented as push strategies in Yogyakarta, namely parking management, restricted road policy, and taxation on cars and fuel. Nonetheless, those three implemented transportation policies currently have given less influence to respondents in making modal shift from private vehicle use to Trans Jogja. Finding of this research shows that the implemented policies were still supply-oriented rather than demand-management, so that the policies implemented give less pressure and still give comfort for commuters to use private vehicles.

Therefore, the development of transportation policies should be demand-driven management and give more pressure to private vehicle users. The supply-oriented transportation policies need to be diminished in order to give less comfort for private vehicle users. Apart from improving the quality of Trans Jogja's service, promoting public transportation is also important in order to attract more people to use Trans Jogja.

Keywords

modal shift; Trans Jogja; transport demand management; pull strategy; push strategy

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Foreword

For Ibu, Meta Grizanda Meizy Rosadi, the very first person who always support every impossible dream I have, and believe that I can do it, I can get it. The other half of me, who always giving the infinite love without expecting a reply. The strongest and the warmest woman I know.

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... I Miss You ...

Abbreviations

BO	Bus operator
BR	Bus regulator
BRT	Bus Rapid Transit
Chl	Challenge
DIY	Daerah Istimewa Yogyakarta
DPPKA	Dinas Pendapatan Pengelolaan Keuangan dan Aset
Finc	Financing
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
IHS	Institute for Housing and Urban Development
Int.Pol	Integration policy
MoU	Memorandum of Understanding
OB	Operational buses
Pol.Dev	Policy development
Pr.Prc	Parking pricing
Pr.Pol	Parking policy
PT-JTT	PT-Jogja Tugu Trans
PT-AMI	PT-Anindya Mitra International
PUSTRAL	Pusat Studi Transportasi dan Angkutan Logistik
RPJMD	Rencana Pembangunan Jangka Menengah Daerah
SO	Standard Operational
SPSS	Statistical Package for the Social Sciences
SUTIP	Sustainable Urban Transport Improvement Project
TDM	Transport Demand Management
Thr	Threat
Tr.Dev	Transportation development
UGM	Universitas Gadjah Mada
UPTD	Unit Pelaksana Teknis Daerah
Veh.Tax	Vehicle tax

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Chapter 1: Introduction

1.1 Background

Road-based land transport systems are increasingly regarded as unsustainable. A number of urban problems are emerging because of them, such as congestion, noise, accidents, local air pollution, and emissions of greenhouse gases. These problems could also have a negative impact not only on the urban environment, but also on social and economic conditions in urban areas (Nykvist and Whitmarsh, 2008).

Sustainable transportation, as part of the sustainable mobility paradigm, is one of the concepts introduced to overcome the 'unsustainability' of road-based transport systems, especially in urban areas. Banister (2008) emphasized that the sustainable mobility concept is expected to encourage a high level of innovative services, giving priority to public transport, and creating urban forms that are walkable and non-motorized transport-friendly, so the need to use cars (as well as motorcycles) can be minimized. One of the challenges that has to be dealt with in pursuing the goal of sustainable mobility is our dependence on automobiles (cars) (Doi and Kii, 2012).

Three strategies have been developed and implemented globally as a framework, under the name “avoid-shift-improve”, for sustainable urban transport to cope with urban transport problems (Dalkmann and Brannigan, 2007, Wright, 2012).

1. Avoid refers to minimizing unnecessary trips and encouraging substitution of (much-needed) physical movement with “at home” activities;
2. Shift refers to shifting the need of physical travel by using more environmental friendly modes;
3. Improve refers to improving technology as well as the energy efficiency and operational efficiency of transport modes.

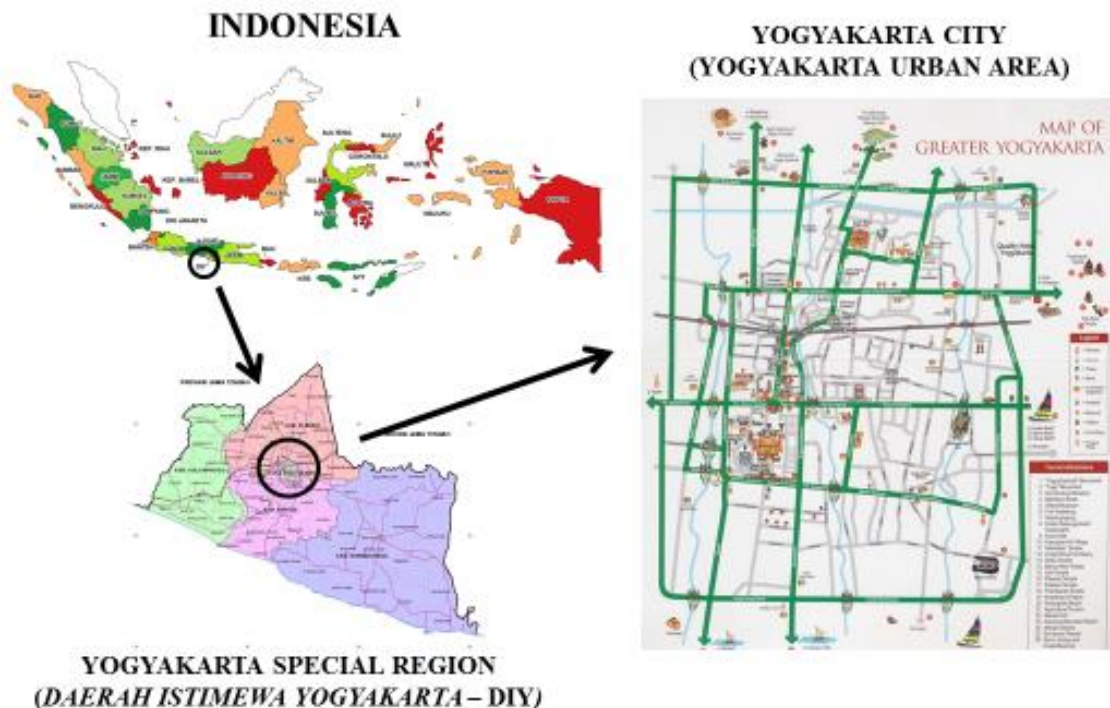
As part of the “shift” strategy, several transport policy measures exist that are expected to be able to reduce the level of car use. These transport policy measures include the promotion of walking and cycling, the development of a new transport hierarchy, slowing down urban traffic, reallocating space to public transport, parking control, road pricing, and making it easier to use public transport (Banister, 2008).

However, implementing the sustainable transportation concept in Asian developing countries is an enormous challenge. This is in keeping with the statement that in most Asian developing countries, people find it more convenient to use cars and/or motorcycles than other travel modes (Satiennam, Jaensirisak, et al., 2015).

Yogyakarta is one of the cities in Indonesia in which people find it more convenient to use private vehicles (cars and motorcycles) as their daily transport mode. This state of affairs leads to people having high levels of car dependency. From 2005 to 2013, the number of private vehicle ownership (especially cars and motorcycles) in Yogyakarta increased drastically by over 100% as shown by the graph in Figure 2. Obviously this has also had negative impacts on urban life, such as bad air quality, congestion, noise and vibration, accidents, lack of economic

efficiency, global climate change, severance, visual intrusion, waste disposal, and loss of living space (Wright, 2012).

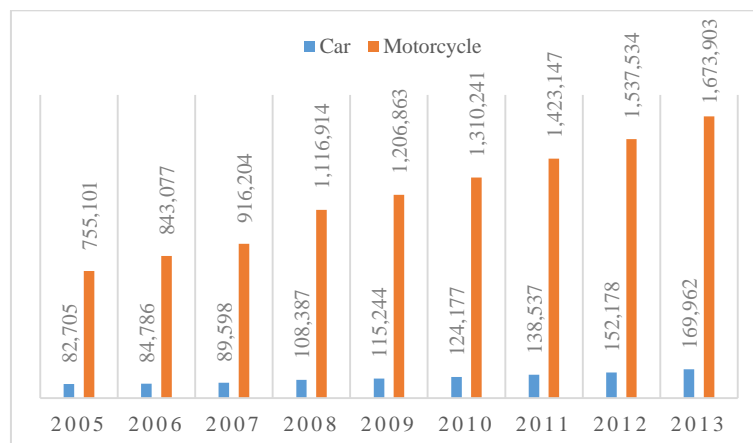
Figure 1 Area of Study: Yogyakarta, Indonesia



Source: (Ministry of Education and Culture, 2015, DPPKA-DIY, 2015, Yogyakarta City Government, 2015)

Being aware of the urban transportation problems in Yogyakarta, and wanting to minimize their negative impact, the government of Yogyakarta Special Region (the equivalent of provincial government), has introduced several transportation programs. Those programs are implementing zone-based urban traffic management, improving the public transport service, introducing an integrated parking system, and an integrated transport-mode system (Yogyakarta Governor Regulation No. 26 of 2014 on Regional Development Work Plan 2015, 2015).

Figure 2 Number of Cars and Motorcycles in Yogyakarta Special Region (2005-2013)



Source: (Central Bureau of Statistics, 2014)

One of the government's transportation policy programs, improving the public transport service, was implemented by adapting the Bus Rapid Transit (BRT) system as the public transport system in Yogyakarta urban area under the name of Trans Jogja. Trans Jogja was also supported by the Ministry of Transportation of Indonesia. Trans Jogja began operating in March 2008, with six networks of routes and 54 buses. Two new routes were added in 2010, and 20 extra buses in 2014.

Trans Jogja is a program for providing urban public transport and is under the responsibility of the Department of Transportation of Yogyakarta Special Region. The regulatory system of Trans Jogja is governed by the Regional Technical Implementation Unit (Unit Pelaksana Teknis Daerah – UPTD) Trans Jogja. Meanwhile, the actual operation of Trans Jogja is in the hands of PT-Jogja Tugu Trans (PT-JTT) which is a consortium of several cooperatives. PT-JTT is a single operator of all Trans Jogja bus lines (Department of Transportation Communication and Informatic, 2014)

1.2 Problem Definition

By adapting the BRT system, Trans Jogja now provides a public transport service that is more convenient for passengers, including such elements as bus shelters; bus units with air conditioning; electronic payment, and scheduled bus travel times. Thus, the implementation of Trans Jogja is expected to attract more people to use public transport.

However, even though the standard of service has improved, the existence of Trans Jogja has still not managed to make it the alternative main transportation option for people in Yogyakarta. Private vehicle use in Yogyakarta still increased during the period (2008-2016), showing that dependency on private vehicles in Yogyakarta is still high.

Initially, the emergence of Trans Jogja as a public form of transportation with new service packaging attracted public attention. Nonetheless, people prefer to continue using private vehicles. They feel that the waiting times as well as the travel times of Trans Jogja are much longer than when using private vehicles. They also assume that the route networks covered by Trans Jogja are less extensive, leaving many areas without a service. Moreover, people feel that using private vehicles (especially a motorcycle) is still cheaper than using Trans Jogja. Thus, they assume that private vehicles are more flexible, efficient, and effective for them than public transportation (Pohan, M. R., 2008, Mega, M., 2011, Mulyono, S., 2015, Fadhillah, I., 2015).

Furthermore, several external factors also exist that make Trans Jogja less attractive for people in Yogyakarta. First, many people in Yogyakarta think that, as long as they are able to buy their own private vehicle, they will use it and prefer not to use public transportation. Furthermore, taxation on private vehicles is still not used as an instrument to minimize car-ownership, so people have the ease of owning their own private vehicle. Moreover, failing to implement an integrated transportation system makes it quite difficult for public transport users in Yogyakarta if they need to transfer or change modes (Alul, 2015). Lastly, the availability and easy access of on-road parking in Yogyakarta City – provided by the municipality for both cars and motorcycles – gives people more comfort and convenience when using private vehicles (Nicolas, 2013).

If the government allows the use of private vehicles to increase and does not promote public transportation as the main choice of transportation mode in Yogyakarta, the emergence of urban transportation problems such as congestion, noise, accidents, local air pollution, and emissions of greenhouse-gases (Nykqvist and Whitmarsh, 2008) is inevitable. Policies need to be developed to manage these negative impacts (Garling and Schuitema, 2007). This state of affairs will therefore lead urban policy-makers to implement transport demand management (TDM) policies (Habibian and Kermanshah, 2011).

Generally speaking, transportation demand management (TDM) can be defined as activities or an approach to reduce vehicle trips, the object of which is to realize the use of a more efficient and sustainable mode of transportation (Dorsey, 2005). One method of the TDM approach is by conducting ‘push’ and ‘pull’ strategies. Perschon (2012) defined how the purpose of the concept of “push and pull” measures is to conduct sustainable transport strategies, in which ‘push’ measures aim at decreasing the use of private vehicles, while the objective of ‘pull’ measures is to make modes of (public) transport more attractive.

Based on the above-mentioned problems, it is argued that Trans Jogja is one of the ‘pull’ strategies of a transport demand management (TDM) measure, which is, however, less balanced with ‘push’ strategies, so it is still having little effect on making a modal shift among private vehicle users to use public transportation. In line with the statement that ‘when only “pull” measures are implemented, the possibility of making a modal shift of transportation is limited, similarly, when only “push” measures are implemented, people may react negatively towards the policy-makers’ (Boaddus, Litman, et al., 2009). Therefore, to pursue the objective of sustainable urban transportation, it is important to consider making policies by combining both push and pull measures, and developing it as a comprehensive TDM (Boaddus, Litman, et al., 2009, Institute for Transportation and Development Policy, 2013).

1.3 Research Objective

Using the concept of Transport Demand Management (TDM) with the implementation of push and pull strategies, push strategies are defined as policies and physical measures implemented by the government to make private vehicle use unattractive. In addition, pull strategy in this research is specified as the service operation quality of Trans Jogja, the objective of which is to attract more people to use public transportation.

Based on the above-described assumption, the main objective of this research is: **To explain how push and pull strategies influence a modal shift from private vehicle use to public transportation in Yogyakarta, Indonesia.**

By explaining the influence of push and pull strategies on modal shifts, it is expected that comprehensive push and pull strategies could be developed to reduce the extent of car use in order to achieve more sustainable urban transportation, specifically for the road-based transportation system in Yogyakarta. Moreover, it would minimize urban transportation problems such as congestion, noise, local air pollution, and emission of greenhouse-gases.

1.4 Proposed Research Question

The proposed research question of this research is:

“How do push and pull strategies influence the modal shift from private vehicle use to public transportation, in the case of Trans Jogja in Yogyakarta, Indonesia?”

With the following sub-questions:

1. To what extent do push and pull strategies affect private vehicle users to choose public transportation instead of private vehicle (private car and motorcycle)?
2. How do push strategies make private vehicle use unattractive?
3. To what extent do the indicators of pull strategies influence modal shift of private vehicle users to public transportation?
4. To what extent do commuter characteristics affect the decision of commuters to do modal shift?

1.5 Significance of the Study

Using more sustainable transportation will have a positive impact on the environment, especially by reducing the negative impact of e.g. congestion, noise, traffic, and air pollution. The main objective of this research is to explain how the implementation of push and pull strategies will influence a modal shift from private vehicle use to public transportation. In relation to policy contributions, this research aims to explain that a combination of transportation policies – through push and pull strategies – need to be implemented comprehensively in order to achieve effective results. In this research, push strategies refer to policies and/or physical measures that will make private vehicle use unattractive, thus reducing the extent of private vehicle use. Pull strategies refer to transportation policies which will attract commuters to use public transportation. This study focuses on Trans Jogja, a provider of public transportation facilitated by the government in Yogyakarta. It operates by providing a good quality public transportation service as well as promoting the use of public transportation. Comprehensively implementing transportation policies through push and pull strategies is expected to minimize urban transportation problems (congestion, noise, local air pollution, and emission of greenhouse gases) and could realize more sustainable urban transportation, especially for road-based transportation systems.

This research is also expected to make a contribution towards academic and empirical studies on the analysis of Transportation Demand Management (TDM). Some academic studies have discussed travel behavior as well as commuter choices regarding public transportation. However to date little research has been done involving in-depth studies on push and pull strategies as a form of TDM implementation, specifically in Yogyakarta. This research aims to explain how push and pull strategies influence commuters to make a modal shift. Therefore, this research is expected to provide information about the relationship between push–pull strategies and a modal shift of commuters based on scientific theory and concepts. Thus, this research should provide relevant information for studies in the same field or further studies about push and pull strategies as well as about TDM concept implementation.

1.6 Scope and Limitations of the Study

There are some limitations in conducting this research. Firstly, this research only takes Trans Jogja as a research object and does not conduct in-depth study into other transportation modes such as taxis, intermediate public transport, and non-motorized transport. This is because Trans Jogja is regarded as a sustainable transportation mode as it can transport a maximum of 40 people in one unit. Therefore, as a mode of transportation it could have a significant impact on modal shift, one that could reduce the extent of private vehicle use on roads. Secondly, even though another regular bus service operates in Yogyakarta, nonetheless it is privately owned and the government has limited involvement in terms of service procurement. For this reason, it too was excluded as a research subject. Trans Jogja, on the other hand, is operated by a third party, while the buses are owned by the government and the system is also fully regulated by the government. Thus the government has full control over the quality of service operations and its combination with other transportation policy, which is the main object of this research. Lastly, because of the time limitation, a deeper explanation of the relationship between Trans Jogja and other transportation modes would not be possible in this research even though it could be a strong relationship capable of achieving a sustainable transportation system in an urban area. This could be further analyzed and investigated in a separate study.

In addition, other challenges in this research include the subjectivity of researcher, especially in choosing samples for the research, data collection, and data interpretation. Therefore, in the process of data collection, the researcher tried to define the indicators and data needed as specifically as possible with clear research instruments. In addition, the researcher determined the criteria for respondents as clearly as possible in order to avoid selection bias towards respondents as far as possible during the data collection and information process. Furthermore, selection bias in choosing respondents occurred especially in conducting the field survey, so the researcher tried to be adaptive and flexible, while still remaining on track in collecting data and related information relevant to the research objective.

Another aspect of the research time is that the researcher had limited time for the data collection process and had to conduct the field work during the Islamic fasting month (Ramadan) in Indonesia, in which the time for interaction with respondents (especially for conducting the interviews) was limited. Therefore, this represents a research limitation in the data collected by the researcher. To overcome this limitation, the researcher tried to collect data through an on-line survey, especially for the group of private vehicle users. For researching the group of Trans Jogja users, the researcher distributed questionnaires by attending the bus station between 07:00 and 09:00 hours in the morning and/or between 13:00 and 16:00 hours in the afternoon. Interviews with key informants were conducted between 10:00 and 13:00 hours, during scheduled interview sessions, by making appointments with the key informants to avoid an overlapping interview schedule.

Chapter 2: Literature Review

2.1 Modal Shift from Private Vehicle Use to Public Transportation

Achieving the main purpose of sustainable transportation will involve certain challenges such as dependency on automobile and also changes in technology as well as in social, economic, and environmental conditions. Innovation in transport systems as well as good transport management are therefore required to solve these challenges (Doi and Kii, 2012). In other words, certain strategies are needed to attain sustainable transportation, because it concerns not only one aspect of sustainability, as all aspects would be affected. This is supported by the statement of Litman and Burwell (2006) who claim that conducting sustainable planning is a process of finding successful economic, social, and environmental long-term strategies by increasing the efficiency of transportation systems. From a ‘comprehensive’ perspective, particularly in the transportation sector, Litman and Burwell (2006) suggested that sustainability requires a reduction in total volume of travel as one of the strategies. Reducing dependency on private vehicle use would help to achieve a more sustainable transport system. Minimizing traffic congestion and accidents is expected to reduce the negative impact on economic aspects; social aspects are that it would increase community livability and have an impact on health; it also would minimize air and water pollution, thus achieving better environmental conditions.

Current forms of land transportation are undeniably unsustainable. Most conditions relating to the transportation sector encourage people to use private vehicles instead of using other modes of transportation which are more sustainable. For instance, some transportation development strategies focus on the construction of new roads or fly-overs to minimize traffic congestion, rather than improving public transportation. Such actions only encourage people to continue to use their own private vehicles and actually increases the number of vehicles of the road. Thus, Nykvist and Whitmarsh (2008) highlighted three major approaches to counter unsustainable transport, namely:

- Improving efficiency and reducing the impact of vehicles;
- Using more sustainable modes of travel;
- Reducing the need to travel.

In line with the approaches mentioned by Nykvist and Whitmarsh (2008), a modal shift is one of the acts of people who opt to use more sustainable modes of transportation. It is defined as changing their choice of transportation mode from private vehicle use to a more environmentally and socially sustainable transport mode, such as public transport and non-motorized transport (Boaddus, Litman, et al., 2009, Wright, 2012, Satiennam, Jaensirisak, et al., 2015). Encouraging people to make a modal shift must be supported by providing a transportation infrastructure that can fulfil people’s needs in relation to their daily travel activities. Providing public transportation is one example of substitution. However, Satiennam, Jaensirisak, et. al (2015) stated that, in many developing Asian cities, encouraging people to make a modal shift to the public transportation mode is quite challenging. This is because most cities have very high dependency on private vehicle use. Furthermore, the poor services of existing public transport push people to use their own vehicles.

Realizing a modal shift (from the use of private vehicle to public transportation) needs support in the form of transportation policy. Policy-making, which can be expected to change the system, needs to be more concerned about people making the preferred choice (Marchau, Walker, et al., 2008). Bus Rapid Transit (BRT) is one of the transport policies aimed at increasing the attractiveness of bus transport as well as influencing people to make a modal shift from private vehicles. The BRT system is said to be more effective in generating patronage than a regular bus system (Satiennam, Jaensirisak, et al., 2015).

Satiennam, Jaensirisak et al. (2015) stated that, from the perspective of passengers, making a modal shift to a BRT system will be significantly influenced by travel time and travel costs. Car-users consider travel time when choosing BRT, in the same way that the fare or travel costs particularly affect the modal choice of motorcycle users (Satiennam, Jaensirisak, et al., 2015). However, previous research on choice of transportation mode in Jakarta, Indonesia (Kawaguchi, Wachi, et al., 2010) showed that private vehicle users prefer flexibility and comfort rather than travel time and travel costs. In relation to this, people in developing Asian cities (in this case in Indonesia) tend to choose private vehicle even though they could opt for public transportation. Many people opt for the motorcycle because it is regarded as a “congestion-free” and flexible transportation mode which can maneuver through narrow spaces in between cars (Kawaguchi, Wachi, et al., 2010). Different journey purposes have a different impact on people’s flexibility in relation to the impact of travel costs on whether people use public transportation or other modes of transportation (Paulley, Balcombe, et al., 2006)

Moreover, there are several other reasons why people find it more convenient to use private vehicles rather than public transportation. In general, people who live in a low density area are more likely to rely on private vehicles (Paulley, Balcombe, et al., 2006). This could be because the low density of population leaves enough space available on roads so people prefer to use a private vehicle that provides them with greater comfort and flexibility. In addition, some people who prefer to use a car come from high-income families and they consider comfort, privacy, as well as status when choosing their main transportation mode. Other people may still prefer to use a motorcycle even though it is unsafe and uncomfortable, as it is cheaper to run and provides them with high accessibility (Satiennam, Jaensirisak, et al., 2015).

The bus is generally known to have a negative image for some people, especially those who have never used public transportation or who may have used it many years ago. This could be due to a lack of knowledge about public transportation services, and the negative opinions of other people. It is therefore necessary to improve the image of the bus as public transportation and to improve the level of services in order to attract potential users to the bus as their main choice of transportation. The quality of bus services should therefore be designed to make it as close as possible to the service preferences of passengers, thus making it possible to increase the usage of public transportation. Besides that, it is also important to provide more information about the transportation system in order to attract more people (Beirao and Cabral, 2007). In other words, it is important to provide information about how public transportation works, about bus network routes, about public transportation fares, and also about time schedules, in order to increase people’s trust so they will choose public transportation as their main mode of transportation.

The choice of transport mode can be measured by several indicators based on the actual travel behavior of commuters. These indicators can cause people to consider whether or not they will switch to using public transportation (Paulley, Balcombe, et al., 2006, Beirao and Cabral, 2007, Spickermann, Grienitz, et al., 2013, Satiennam, Jaensirisak, et al., 2015). The indicators are travel time, travel costs, flexibility, comfort, and trip purpose. Three indicators were used in this research to measure commuter decisions on whether they would choose to use a private vehicle or public transportation as their main transportation mode. According to a statement of Garling and Schuitema (2007), TDM measures mainly affect commuters' travel choice by directly influencing trip chain attributes (trip purposes, trip destinations, travel modes, travel times, routes, costs, departure times). Furthermore, commuters' travel choice affects their mode choice (in this case whether they will use a private vehicle or public transportation). As highlighted by Beirao and Cabral (2007), trip purpose affects choice of a specific travel mode, because travel for a leisure purpose and travel for a work purpose have different degrees of flexibility. This results in expected total travel time, especially when choosing a transportation mode for a work purpose. Besides that, willingness to pay the fare for public transportation also affects commuters' modal choice, whereby commuters consider whether the costs of travelling with public transportation balance up in relation to the distance they travel and the services provided. The following is an explanation of the three indicators used in this research:

1. Trip purpose

A passenger's trip purpose or type of journey will affect the choice of a specific transport mode. For instance, trips that tend to have a leisure purpose, such as shopping or a personal business trip, will have flexibility in terms of destination and travel time. In this case, commuters are flexible in whether they choose a private vehicle or public transportation. Furthermore, if they choose to use public transportation, they have more flexibility in travel time. However, people who travel to school or work have little choice in trip end-time and time of journey (this has already been decided). If they choose to use public transportation, its schedules need to be on-time, because total travel time is important to them (Paulley, Balcombe, et al., 2006, Beirao and Cabral, 2007, Spickermann, Grienitz, et al., 2013, Satiennam, Jaensirisak, et al., 2015).

2. Expected total travel time

Travel time is regarded as one of the important reasons for mode choice. It is a key factor in choosing a transport mode for school and work journeys. However, if there is less pressure to be on time, the value of time is lower (for instance in a leisure journey). Total travel time will be different for a private vehicle and public transport. In-vehicle travel time for a private vehicle is counted from the start of the journey to the end of the journey, which gives total travel time. However, total travel time for public transport use is counted from access time from (a passenger's) home to the bus station, waiting time, in-vehicle travel time on the bus, and egress time between the bus station and the final destination. Generally, bus travel time is much longer than car travel time. It is therefore important to reduce travel time from home to the final destination in order to get passengers to choose the bus as their transport mode (Paulley, Balcombe, et al., 2006, Beirao and Cabral, 2007, Spickermann, Grienitz, et al., 2013, Satiennam, Jaensirisak, et al., 2015).

3. Willingness to pay

The fare for public transport has a significant effect on modal choice. The fare is determined by the unit distance, whereby if the unit distance increases, the fare will also increase. In the case of fares for public transport, people's income also affects their willingness to pay. If the fare rises, people may switch to traveling by private vehicle. Nevertheless, travelers with higher incomes will have greater elasticity in choosing transport mode and will have other alternatives when fares increase. However, the level of public transportation service will also influence people's willingness to pay in terms of how much they will pay for the service provided (Paulley, Balcombe, et al., 2006, Satiennam, Jaensirisak, et al., 2015).

In this research, the modal choice of commuters was measured based on the indicators mentioned above. The results of the measurements were used to indicate passenger willingness to make a modal shift from a private vehicle to public transport (bus). In other words, this research should explain a commuter's willingness to make a modal shift based on their trip purpose, how much travel time they expect when using public transportation, and how much a commuter is willing to pay for using public transportation (in this case BRT).

2.2 Transport Demand Management

Generally, the car as a mode of transportation is regarded as being more attractive than other transport modes. It usually has a faster travel time, is comfortable, provides privacy as well as carrying capacity, and is also seen as a status symbol for many people (Garling and Schuitema, 2007). Additionally, motorcycles are also considered as a mode of transportation that is more attractive to commuters, especially in Asian developing countries. They provide users with flexibility and a faster travel time (Satiennam, Jaensirisak, et al., 2015). According to a statement of Garling and Schuitema (2007), motorized private vehicle ownership is predicted to increase in the future, which will be followed by an increased use of motorized private vehicles. This will therefore be followed by a reduction in road-space, and lead to urban transportation problems such as air pollution and congestion.

Nykvist and Whitmarsh (2008) stated that frequent car use (motorized private vehicles) is causing urban problems such as congestion, noise, accidents, local air pollution, and emissions of greenhouse gases. These negative impacts have caused many people to believe that a car-based transportation system is not sustainable, and that policies to manage those negative impacts are needed (Garling and Schuitema, 2007). This is causing urban policy-makers to implement transport demand management (TDM) policies (Habibian and Kermanshah, 2011). As stated by Nykvist and Whitmarsh (2008), one of the major approaches that has been highlighted and which addresses the unsustainable transport problem due to urban transportation is the use of more sustainable modes of travel. Dorsey (2005) defined TDM in general as a method or activity, the main objective of which is to reduce vehicle trips in order to realize efficient transportation use. Moreover, he stated that by conducting a mass transit incentive program, it will reduce the amount of (private) vehicle use and thus also influence (i.e. reduce) the need of parking capacity as well as reducing vehicle-operating costs. Besides that, conducting Transport Demand Management (TDM) is also seen as part of sustainable urban transportation implementation, whose main objective is to reduce traffic volume and also

to promote a modal shift from private vehicle use to more sustainable modes of transport (Boaddus, Litman, et al., 2009)

TDM is regarded as part of implementing a sustainable urban transportation concept, one that will reduce the total volume of traffic and promote a modal shift to more sustainable modes of transport (Boaddus, Litman, et al., 2009). The main purpose of TDM measures (see Table 1) is to change travel characteristics by offering other alternatives. Below, some of the conditions are identified that need to be conducted in order for TDM measures to work effectively, especially in reducing the amount of car use (Garling and Schuitema, 2007).

- TDM measures should reduce the attractiveness of car use;
- TDM measures should activate car use reduction goals;
- After activating car use reduction goals, TDM measures should facilitate goal attainment.

It is important that TDM measures are conducted comprehensively, whereby one measure is needed to encourage another measure. This is known as a ‘push’ and ‘pull’ strategy’. ‘Push’ strategies are measures that will make the use of cars less attractive, while ‘pull’ strategies are measures that encourage people to use a more sustainable transportation mode (Habibian and Kermanshah, 2011, Perschon, 2012).

Making TDM measures comprehensive by combining both ‘push’ and ‘pull’ strategies will lead to more effective transportation policies capable of achieving the objective of sustainable urban transportation (Boaddus, Litman, et al., 2009, Institute for Transportation and Development Policy, 2013). Otherwise, implementing only ‘pull’ measures will barely have any effect on realizing a modal shift, because improvements in sustainable transportation modes (public transportation services or non-motorized transport facility) may remain unused if using a motorized private vehicle is still a cheap and time-efficient option. In the same way, implementing only ‘push’ measures will turn people against policy-makers, because they interpret what they see as unfair policy implementation aimed at discouraging motorized private vehicle use without providing other alternatives (Boaddus, Litman, et al., 2009). Ultimately, combining both push and pull strategies will be effective in reducing car use due to the expected acceptance by the general public (Garling and Schuitema, 2007).

Table 1 shows the variants of TDM measures and examples of activities and/or methods. Public transportation services, in the form of a BRT system, are studied in greater depth in this research as an example of pull strategies in combination with push strategies.

In this case, BRT could be seen as a solution to the urban transportation problem that will help provide cities with more sustainable urban mobility (Lindau, Hidalgo, et al., 2014). The objective of implementing a BRT system is to attract more people to use public transportation, and change their transportation mode of choice (Satiennam, Jaensirisak, et al., 2015). However, instead, the poor services of public transportation push people to use their own vehicles (Satiennam, Jaensirisak, et al., 2015). As a ‘pull’ strategy to encourage people to use a more sustainable transportation mode, implementing a BRT system needs to be balanced with a ‘push’ strategy that will make using a private vehicle less attractive (Habibian and Kermanshah, 2011)

Table 1 Travel Demand Management Measures

TDM Measures	Push Strategies	Pull Strategies
Physical change measures	<ul style="list-style-type: none"> - Reduce parking facilities - Traffic calming - Pedestrian-only zones 	<ul style="list-style-type: none"> - Improving public transport services (bus) - Improving infrastructure for walking and cycling - Park and ride schemes - Land use planning to encourage shorter travel times
Legislative and economic policies	<ul style="list-style-type: none"> - Prohibiting car traffic in city centers - Parking control - Decreasing speed limits - Taxation on cars and fuel - Kilometer charges 	<ul style="list-style-type: none"> - Decreasing costs of public transport
Information and education measures		<ul style="list-style-type: none"> - Individualized marketing - Public information campaigns - Giving feedback about consequences of behavior - Social modelling

Sources: (Garling and Schuitema, 2007, Boaddus, Litman, et al., 2009)

In relation to a modal shift and implementing BRT (as sustainable urban public transportation), the objective of implementing a sustainable system that meets user needs can be achieved by having an integrated system of transportation (Spickermann, Grienitz, et al., 2013). It is therefore important to reduce the level of private vehicle use by promoting public transportation, by conducting TDM measures comprehensively, whereby one measure is needed to encourage other measures. Making TDM measures comprehensive by combining both ‘push’ and ‘pull’ strategies will lead to more effective transportation policies capable of achieving the objective of sustainable urban transportation (Perschon, 2012, Boaddus, Litman, et al., 2009, Institute for Transportation and Development Policy, 2013)

Nonetheless, the planning and implementation process for a BRT system also faces some barriers. The stakeholders involved do not always understand the process in the same way. Some issues are taking place continuously, such as the coordination of multiple agencies and private operators for institutional arrangements; competition in using road space in general traffic conditions; and misconceptions of buses being a low-quality transportation mode. Furthermore, lack of communication among the stakeholders is another important issue. The result of this is that most time and energy in the planning and implementation process is spent on negotiating (Lindau, Hidalgo, et al., 2014).

Moreover, Lindau, Hidalgo et al. (2014) emphasized that although BRT may impact road volume in terms of vehicles per hour, it will also provide a greater capacity to move people. In the same way, BRT should be seen as part of an integrated transport system, i.e. a solution to the urban transportation problem. It will also support the aim of increasing sustainable urban mobility in the city.

2.2.1 Push Strategies: Transportation Policy Development

‘Push’ strategies are measures intended to make car use less attractive (Habibian and Kermanshah, 2011). These strategies are implemented as transport policies to control the use of private vehicles. As policies, their main objective is to control the urban transportation system, and also to solve its problems and generate benefits (Marchau, Walker, et al., 2008). As a package of TDM measures, push strategies have been used as the main driving force in realizing a modal shift, thereby making the use of private vehicles less attractive.

As shown in Table 1, several TDM measures were included as push strategies. However, not all the push strategies mentioned were studied in this research. Several push strategies were chosen based on transportation policies that have been implemented in the study area of this research (Yogyakarta Special Region Local Regulations No. 6 of 2013 on Medium-term Development Plan in 2012-2017, 2013), and also based on the consideration that, in Asian developing countries, car and motorcycles are regarded as more convenient and more popular than other transportation modes, whereby the support infrastructure is also well-developed (Satiennam, Jaensirisak, et al., 2015).

Paulley, Balcombe et al. (2006) stated that small changes in car travel behavior can have a large impact on increasing the use of public transport. Similarly, implementing push strategies have a negative incentive on controlling the use of private vehicles, which can be realized by implementing not only physical measures but also legislative and economic policies.

Table 2 shows examples of measures for push strategies (Garling and Schuitema, 2007, Boaddus, Litman, et al., 2009). Parking is regarded as a physical change measure that will have an effect on modal shift. Boaddus, Litman, et al. (2009) stated that a ‘social service’ approach to parking has generally been implemented, whereby parking is provided by shop-owners, employers, or home developers, even when street-parking is easily available. Easy access and an abundant supply of parking places encourages people to use private vehicles. Reducing the amount of parking is expected to discourage people from using private vehicles. This must also be supported by managing the price of parking. Conducting parking management shows that developing transportation policies is important in that it leads to demand-management rather than supply orientation in reducing the amount of private vehicle use (Boaddus, Litman, et al., 2009).

Table 2 Push Strategy Measures

TDM Measures	Push Strategies
Physical change measures	<ul style="list-style-type: none">- Reduce parking supply- Traffic calming- Pedestrians-only zone
Legislative and economic policies	<ul style="list-style-type: none">- Parking control<ul style="list-style-type: none">➔ Parking pricing➔ Parking management- Taxation on cars and fuel

Sources: (Garling and Schuitema, 2007, Boaddus, Litman, et al., 2009)

In addition, traffic calming is used to reduce the speed of vehicles on roads, as it is supposed to make the use of private vehicles less comfortable (Boaddus, Litman, et al., 2009, Wright, 2012). Moreover, the pedestrian infrastructure needs to be considered in order to reduce the amount of private vehicle use, because if the pedestrian infrastructure is of a poor quality, it encourages people to use their own vehicles even for very short (walking) distances (Wright, 2012). The main objective of a physical change measure in the form of a pedestrians-only zone is to give limited access to private vehicles by providing more access to pedestrians or giving access only to pedestrians, non-motorized transportation, and public transportation in certain areas (Beirao and Cabral, 2007). Restricting the use of private vehicles in certain areas reduces comfort for private vehicle users and is expected to encourage them to minimize their use of private vehicles.

Taxation on cars and fossil fuel is another push strategy that can be expected to minimize the use of private vehicles. Previous research has shown that a reduction in private vehicle use is more likely to occur when combining an increased tax with improved public transport, while implementing only the tax increase would not result in any reduction in private vehicle use (Eriksson, M. Nordlund, et al., 2010). Furthermore, taxation on cars (private vehicles) is also a policy for controlling the growth in private vehicle ownership.

2.2.2 Pull Strategies: Improving Public Transport Service (Bus Rapid Transit System)

‘Pull’ strategies are measures that encourage people to use a more sustainable transportation mode (Habibian and Kermanshah, 2011). The objective of pull strategies is to provide an alternative travel option instead of using private vehicles (Eriksson, M. Nordlund, et al., 2010). To implement pull strategies, a sustainable mobility approach is needed, involving policy measures capable of influencing individual travel decisions (Nykivist and Whitmarsh, 2008). Improving public transportation services is one of the pull strategies in providing an alternative choice of travel mode for people, whereby the main objection is to make public transportation more attractive than private vehicles. Some policies related to public transportation aim at making it more attractive, e.g. by providing an accessible public transport infrastructure and reasonable travel costs by subsidizing fares (Satiennam, Jaensirisak, et al., 2015).

Moreover, in order to make public transportation more attractive, transportation policy should also promote the image of public transportation. The transportation system needs to be more competitive (Beirao and Cabral, 2007). Providing a new public transport system is expected to help build a new image of public transport, making it more attractive for people, and influencing their decisions when choosing a transport mode. After introducing the new system, the next step should be to provide a better service, and offer passengers added convenience. As an urban public transportation mode, travel by (urban) bus tends to be for short trips, so walking is a feasible alternative for (potential) passengers. Therefore, whether a person chooses the bus as their main urban transportation will probably depend on the quality of the service. Providing services in the transport sector needs to be adjusted to meet the needs of people as passengers (consumers), so these must meet the preferences of people who can be regarded as potential users (Ongkittikul and Geerlings, 2006).

With reference to the TDM measures mentioned in Table 1, this research discusses public transportation services as a pull strategy in greater depth, specifically, the bus rapid transit system (BRT system). Introducing a BRT system is a transport policy that aims at increasing the attractiveness of bus transport as well as influencing people to make a modal shift from private vehicles (Satiennam, Jaensirisak, et al., 2015).

The quality of a bus service is regarded as an important factor of BRT systems, and one that will influence the decisions of commuters to make a modal shift (Paulley, Balcombe, et al., 2006). In this research, several indicators are defined for measuring the quality of a bus service, which can be expected to explain the role of the pull strategy (BRT system) in influencing the decisions of commuters to make a modal shift.

The indicators of bus service quality used in this research are (Paulley, Balcombe, et al., 2006, Beirao and Cabral, 2007, Spickermann, Grienitz, et al., 2013, Satiennam, Jaensirisak, et al., 2015):

1. Waiting environment

The waiting environment is an indicator of the comfort felt by passengers while waiting for a bus in a bus shelter. In order to attract people to using public transportation, it is important to provide a comfortable and clean waiting environment: shelter for protection from weather conditions; the provision of seats and lighting; the provision of bus service information (arrival times and bus route networks); and also security (Paulley, Balcombe, et al., 2006). Past research has shown that if passengers can depend on the bus service information (real arrival times and bus route networks), this gives them a sense of comfort and trust in the service (dell'Olio, Ibeas, et al., 2011). Expectations are that providing a comfortable waiting environment will attract potential passengers (private vehicle users) to place their trust in the service and influence their choice in making a modal shift to public transportation.

2. Waiting time

The waiting time at a bus station will influence whether people choose the bus as their main transportation mode, because the waiting time also influences passengers' total travel time. If the waiting time is too long, it could form a barrier to using public transport (Paulley, Balcombe, et al., 2006, Beirao and Cabral, 2007, Spickermann, Grienitz, et al., 2013, Satiennam, Jaensirisak, et al., 2015). Keeping the waiting time as short as possible will make people more comfortable about using public transportation, which would influence the decisions of commuters on whether to choose public transportation or not. Giving real time information on bus arrivals can help to reduce the perceived waiting time of passengers (Boaddus, Litman, et al., 2009). However, the waiting time also depends on traffic conditions, the speed of the bus, and also the frequency of the bus. The assumption is that setting the speed of the bus and increasing the number of buses on routes could minimize the waiting time of bus users.

3. Headway/service interval

The headway or service interval refers to the frequency with which buses arrive and the time till the arrival of the next bus. It relates to passengers' waiting time (Paulley, Balcombe, et al., 2006). It is important to set the service interval with the shortest possible distance or time between buses. Having a high frequency bus service would also increase the degree to

which public transport is used (Boaddus, Litman, et al., 2009). Previous research conducted by Satiennam, Jaensirisak, et al. (2015) indicated that increasing a service frequency would have the effect of reducing total travel time, which would significantly affect a modal shift to BRT.

4. Public transport interchange

An interchange is a place where passengers can transfer between or within modes of transport. Generally, passengers dislike interchanges, and prefer to choose direct travel between their point of departure and their destination (Beirao and Cabral, 2007). In other words, public transport is more attractive to potential users (private vehicle users) when it has the least possible number of bus transfers to reach their final destination. Providing an effective bus route with a low number of public transport interchanges, or a direct route will make public transportation more attractive, and is taken into consideration when making decisions on choosing a mode of transportation.

5. Operational bus hours

The number of operational bus hours relates to how long bus services are provided during a day, which will affect the usage time of a bus service (Paulley, Balcombe, et al., 2006). If a bus service has a long usage time, it can be said to have a high degree of flexibility, especially in relation to travel time. The assumption is that providing long bus hours, i.e. offering a high degree of flexibility, would also increase the possibility of potential users making a modal shift. This is in line with the findings of Kawaguchi, Wachi, et al. (2010), who stated that private vehicle users seek flexibility when choosing a travel mode.

6. In-vehicle travel time

The in-vehicle travel time is the time spent in a vehicle, and this depends on the average speed of the bus. Generally, the speed of a bus without an exclusive lane will be between 25 and 40 km/h, which is slower than the average speed of a private vehicle (motorcycles and private cars). This makes some people think that bus travel times are unreliable. It is therefore important to improve the reliability and travel times of buses as a form of public transportation (Paulley, Balcombe, et al., 2006, Beirao and Cabral, 2007, Spickermann, Grienitz, et al., 2013, Satiennam, Jaensirisak, et al., 2015). Based on previous research, the percentage of modal choice for a BRT system will increase if the total travel time is reduced (Satiennam, Jaensirisak, et al., 2015). Therefore, the assumption is that a BRT system needs to offer the shortest possible in-vehicle travel time, for instance by providing effective bus routes and a high-frequency bus service. This would make the BRT system more attractive to potential users (in this case private vehicle users) and increase the percentage of modal shifts.

7. Travel costs

Obviously, travel costs also affect modal choice, in this case the costs of travelling by bus. In particular, travel costs are particularly important for public transport users with lower incomes (Paulley, Balcombe, et al., 2006, Beirao and Cabral, 2007, Spickermann, Grienitz, et al., 2013, Satiennam, Jaensirisak, et al., 2015). Research conducted by Satiennam, Jaensirisak, et al. (2015) showed that a modal shift of private vehicle users to a BRT system would increase if the travel costs were decreased. However, that research also showed that other service indicators played a role in influencing commuters' decisions to make a modal

shift, because even if they could travel free of charge, not all commuters would switch to the BRT system.

8. Safety

Safety is not easily measured, but could influence how commuters evaluate the service quality (of public transportation) and also affect their choice of transport mode. Some passengers would be willing to pay more to guarantee their safety during trips. Indications of safety can usually be seen from the security of the environment while waiting for the transportation mode, inside the vehicle, and also from data on accidents (Paulley, Balcombe, et al., 2006, Beirao and Cabral, 2007, Spickermann, Grienitz, et al., 2013, Satiennam, Jaensirisak, et al., 2015). Previous research indicated that to improve the attractiveness of public transportation, it is important to increase passengers' perception of safety when traveling with public transportation (dell'Olio, Ibeas, et al., 2011). This can be done, for instance, by only employing chauffeurs who drive calmly and by ensuring that the vehicles are well-maintained. It is also assumed that increasing the perceived safety of using public transportation will increase the number of modal shifts from private vehicle use to public transportation.

However, urban public transport implementation is also influenced by several crucial environmental conditions, which can be categorized as external conditions. These include external developments such as urban planning, technological progress, economic developments, demographic developments, as well as the consequences of the actual implementation itself, e.g., safety and the environment. Those conditions may lead crucial stakeholders to evaluate the consequences, and cause them (for example) to change their transportation mode preferences in order to realize a better environmental quality (Marchau, Walker, et al., 2008).

2.3 Influence of Commuter Characteristics on Making a Modal Shift

Commuter characteristics can also influence the decision to make a modal shift. For example, peak times and off-peak times will influence modal choice, whereby the trips of people who travel in peak hours tend to be for work and education purposes, while those of people who travel in off-peak hours tend to be for leisure and personal purposes. Gender and age will also influence the modal choice of transport, in the sense that males have more elasticity in choosing a mode of transportation than females, and the elderly tend to choose public transportation because of the limitations of car ownership. Moreover, income is also a commuter characteristic that will influence a commuter's choice, whereby travelers with a higher income have more choices if the fares for public transportation increase (Paulley, Balcombe, et al., 2006, Satiennam, Jaensirisak, et al., 2015).

In this research, commuter characteristics have been divided into two different variables, namely a control variable and social economic status as moderator variable. The control variable consists of age and gender, as these factors are assumed to influence the decisions of commuters in making a modal shift, though this will not be directly affected by TDM policy implementation (push and pull strategies). The definitions for the control variable (age and gender) used in this research are (Paulley, Balcombe, et al., 2006, Dijst, Rietveld, et al., 2013):

1. Age

People in the 'middle-aged' group tend to have most trips that are usually a large distance from home. This is because they are mostly in the period of career-development. Most young people and the elderly, on the other hand, have limited networks and activities. Furthermore, the elderly have limited car ownership so they tend to choose public transport (Paulley, Balcombe, et al., 2006, Dijst, Rietveld, et al., 2013). Previous research has shown that commuters aged 18-29 years travel mostly by private car (Limtanakool, Dijst, et al., 2006). This finding was confirmed by other research results which indicated that older private vehicle users have a greater tendency to switch to the BRT system than younger private vehicle users (Satiennam, Jaensirisak, et al., 2015).

2. Gender

Commuter choices based on gender are influenced by differences in working hours and commuting distance. More men tend to have a larger total commuting distance than women (Dijst, Rietveld, et al., 2013). Based on previous research, female private vehicle users were more likely to make a modal switch to using the BRT system than male private vehicle users, because females indicated having less elasticity in choosing a mode of transportation than males (Satiennam, Jaensirisak, et al., 2015)

Social economic status, on the other hand, is defined by education level and household income, which affects commuter considerations on making a modal shift once they become aware of the impact of TDM policy implementation. Social economic status is defined by (Paulley, Balcombe, et al., 2006, Dijst, Rietveld, et al., 2013, Spickermann, Grienitz, et al., 2013, Satiennam, Jaensirisak, et al., 2015) :

1. Education level

People with a high level of education usually have a specialized job that often involves a longer commuting distance, and this will affect their preferences in choosing a transportation mode (Dijst, Rietveld, et al., 2013). Many jobs for highly educated people are located in the city center (Limtanakool, Dijst, et al., 2006). This means that easy access via a BRT system from settlement areas to the city center is important. Reduced accessibility would tend to cause more people to choose a private vehicle rather than the BRT system.

2. Household income

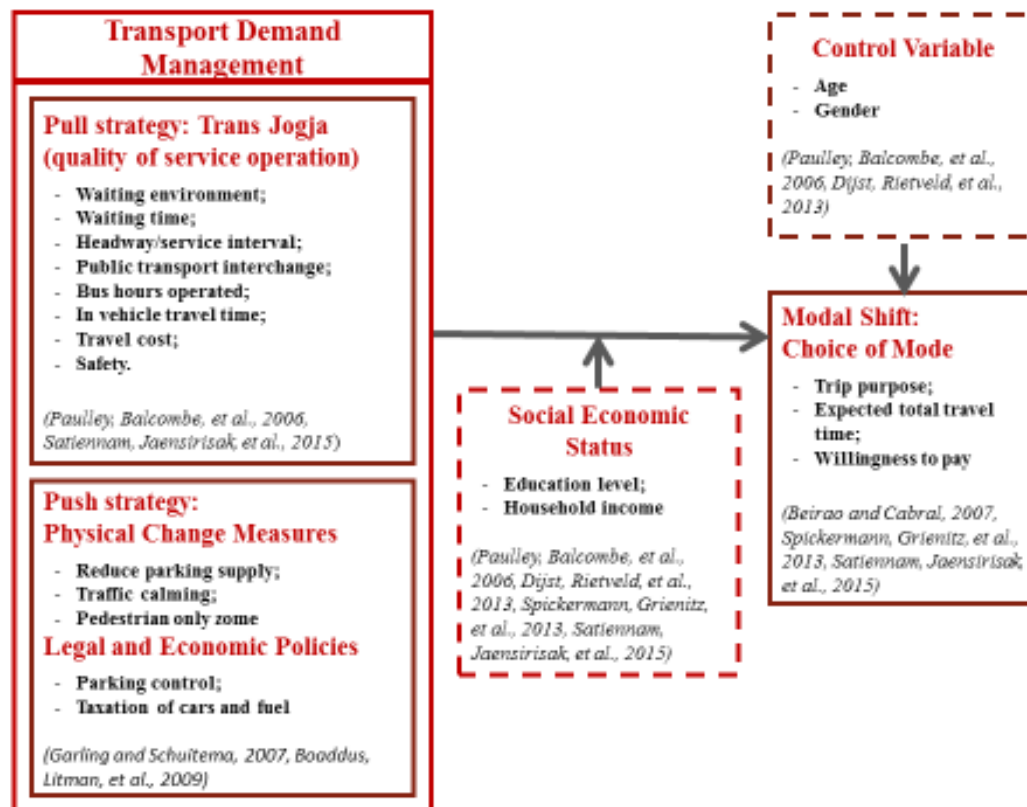
An increase in income is often accompanied by an increase in average trip length, whereby people with a high rate per hour have a high time-value and this will also affect their consideration of travel time. Furthermore, as people become richer, we see an increase in their willingness to pay more for quality, speed, reliability, and comfort during trips. However, the use of public transport may decrease (or stabilize) as income increases (Paulley, Balcombe, et al., 2006, Dijst, Rietveld, et al., 2013). Previous research shows that private vehicle users from low-income and middle-income households are more likely to make a modal shift to a BRT system (Kawaguchi, Wachi, et al., 2010). Nonetheless, current public transport users with a low income choose to travel by BRT because they regard having a private vehicle as an unattainable achievement. Therefore, travel costs are very important for people with lower incomes (Beirao and Cabral, 2007). On the other hand, results from past research showed that some people from high-income families take into account comfort, privacy and status consideration when choosing their main transportation

mode. In this case, it would be very difficult to get them to switch to public transport, even if highly efficient public transportation is provided (Satiennam, Jaensirisak, et al., 2015).

2.4 Conceptual Framework

The conceptual framework for this research was formulated based on a review of the literature. This research seeks to explain the influence of TDM policy implementation on the modal shift of private vehicle users to public transportation. TDM policy is represented by push strategy (physical change measures; legislative and economic policies) and pull strategy (service quality of Trans Jogja operations). A modal shift in this research was measured by looking at commuters' choice of transport mode based on their actual travel behavior. Commuter characteristics were also represented by means of a control variable (age and gender) and social economic status. The conceptual framework for this research is shown in Figure 3 Conceptual Framework.

Figure 3 Conceptual Framework



Sources: (Paulley, Balcombe, et al., 2006, Beirao and Cabral, 2007, Boaddus, Litman, et al., 2009, Dijst, Rietveld, et al., 2013, Spickermann, Grienitz, et al., 2013, Satiennam, Jaensirisak, et al., 2015)

The objective of this research is to discuss how Transport Demand Management in the form of comprehensively implementing push and pull strategies will influence a modal shift of private vehicle users to public transportation (in this case, to Trans Jogja). Pull strategy was represented by the service quality of Trans Jogja public transportation operations as provided by the government in Yogyakarta, Indonesia. Push strategies were represented by physical

change measures and legislative economic policies on transportation sectors. The assumption was that combining push and pull strategies comprehensively would lead to effective transportation policies to achieve the objective of sustainable urban transportation (Boaddus, Litman, et al., 2009, Institute for Transportation and Development Policy, 2013), in the case of this research by influencing the decisions of commuters to make a modal shift from private vehicle use to public transportation (BRT). Implementing only ‘pull’ measures would do little to realize a modal shift, and implementing only ‘push’ measures would make people turn against the policy-makers (Boaddus, Litman, et al., 2009). In this research, a modal shift was represented by commuters’ choice of transportation mode, i.e. whether they chose a private vehicle or public transportation (BRT), measured by their trip purpose, expected travel time, and willingness to pay. In addition, this research assumed that a control variable represented by age and gender would influence commuters in making a modal shift, though these are not directly affected by TDM policy implementation. On the other hand, social economic status (education level and income) would affect commuter considerations in making a modal shift once they became aware of the impact of TDM policy implementation.

Chapter 3: Research Design and Methods

3.1 Revised Research Questions

The main research question of this study is:

“How do push and pull strategies influence a modal shift from private vehicle use to public transportation in the case of Trans Jogja in Yogyakarta, Indonesia?”

To answer the main research question, the following sub-questions are:

1. How do push strategies make private vehicle use unattractive?
2. To what extent do the indicators of pull strategies influence a modal shift of private vehicle users to public transportation?
3. To what extent do commuter characteristics affect the decisions of commuters to make a modal shift?

3.2 Research Strategy

The main research strategy used in this research was case study, whereby the researcher tries to get a deeper understanding of one or several research objectives or processes that have a comparative element within a given scope of time and/or space (Verschuren and Doorewaard, 2010) by doing a case study. The focus of this research was on Trans Jogja as provider of public transport services, while the main objective was to explain how the operating quality of Trans Jogja's public transport service (as pull strategy) combined with push strategy (as part of TDM policy implementation) influenced a modal shift in private vehicle (motorcycle and private car) users to public transportation in Yogyakarta, Indonesia. The comparative element of this research is between users of private vehicle and users of Trans Jogja, based on their preferences in choosing their main mode of transportation. Moreover, the object of this research is to explain a contemporary phenomenon in-depth, specifically the causalities between the phenomenon and the real-life context that are not clearly feasible (Yin, 2009), namely TDM policy implementation and a modal shift. Those conditions used a case study as an applicable strategy for this research.

The process of collecting data for this research, which has a large research population, involved users of private vehicles (motorcycle users and private car users) and current users of Trans Jogja. In addition, it also needed in-depth data and information from the government as regulator and provider of the system. A mix-method was therefore used in the process of collecting data. Quantitative data analysis was used to analyze the influence of pull and push strategies on modal shift decisions of commuters. In this case, these strategies were measured by asking respondents for their opinion, their assessment and their perception of the quality of Trans Jogja's services and the implemented transportation policy, and the influence of those strategies on their decision to make a modal shift. Qualitative analysis was used to analyze data and information sourced from key informants, which resulted in a understanding of the comprehensive implementation between push and pull strategies and the effect of the implemented strategies on commuters.

3.3 Operationalization: Variables and Indicators

Based on the literature review, variables and indicators are presented in Table 3 Variables and Indicators together with the data needed for this research.

Table 3 Variables and Indicators

Concept	Variable		Indicator	Scale of Measurement	Type of Data	Source of Data
Transport Demand Management	Modal Shift: Choice of Mode (<i>Beirao and Cabral, 2007, Spickermann, Grienitz, et al., 2013, Satiennam, Jaensirisak, et al., 2015</i>)		Possibility to make a Modal Shift	Nominal	Qualitative	Questionnaire
			Trip Purpose	Nominal	Qualitative	
			Expected Bus Waiting Time	Ordinal (Interval)	Quantitative	
			Expected Bus Travel Time	Ordinal (Interval)	Quantitative	
			Willingness To Pay	Ordinal (Interval)	Quantitative	
	Push Strategy: Physical Change Measures; Legislative and economic policies (<i>Garling and Schuitema, 2007, Boaddus, Litman, et al., 2009</i>)		Parking Management (Reduce parking supply; Parking control)	Nominal	Quantitative Qualitative	Questionnaire Interview Secondary Data
			Restricted Road Policy (Traffic calming; Pedestrians-only zone)			
			Taxation on cars and fuel			
	Pull Strategy: Trans Jogja (Quality of service operation) (<i>Paulley, Balcombe, et al., 2006, Satiennam, Jaensirisak, et al., 2015</i>)		Waiting environment	Ordinal (Likert)	Quantitative Qualitative	Questionnaire Interview
			Waiting time	Ordinal (Likert)		
			Headway/service interval	Ordinal (Likert)		
			Public transport interchange	Ordinal (Likert)		
			Operational bus hours	Ordinal (Likert)		
			In-vehicle travel time	Ordinal (Likert)		
			Travel cost	Ordinal (Likert)		
			Safety	Ordinal (Likert)		
	Commuter Characteristics (<i>Paulley, Balcombe, et al., 2006, Dijst, Rietveld, et al., 2013, Satiennam, Jaensirisak, et al., 2015</i>)	Control Variable	Age	Ratio	Quantitative	Questionnaire
			Gender	Nominal (dichotomous scale)		
		Social economic status	Household income	Ratio	Quantitative	Questionnaire
			Education level	Ordinal		

Sources: (*Paulley, Balcombe, et al., 2006, Beirao and Cabral, 2007, Boaddus, Litman, et al., 2009, Spickermann, Grienitz, et al., 2013, Satiennam, Jaensirisak, et al., 2015*)

3.4 Data Collection Methods

For collecting data and information to answer the research question, this research used survey (questionnaire), interview, and secondary data as research instruments. The questionnaire in the survey was used to gather primary information of actual behavior of commuters in making a modal choice that could be influenced by TDM policy (implementation of push and pull strategies); and what respondents preferably need to do to make a modal shift from private vehicles to public transportation. The questionnaire was formed by structuring the questions to measure independent and dependent variables as well as the causalities of both variables based on the theory of this research. Because of the number of respondents needed and the time limitation, the researcher used on-line survey as one of the instruments. However, the researcher also conducted a direct survey to gather data and information (based on a questionnaire) in order to avoid an imbalance in the number of respondents. The questionnaire for both groups of respondents basically contained the same questions in order to measure the same indicators. However, the researcher used two different questionnaires because the wording had to be different for the two groups of respondents. For users of Trans Jogja, the researcher designed the questionnaire to measure indicators based on their actual travel behavior with Trans Jogja as well as their assessment while using the services of Trans Jogja. For private vehicle users the researcher had to use different wording, even though the questionnaire measured the same indicators, because of the different condition of respondents whereby it was assumed that private vehicle users never used Trans Jogja and that their assessment would be based on their opinion, perception, and expectation in respect of Trans Jogja.

Table 4 Data Collection Methods

Data Collection Method	Type of Data	Data Collection Instrument	Sampling Method	Data Sources	Number of Respondents
PRIMARY DATA					
Survey	Quantitative	Questionnaire (Structured)	Stratified Random Sampling	Users of private vehicle	106
				Users of Trans Jogja	68
Interview	Qualitative	Interview guide (Semi-structured)	Single Purposive Sampling	Key informants	8
SECONDARY DATA					
Document Review	Planning Documents and Local Regulation	Document Checklist		Government office; Key informants.	

Sources: Data Collection Process, 2016

The interviews were conducted to gather in-depth information from the government as policy-maker and policy-developer. In addition, the operator of Trans Jogja was also interviewed. The

interviews took place using semi-structured questions, based on the theory used; it also contained open questions to get more in-depth knowledge from respondents. Interview was used as an instrument to collect and gather information, specifically on push strategies that have been implemented (or will be implemented) by the government in combination with pull strategy (Trans Jogja service provision).

Finally, secondary data were used to support the explanation about push and pull strategy as TDM policy implementation in Yogyakarta, and its relationship with a modal shift from private vehicle to public transport. Secondary data used for this research relate to transportation policy, legal documents (from the transportation sector) and reports. Secondary data types and sources are shown in the following table.

Table 5 Secondary Data

No	Data Used	Source	Type
1	Medium Term Development Plan of Yogyakarta Special Region, 2012-2017;	Agency of Planning and Regional Development, Yogyakarta Special Region	Planning Document
2	Local Regulation of Yogyakarta Special Region Number 3 on 2011 on Regional Tax;	Department of Regional Revenue, Management, and Asset Finance, Yogyakarta Special Region	Regulation
3	Local Regulation of Yogyakarta City Number 18 of 2009 on Parking Policy;	Department of Transportation of Yogyakarta City;	Regulation
4	Local Regulation of Yogyakarta City Number 19 of 2009 on On-Street Parking Retribution;	Department of Transportation of Yogyakarta City;	Regulation

Sources: Data Collection Process, 2016

Data and information from secondary data were used to support arguments or statements of key informants and also to complete the data needed to answer the main research question of this research. For instance, secondary data were used to support statements and arguments of key informants in the interview process. Furthermore, secondary data were also used to complete the information needed from respondents in the survey. Moreover, arguments and statements of key informants were used to double-check on the results of the data collection process from the survey.

Using three different data collection instruments was expected to supplement one another's information and provide this research with a comprehensive view of the problem. It was also part of a triangulation process that used several data sources as means to increase the reliability of this research and also to reduce threats relating to validity. Other instruments were used to double-check the data collection process and the research results (Thiel, 2014). The validity and reliability of measurements in this research are explained in more detail in the last part of this chapter.

3.5 Data Analysis Methods

Two kind of primary data were used and collected for this research, namely quantitative and qualitative data. Both types of data had different analysis methods. Quantitative data for this research were processed and analyzed using SPSS (Statistical Package for Social Science) as well as Microsoft Excel. Collected data were analyzed using both descriptive and statistical analysis.

Descriptive analysis took place for a number of respondents in the two different groups: respondents based on gender and group of age; and also a group of respondents based on education level and personal income per month were analyzed using Microsoft Excel. These data were interpreted using tables, pie charts and bar charts to make it easier to compare characteristics between the two groups of respondents (private vehicle users and Trans Jogja users) and to make the data more intelligible.

In addition, descriptive analysis using cross-tabs in SPSS was conducted to analyze variables on an ordinal measurement level, such as the willingness of private vehicle users making a modal shift based on bus waiting time, travel time, and travel costs; and the willingness of using Trans Jogja based on education level and personal income. Cross-tabs in SPSS were used to simplify the data and facilitate their explanation.

Moreover, Chi-Square test in SPSS was used to test the statistical significance of differences between the two groups of respondents in respect of some variables on a nominal or an ordinal measurement level. In this research, Chi-Square Test was used to measure:

1. Significance of difference in respondents' characteristics based on gender and age;
2. Significance of difference in respondents' possibility of making a modal shift;
3. Influence of push strategies on respondents' decision to make a modal shift;

Furthermore, statistical measures for indicators of pull strategy were conducted by using the Mann-Whitney U-Test in SPSS, because all data used for analysis were on a Likert scale using ordinal and non-parametric data. In addition, this test was chosen because analysis conducted by comparing two independent groups of respondents, namely private vehicle users and Trans Jogja users.

In addition, two different methods were used to measure the influence of commuters' characteristics on making a modal shift decision. The Chi-Square test was used to measure the influence of the variable 'gender', because gender data were on a nominal measurement level, certainly on a dichotomous scale, while decisions on a modal shift were also measured on a nominal measurement level by using the choices 'yes', 'no', and 'maybe'. The influence of the variables age, education level, and personal income on making a modal shift decision were measured using the Kruskal-Wallis test in SPSS. This test was chosen because data on these variables were on an ordinal measurement level, while decisions on making a modal shift were on a nominal measurement level.

Thus, expectations were that the influence of independent variables (pull strategy: quality of service operation) and push strategies on private vehicle users to make a modal shift could be

measured and explained, while the main factor of pull strategy that attracts people to using public transportation could also be identified.

Qualitative data for this research were analyzed in a semi-structured coding analysis. Coding analysis was used because it was analyzing interview data, in which open coding could help the researcher to distinguish concepts and categories in the data. The distinct concepts and categories then would forming the basic units of analysis (Miles and Huberman, 1994). Besides that, using coding analysis allowed researcher to bring different perspectives of key informants to the data analysis (Newcomer, Hatry, et al., 2015).

Topics for the interview guide were based on the indicators of variables used in this research. However, interview topics were also left open in order to find new information or new indicators based on the results of interviews with key informants. The initial topic list for collecting data and information for qualitative data are enclosed in Annex 1 Research Instrument part C Interview Guide for Transportation Policy Operator/Developer. Some of the topics used to make codes for analyzing the qualitative data based on interviews with key informants are as follows:

Table 6 List of Codes

No.	Topics	Sub-topics	Codes
1	Pull strategy	Bus operator	BO
2		Bus regulator	BR
3		Operational buses	OB
4		Standard Operational	SO
5	Transportation policy development	Transportation development	Tr.Dev
6		Policy development	Pol.Dev
7		Integration policy	Int.Pol
8	Push strategy	Parking policy	Pr.Pol
9		Parking pricing	Pr.Prc
10		Vehicle tax	Veh.Tax
11		Financing	Finc
12	Threats and challenges	Threat	Thr
13		Challenge	Chl

Sources: Data Analysis, 2016

Analyzing qualitative data took place manually using Microsoft Excel as medium for data processing. This took place manually because there were only 8 key informants, so the data could be handled manually without using software such as Atlas Ti.

The data analysis process started by making a transcription of the interviews with key informants. The interviews were recorded to avoid loss of important information. The results of interviews then were grouped in the table based on the list of sub-topics, and were given codes for each important statement or argument relating to the topics and/or sub-topics. Finally, the sorting of data and information was done by summarizing the important information. The researcher used the main research question to identify information needed from the qualitative data analysis, as well as looking for patterns of information that could be used.

The qualitative data analysis was expected to explain the combination of push and pull strategies that had been implemented and/or would be implemented by the government as part of TDM policy implementation. Furthermore, expectations were that a combination of policies, which could reduce the extent of private vehicle use by promoting public transportation, had been implemented comprehensively in order to achieve effective results.

3.6 Data Sampling: Sample Size and Collection

This research used two different sampling techniques in collecting quantitative and qualitative data. For quantitative data (questionnaire) this research used stratified probability random sampling. This technique was used because a sampling frame was created based on some criteria for the two categories of groups of respondents, namely users of private vehicle and users of Trans Jogja, and drew a random sample from each group (Neuman, 2006). The selected criteria for choosing respondents for collecting quantitative data were:

- They were commuters;
- They used the public transportation service (Trans Jogja), so they should live – and/or perform daily activities – in Yogyakarta City;
- They had a driving license, so they could choose between using a private vehicle and/or public transportation (Trans Jogja);
- They were in a productive age-group (17-65 years old)

Data limitation meant that the research population used was restricted to the number of inhabitants in Yogyakarta city. This was used for counting the sampling for this research. However, the size of the population was restricted based on the criteria for this research (age-group 17-65 years old). Because of the limitation, the researcher had to make sure both groups of respondents were more or less the same size.

Slovin's formula was used to count the number of respondents needed. The use of this formula helped the researcher to get a sample size which would have reasonable accuracy of results to represent the population as a whole, because it was not possible to study the entire population. By using Slovin's formula, the researcher could decide on the confidence level of sampling to represent the population. The number of respondent counted using Slovin's formula (1960) was:

$$n = \frac{N}{(1 + (N \times e^2))}$$

N = Number of population;

n = Number of sampling;

e = Error tolerance.

For this research, the population of Yogyakarta City was 402,709 inhabitants. The percentage of the age-group 17-65 years (targeted respondents) was 69.1%. So that N or the population for this research was:

$$N = 69.1\% \times 402,709 = 278,272 \text{ (inhabitants)}$$

This research had a confidence level of 93% with a 7% margin of error. Based on Slovin's formula and the information mentioned above, the sample number for this research should be:

$$n = \frac{N}{(1+(N \times e^2))} = \frac{278,272}{1 + (278,272 \times 0.07^2)} = \frac{278,272}{1,364.53} = 203.93 \sim 204 \text{ (respondents)}$$

Qualitative data for this research were collected by carrying out interviews based on single purposive sampling as sampling technique. Single purposive sampling was used because respondents/key informants were chosen based on their knowledge and informative purpose, so the assumption was that they would provide the researcher with a deeper knowledge (Neuman, 2006). Key informants from local agencies were approached by making appointments and visiting their office.

However, because of the limitation of time for data collection process, surveys were conducted in parallel by spreading the questionnaires and interviews, so that both data collections were conducted in the same period of time. Respondents from the group of private vehicle users were approached by using on-line survey, while respondents from the group of Trans Jogja's users were approached by conducting direct survey at the bus station.

3.7 Data Reliability and Validity

Reliability has a function of accuracy and consistency in terms of variable measurement (Thiel, 2014). The accuracy of this research were obtained by designing a questionnaire and an interview guide as correctly and precisely as possible. They were designed based on the theory used to measure variables. The researcher tried to distinguish clearly the different values between independent and dependent variables. This took place by measuring each variable with different indicators. In addition, the researcher also conducted the research as clearly as possible at every stage, from preparation up until the analysis data process. Moreover, triangulation data were obtained by using several data sources in order to increase the reliability of the research. In the same way, the value of the repeatability of this research is that a concept and pattern was used that can probably be used for further studies and/or similar topics of study about a modal shift in a different case.

External validity refers to whether or not the findings of the study can be generalized to a similar situation, while internal validity refers to the cogency of the study (Thiel, 2014). In this research, external validity was measured through a process of defining the research sample to represent the research population precisely. The assumption is that the results of this research could be generalized to a larger population. However, because of the limited research time, the calculation of research samples for this study did not use the highest confidence level (100%). The researcher only has a 93% confidence level in the research sample, which would result in a 7% error if the results of this research were to be generalized for a larger population.

Internal validity was measured based on whether the data and information obtained were measured adequately based on the theory used and whether they had been operationalized. Operationalization was based on structuring the research operationalization consistently, from concept to indicators, so that the indicators were capable of measuring the variables validly. For instance, the dependent variable in this research was the modal shift which was measured by the commuter's modal choice. Furthermore, internal reliability was also measured based

on the existence of causalities of both independent and dependent variables. To be certain of the internal validity in this research, it was important to be certain about the exclusivity of variable measurements, so that the two variables did not have same indicators for measuring their values. Furthermore, conducting data triangulation was also important in realizing the internal validity of this research. This research used three data collection methods, which were a combination of survey, interview, and secondary data collection.

Chapter 4: Research Findings and Analysis

4.1 Description of the Scope of the Study:

Development and Implementation Process of Trans Jogja

Based on the interview with an informant from the Infrastructure Development Section, Planning and Regional Development Agencies of Yogyakarta Special Region, before 2008 the public transport provision in Yogyakarta was operated by a regular cooperative company and the buses were private property. At the time, the operator did not have specific standards for the service provided. This is regarded as one of the reasons why people were less attracted to public transportation, so in 2005 transportation in Yogyakarta was dominated by private vehicles.

Table 7 Development and Implementation Process of Trans Jogja (2005 – 2016)

2005 - 2007	<ul style="list-style-type: none">• Feasibility study for public transportation reform in Yogyakarta;• Socialization of the new public transportation form (Trans Jogja);• Preparation for the management board of Trans Jogja;• Forming the consortium company (PT. Jogja Tugu Trans) as operator of Trans Jogja.
2007	<ul style="list-style-type: none">• Government in provincial level made a cooperation agreement with the government in city level
2008	<ul style="list-style-type: none">• Trans Jogja was started to implement, with the operationalization of 54 buses and 6 routes
2008 - 2015	<ul style="list-style-type: none">• Trans Jogja had been operated by PT. Jogja Tugu Trans (PT. JTT), Department of Transportation, Yogyakarta Special Region as regulator
2015 - Present	<ul style="list-style-type: none">• Trans Jogja has been operated by operating 74 unit buses and 8 routes;• System of Trans Jogja has been managed and operated by PT. Anindya Mitra Internasional (PT. AMI).
Future Development	<ul style="list-style-type: none">• There will be 167 units of bus operated with 17 routes of bus.

Source: Data Analysis, 2016

The process of developing Trans Jogja as a public transportation service provided by the government started in 2005, whereby the provincial Department of Transportation conducted several studies for its implementation, such as a feasibility study to reform the public transport system, socialization for the program (Trans Jogja), forming a cooperation between the provincial government and the operator of Trans Jogja, and preparations for the management board of Trans Jogja. At the time, the operator of Trans Jogja was proposed in the form of a consortium consisting of existing public transport cooperative organizations, so that Trans

Jogja would not be operated privately, as it would be operated by the consortium company named PT-Jogja Tugu Trans (PT-JTT).

In 2007, the provincial government entered into an agreement with the local government at city level by drawing up a Memorandum of Understanding (MoU) in which the city government declared that they wanted to contribute towards developing public transport services in Yogyakarta urban area. The government of Yogyakarta City supported the provincial government by donating 20 units of buses to Trans Jogja and by building 34 bus stations in Yogyakarta City. The implementation of Trans Jogja as a new system for public transport in Yogyakarta started in 2008, with the operationalization of 54 units of buses and 6 bus routes.

Figure 4 Trans Jogja bus



Source: Field Survey, 2016

The provincial government (Department of Transportation) had an agreement with the operator, PT-Jogja Tugu Trans, to provide Trans Jogja services between 2008 and 2015. The agreement ended at the end of 2015. Unfortunately, no preparation took place in terms of transferring the function from PT-JTT as an operator to another company. The Department of Transportation decided to make a direct assignment to PT-Anindya Mitra International (PT-AMI) to operate Trans Jogja. In this case, PT-AMI is a regionally owned enterprise.

Institutionally, Trans Jogja was regulated by the Technical Implementation Unit of Trans Jogja (*Unit Pelaksana Teknis Daerah - UPTD*), the Department of Transportation, Communication, and Informatics, Yogyakarta Special Region. Having a role as a regulator in providing the public transportation service, the Department of Transportation has the authority to conduct surveillance of Trans Jogja's service provision.

In providing the service, the Trans Jogja operator must refer to the minimum service standard prepared by UPTD Trans Jogja. The minimum service standard for Trans Jogja is a service standard provided by the Ministry of Transportation and is generally applicable in Indonesia. However, the Department of Transportation of Yogyakarta Special Region combined it with the local regulations, adjusted it according to local conditions, and made this the minimum service standard for Trans Jogja. The minimum service standard of Trans Jogja regulates how

the operator provides the service, covering such matters as bus speed to set the headway or bus interval, cleanliness, and safety to meet the minimum standard set by the government.

Figure 5 Bus Routes of Trans Jogja 2016



Source: Technical Implementation Unit of Trans Jogja (Unit Pelaksana Teknis Daerah - UPTD) Department of Transportation, Communication, and Informatics, Yogyakarta Special Region, 2016.

Currently, 74 buses are in operation that serve eight Trans Jogja bus routes. The current number of buses in operation is not regarded as meeting the people's needs for public transportation. It still does not have significant influence in attracting people to use Trans Jogja as their main choice of transportation mode, the objective being to reduce the amount of private vehicle use in Yogyakarta urban area.

Future developments are that the government is to provide 167 units of buses, operating on 17 routes, which is expected to be capable of serving the mobility of people in the Yogyakarta urban area, providing shorter headway of buses, and an extensive bus route coverage. The number of buses and routes needed is based on a the feasibility study conducted by the Study Center of Transportation and Logistics (*Pusat Studi Transportasi dan Angkutan Logistik* (PUSTRAL)), University of Gadjah Mada Yogyakarta and the Sustainable Urban Transportation Improvement Project (SUTIP) funded by GIZ (International Cooperation of

Germany). It is also in line with the ‘1000 BRT’ program declared by the Ministry of Transportation.

4.2 Description of Sources and Respondents

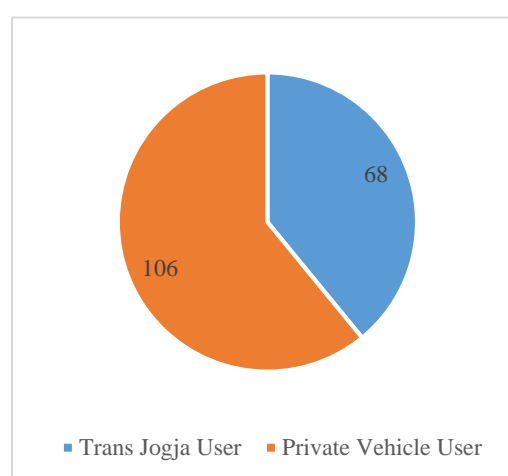
The process of collecting data for this research involved: doing surveys of two groups of respondents (Trans Jogja users and private vehicle users); holding interviews with key informants such as transportation policy-makers as well as the public transportation operator in Yogyakarta; and also analyzing secondary data such as local regulations and regional planning documents. This part explains the data collection process that was conducted.

4.2.1 Respondents for the Survey

This research involved two group of respondents, namely Trans Jogja users, representing users of public transportation in Yogyakarta, and private vehicle users. In total, 108 Trans Jogja users participated in this research, in addition to 122 private vehicle users.

Unfortunately, not all respondents who participated met the necessary criteria. Some respondents did not meet the criterion of owning a private vehicle and having a driving license. Of the 230 respondents for both groups, 37 respondents did not own a private vehicle, and 46 respondents did not have a driving license. In addition, some of them were in the age-groups < 17 (less than 17 years old) and > 65 (more than 65 years old), so they were not in the productive age-group and also had to be omitted.

Figure 6 Group of Respondents



Source: Data Analysis, 2016

The reduction in the number of respondents' data and information took place based on the respondents' criteria necessary for this research. After reducing the number of respondents who met the respondents' criteria for this research, the final number of respondents to be analyzed were 68 Trans Jogja users and 106 private vehicle users. Most respondents who did not have a private vehicle or a driving license were Trans Jogja users, so the number of respondents from the group of Trans Jogja users decreased drastically.

4.2.2 Respondents by Age and Gender

The group of Trans Jogja users was made up of 32 men and 36 women who participated as respondents, and who were then divided into 7 age-groups. Respondents from the age-groups 17-25 and 26-35 years dominated as respondents in this research, because they were more reachable in the process of data collection by distributing questionnaires directly at the bus station.

In the same way, there were 56 men and 50 women in the group of private vehicle users who participated as respondents. They too were divided into 7 age-groups, and respondents from age-groups 17-25 and 26-35 years dominated this group as well. In this case, questionnaires for private vehicle users were distributed by means of an on-line survey in which people who have more access to on-line surveys were people in both age-groups (17-25 and 26-35 years).

Table 8 Number of Respondents Based on Gender and Age Group

Group of Respondents		Trans Jogja User		Private Vehicle User		Total	
		Total	%	Total	%	Total	%
Gender	Male	36	52.9	56	52.8	92	52.9
	Female	32	47.1	50	47.2	82	47.1
	Total					174	100.0
Age	17 - 25	22	32.3	39	36.8	61	35.0
	26 - 35	17	25.0	32	30.2	49	28.2
	36 - 45	15	22.1	13	12.3	28	16.1
	46 - 55	8	11.8	13	12.3	21	12.1
	56 - 65	6	8.8	9	8.4	15	8.6
	Total					174	100.0

Source: Data Analysis, 2016

After dividing the respondents based on age and gender, a Chi-Square test on SPSS was conducted to examine the statistical significance of the difference between the two groups. The test results show that there was no statistically significant difference between the two groups of respondents based on gender. The 'Pearson Chi-Square' row shows a value of $p = 0.989$, in which $p \geq 0.05$, which means that men and women were equally represented as respondents in both groups. It actually shows the number of respondents based on gender, in which the total number of male respondents as well as female respondents in both groups did not differ greatly.

Table 9 Statistical Measurement of Respondents Based on Gender and Age

Chi-Square Tests Based on Gender of Respondents

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	,000 ^a	1	,989	1,000	,556
Continuity Correction ^b	,000	1	1,000		
Likelihood Ratio	,000	1	,989		
Fisher's Exact test					
Linear-by-Linear Association	,000	1	,989		
No. of Valid Cases	174				

a. 0 cells (0.0%) have an expected count of less than 5. The expected minimum count is 32.05.

b. Computed only for a 2x2 table

Chi-Square tests Based on Age Group of Respondents

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	3,112 ^a	4	,539
Likelihood Ratio	3,050	4	,549
Linear-by-Linear Association	,499	1	,480
No. of Valid Cases	174		

a. 0 cells (0.0%) have an expected count of less than 5. The expected minimum count is 5.86.

Source: Data Analysis, 2016

In the same way, a Chi-Square test was conducted to test for significance of respondents based on age. Values of p in the Chi-Square test shows that $p = 0.539$ in which $p \geq 0.05$. This means that there was no statistically significant difference between the respondents based on age for both of groups, the Trans Jogja users and the private vehicle users.

In conducting this research, the number of respondents based on age was controlled to avoid accumulation in one group. Even though the respondents of this research were dominated by people in age-groups 17-25 and 26-35 years, nonetheless the distribution of respondents was maintained, so no large differences existed for each group. Therefore, there was no statistically significant difference between the two groups based on age.

4.2.3 Respondents by Education Level and Income

In this research, in addition to dividing the respondents based on age and gender, the respondents were also divided based on their education level and personal income. Dividing the respondents into several groups based on educational level and personal income aimed at explaining the influence of social economic status on their decision when choosing a transportation mode. Further analysis is explained in the correlation analysis of this chapter.

The number of respondents based on education level is related to the number of respondents based on age-group. As explained above, most respondents were in the age-groups 17-25 and 26-35 years. In line with this, the respondents were dominated by people who graduated from senior high school and have a bachelor's degree. There were 28 Trans Jogja Users (30%) who had graduated from senior high school, and 20 with a bachelor's degree. Of the private vehicle users who participated, 50 (50%) have a bachelor's degree, 23 have a master's degree, and 22 were senior high school graduates. Based on the data collected, the education level of private vehicle users was higher than that of Trans Jogja users.

Table 10 Number of Respondents based on Education Level and Personal Income

Group of Respondents		Trans Jogja User		Private Vehicle User		Total	
		Total	%	Total	%	Total	%
Education Level	Elementary School	1	1.5	2	1.9	3	1.7
	Junior High School	2	2.9	1	0.9	3	1.7
	Senior High School	28	41.2	22	20.8	50	28.7
	D1/D3 (Vocational College)	11	16.2	4	3.8	15	8.6
	D4/S1 (Bachelor Degree)	20	29.4	50	47.2	70	40.2
	S2 (Master Degree)	6	8.8	23	21.7	29	16.7
	Dr/PhD	0	0.0	4	3.8	4	2.3
Total						174	100.0
Personal Income	< IDR 1,500,000	22	32.4	25	23.6	47	27.0
	IDR 1,550,000 - IDR 3,000,000	25	36.8	35	33.0	60	34.5
	IDR 3,050,000 - IDR 5,000,000	13	19.1	27	25.5	40	23.0
	IDR > 5,000,000	8	11.8	19	17.9	27	15.5
	Total					174	100.0

Source: Data Analysis, 2016

On the other hand, respondents in this research were distributed almost equally based on personal income per month. The regional minimum wage in Yogyakarta city is about IDR 1,452,400 per month. Almost 30% of the respondents in each group (25 Trans Jogja users and 35 private vehicle users) had a personal income of about IDR 1,550,000 – IDR 3,000,000 per month. However, less than 20% respondents among both Trans Jogja users and private vehicle users (8 people and 19 people respectively) had a monthly income in excess of IDR 5,000,000.

4.2.4 Key Informants for the Interview

Besides conducting a survey by distributing a questionnaire to respondents, the researcher conducted interviews with eight key informants who are connected with transportation policy in Yogyakarta. These key informants have roles as policy-maker or policy-developer; regulator of Trans Jogja public transportation provided by the government; operator of Trans Jogja; and technical advisor assisting the government of Yogyakarta Special Region in the process of developing Trans Jogja as a system for providing public transport services. These key informants are:

1. Head of Infrastructure Development Section, Planning and Regional Development Agencies of Provincial Government, Yogyakarta Special Region;
2. Head of Urban Transport Sector, Department of Transportation of Yogyakarta City
3. Former Head of Urban Transport Sector (Initiator of Trans Jogja), Department of Transportation of Yogyakarta City;
4. Head of Regional Expenditure, Department of Regional Revenue, Management, and Asset Finance, Yogyakarta Special Region;
5. Former Technical Advisor for Sustainable Urban Transportation Improvement Project (SUTIP) funded by GIZ (International Cooperation of Germany);
6. Staff of Technical Implementation Unit of Trans Jogja, Department of Transportation, Communication, and Informatics, Yogyakarta Special Region;
7. Staff of Traffic Management Sector, Department of Transportation, Communication, and Informatics, Yogyakarta Special Region;
8. Staff of Operations for Trans Jogja, PT-Anindya Mitra International, Yogyakarta (current operator of Trans Jogja).

4.2.5 Secondary Data

Based on the interviews with key informants, use was made of some planning documents and local regulations used in developing transportation policy in Yogyakarta. After reviewing some of the documents, it turned out that several documents relate to the analysis for this research so these were used as secondary data to support the analysis process for this research. Those documents are:

1. Medium Term Development Plan of Yogyakarta Special Region, 2012-2017;
2. Local Regulation of Yogyakarta Special Region Number 3 on 2011 on Regional Tax;
3. Local Regulation of Yogyakarta City Number 18 of 2009 on Parking Policy;
4. Local Regulation of Yogyakarta City Number 19 of 2009 on On-Street Parking Levy;

4.3 Willingness to Make a Modal Shift

As dependent variable in this research, the willingness to make a modal shift could be defined as respondents' choice of whether or not they would shift from private vehicle use to Trans Jogja. Both groups of respondents were asked whether or not they would use Trans Jogja in the future. Their replies were divided into 3 groups: yes; no; and maybe.

Based on their replies, 70% of respondents from the group of Trans Jogja users said they would use Trans Jogja in the future. However, 14 people were not sure whether they would still use Trans Jogja or not, and 5 Trans Jogja users said they would not use Trans Jogja in the future. Similarly, 65.1% (69 people) of private vehicle users said they would be willing to use Trans Jogja in the future, and 37 people said they would still use their private vehicles.

Table 11 Statistical Measurement for Willingness to Make a Modal Shift Based on Group of Respondents

Willingness To Use Trans Jogja in The Future * Group of Respondents Cross-tabulation

		Group of Respondents				Total	
		Trans Jogja User		Private Vehicle User		Total	
		Total	%	Total	%		
Possibility of using Trans Jogja in the Future	Yes	45	70.3	69	65.1	114	67.1
	No	5	7.8	37	34.9	42	24.7
	Maybe	14	21.9	0	0.0	14	8.2
Total		64	100.0	106	100.0	170	100.0

Chi-Square tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	35,206 ^a	2	,000
Likelihood Ratio	41,576	2	,000
Linear-by-Linear Association	2,705	1	,100
No. of Valid Cases	170		

a. 0 cells (0,0%) have an expected count of less than 5. The expected minimum count is 5,27.

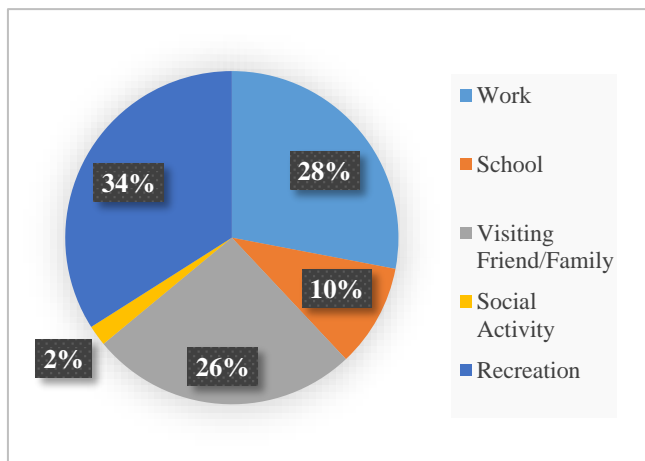
Source: *Data Analysis, 2016*

A Chi-Square test was used to test for a significant difference between the two groups regarding their willingness to make a modal shift. The value of $p = 0.000$, in which $p \leq 0.05$, means that there is a statistically significant difference between the two groups. Looking at the number of responses, Trans Jogja is still attractive to current users and they would continue to choose it as their mode of choice. In comparison, the number of respondents from the group of private vehicle users who were not attracted to Trans Jogja is quite high, meaning they would continue to use their own private vehicles and would not switch to using Trans Jogja. Nonetheless, 65.1% of private vehicle users did say they would probably switch to use Trans Jogja. However, several conditions apply to their answers.

The respondents who said they would not use Trans Jogja in the future said Trans Jogja offered them less flexibility, so it was quite hard for them to use public transportation for their daily activities. Furthermore, the poor physical condition of some of Trans Jogja's buses also made them hesitate to use Trans Jogja.

On the other hand, some respondents thought that Trans Jogja has several positive conditions which could result in them using Trans Jogja in the future. In their opinion, Trans Jogja provides a comfortable service at a cheap price, and it is also accessible. Some thought that using Trans Jogja could decrease traffic congestion in Yogyakarta. However, they stated that Trans Jogja still needs to improve and develop the quality of its service.

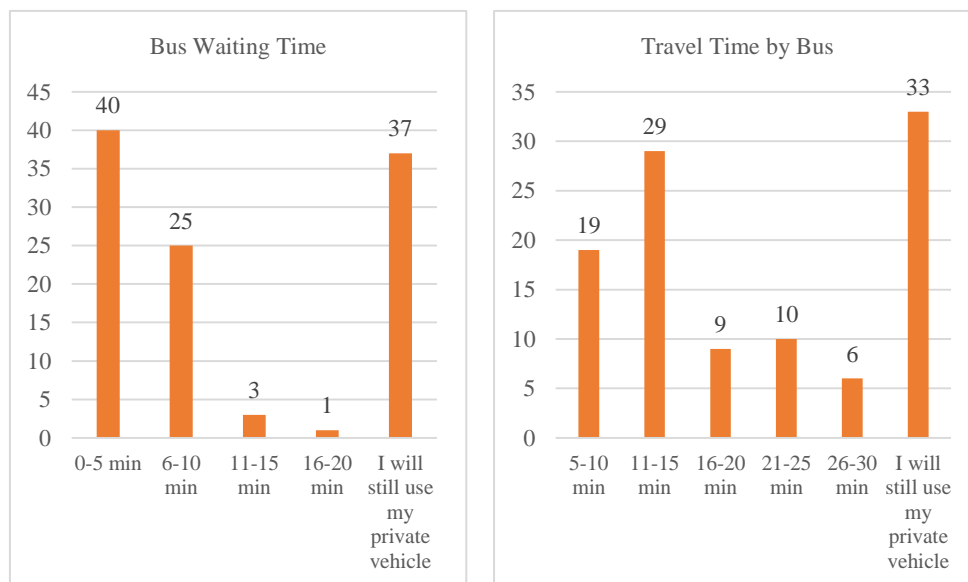
Figure 7 Reason for Using Trans Jogja by Trip Purpose



Source: Data Analysis, 2016

Both groups of respondents have their own reasons for using Trans Jogja or still using their own private vehicles. The reasons are mostly based on their personal interests and needs. Trans Jogja users were asked for what travel purpose they mostly use Trans Jogja. It seems that Trans Jogja users do not use Trans Jogja for all their travel purposes. Travel purpose reason for using Trans Jogja: Thirty four percent (34%) of respondents use Trans Jogja for recreational purposes, while 28% of them use Trans Jogja for work. Moreover, 26% respondents chose Trans Jogja as their mode choice to visit friends/family. Few respondents use Trans Jogja for social activity or a school-related travel purpose (2% and 10% respectively).

Figure 8 Willingness of Private Vehicle Users to Make a Modal Shift Based on Bus Waiting Time and Travel Time by Bus



Source: Data Analysis, 2016

Private vehicle users were also asked about three conditions that would probably affect their choice of using Trans Jogja. Those conditions were bus waiting time; travel time by bus; and travel costs.

Of the respondents from the group of private vehicle users who said they would be willing to use Trans Jogja in the future, 40 would use Trans Jogja if the bus waiting time was about 0-5 minutes. Moreover, 25 people said that they would use Trans Jogja if the bus waiting time was about 6-10 minutes. Looking at their willingness based on travel time by bus, 29 private vehicle users stated that they would use Trans Jogja if they had 11-15 minutes in road travel time by bus; and 19 said they would choose Trans Jogja if they had 5-10 minutes travel time by bus.

Figure 9 Willingness of Private Vehicle Users to Make a Modal Shift



Source: Data Analysis, 2016

In addition, private vehicle users were asked about their willingness to make a modal shift based on travel costs of Trans Jogja. Based on their responses, it seems that travel costs did not influence their choice on whether or not to choose Trans Jogja as their mode of transportation. It shows that 43 respondents said they would be willing to use Trans Jogja as long as a good and comfortable service is provided. The assumption is that quality of service is more important in getting them to make a modal shift than travel costs.

4.4 Push Strategies

Transportation policies as push strategies have been prepared comprehensively to support pull strategies (in this case Trans Jogja) in promoting public transport use and controlling the use of private vehicles. In Yogyakarta, some programs have been implemented as push strategies in line with the objective of transport demand management. A key informant from the Infrastructure Development Section of Planning and Regional Development Agency mentioned some programs such as the development of a pedestrian zone in the Malioboro area (a famous street in Yogyakarta and center of historical and cultural events); off-street parking; park and ride; encouraging the development of non-motorized transportation (such as pedicabs –“*becak*” – and creating a bicycle lane); and modification of traffic management by implementing one-way traffic flows in the city center to support public transportation routes. The implemented programs prioritized public transportation, encouraging more people to use public transportation.

In some situations, transportation policies as push strategies are inconvenient for users of vehicles on roads. However, an informant from UPTD Trans Jogja said this is one of the methods to reduce the comfort of private vehicle users and make them switch to public transportation.

4.4.1 Transportation Policy Development Process

In the process of policy development, the role of Planning and Regional Development Agency is to make planning and concepts that must be followed until those concepts have been implemented properly. However, in addition to making proper preparations, the implementation process also needs to be promoted, which in turn requires the involvement of finance in implementing the program.

One of the key informants in the Technical Implementation Unit of Trans Jogja (UPTD Trans Jogja) stated that developing transportation policy is not only about developing technical policy, as it also affects and is affected by social and cultural conditions, local regulations and policy, as well as local history. The development of inter-sectoral policy is therefore also needed to support the development of transportation policy. Inter-sectoral policy should be conducted in well-developed synergy and should be continued with integrated coordination. The key informant in the Traffic Management Section, Department of Transportation added that continuous communication is necessary in order to arrive at the same understanding before implementing the concept of transportation policy.

In relation to developing transportation policy in Yogyakarta, the provincial government refers to regional regulations regarding the medium-term development plan (*Rencana Pembangunan Jangka Menengah – RPJMD*) of Yogyakarta before making decisions on developing policies, in this case transportation policies. However, an informant from the Infrastructure Development Section, Planning and Regional Development Agencies of Yogyakarta Special Region explained that transportation policy development in Yogyakarta was initiated after the emergence of transportation problems. For instance, developing policy for providing public transportation was initiated after the occurrence of such urban transportation problems as traffic congestion and air pollution. In this case, transportation policy was not initiated based on considering the needs of people in Yogyakarta, such as their mobility characteristics, and whether or not they need public transportation. Therefore, policy-makers in Yogyakarta are not willing to take risky decisions in developing transportation policy. For instance, the key informant in the Traffic Management Section of Department of Transportation said that policy for traffic management to reduce the use of private vehicles did not take an extreme form, but merely regulates traffic management capacity. Nonetheless it does not yet prohibit or restrict the use of private vehicles, because regulating the use of private vehicles would not be an easy task.

4.4.2 Implemented Transportation Policy as Push Strategies in Yogyakarta

Based on the interviews with key informants, especially on the side of the government, three implemented transportation policies can be regarded as push strategies in transport demand management in Yogyakarta. These policies are vehicle tax, parking management, and restricted road use policy.

1. Parking Management

Based on the local regulation of parking policy (Local Regulation of Yogyakarta City Number 18 of 2009 on Parking Policy, 2009), there are four types of parking location, namely on-street parking; off-street parking; privately-owned off-street parking; and temporary parking lots. The

informant from the Traffic Management Section, Department of Transportation, Yogyakarta Special Region, stated that parking management is the responsibility of each local (city level) government. However, being aware of the limited financial capacity of local government, the provincial government has provided financial support, specifically to build a parking infrastructure for off-street parking. The city government is under an obligation to manage and maintain the parking infrastructure.

The government – both on a city level as well as a provincial level – tried to implement a policy of progressive parking pricing in Yogyakarta urban area. An informant from the Department of Transportation in Yogyakarta City said that policy for differentiated parking pricing based on four different zones in the urban area was implemented in 2009 (Local Regulation of Yogyakarta City Number 19 of 2009 on On-Street Parking Levy, 2009), whereby the price for the core zone is higher than for the outer zone. At first, they assumed implementing progressive parking pricing would slightly reduce the use of private vehicles in the urban area. However, this policy did not work effectively at the time because parking attendants in the outer zone eventually charged the same price as in the core zone of the urban area. As a result, the policy had no influence on private vehicle users in minimizing the use of their vehicles in the urban area. Parking pricing eventually returned to past policy, which imposes the same parking rate in all zones of Yogyakarta.

Figure 10 Off-Street Parking ‘Abu Bakar Ali’



Source: Field Survey, 2016

The government is still forming other transportation policy that is expected to reduce the number of private vehicles passing through the Yogyakarta urban area and thus minimize urban transportation problems. Nonetheless, the government has not yet decided on reducing parking place availability, as people in Yogyakarta still depend on parking places, so there is still a high demand. To support the implementation of Trans Jogja in terms of allowing public transport easy road access, the government has tried to reduce the amount of on-street parking and replace it with off-street parking (parking building).

2. Restricted Road Policy (Pedestrian Zone Development in the Malioboro Area)

The Malioboro area is located in Yogyakarta's city center which is famous for social and economic activities, and as a cultural tourist attraction, as well as being the center of cultural events in Yogyakarta. Pedestrian-zone development in the Malioboro area is a transportation infrastructure development program that is expected to give priority to pedestrians, non-motorized transport, as well as public transportation in that area. This program is the implementation of a traffic management strategy for minimizing the use of private vehicles in

the city center.(Yogyakarta Special Region Local Regulations No. 6 of 2013 on Medium-term Development Plan in 2012-2017, 2013). This program is also supported by other physical strategies, such as building an off-street parking building. An informant from the Sustainable Urban Transportation Improvement Project (SUTIP), funded by GIZ (International Cooperation of Germany), stated that pedestrian-zone development in Malioboro areas is one of the corridor improvement programs related to public transport development and parking management as part of the comprehensive implementation of transport demand management in Yogyakarta.

Figure 11 Pedestrian Way in Malioboro Area

Before Parking Relocation



After Parking Relocation



Source: GIZ-SUTIP, 2013; Field Survey, 2016

Before this program was implemented, pedestrian paths along the main street of this area were used as parking places for motorcycles. This program was initiated in 2012 and implemented in 2016. The starting point for implementation was the relocation of parking places for motorcycles from the main street to off-street parking (a parking building) located at one of the entry points to the area and known as the *Abu Bakar Ali* Parking Building. Since relocating the motorcycles that used to be parked along the main street, the pedestrian paths in the Malioboro area have returned to their original function: intended only for pedestrians. Currently, all kinds of vehicles (public transportation and private vehicles) can pass through the main street of the Malioboro area. However, one of the informants from the Infrastructure Development Section of Planning and Regional Development Agency stated that by 2018 private vehicles would be restricted from using the main street of the Malioboro area and only non-motorized transportation, public transport, emergency vehicles (ambulance and/or firefighters), and vehicles with a state-interest purpose will be allowed to pass through the street. An informant from the Traffic Management Section of Department of Transportation added that by restricting private vehicle use on the main street of the Malioboro area, Trans Jogja will be expected to transport people to the center of the Malioboro area, or people will be encouraged to walk from the Abu Bakar Ali Parking Building in that area, thus minimizing the use of private vehicles in the city center, and reducing traffic congestion as well as air pollution.

3. Vehicle Tax

There are 5 regional tax sources for Yogyakarta Special Region, namely vehicle tax, vehicle fuel tax, vehicle-ownership transfer fee; surface water tax; and cigarette tax (Local Regulation

of Yogyakarta Special Region Number 3 on 2011 on Regional Tax, 2011). Three of these sources relate to vehicle use in Yogyakarta. This is in line with the statement of an informant from the Planning and Regional Development Agency, who said that the current main source of regional revenue is from taxes related to vehicle use because Yogyakarta does not have natural resources capable of generating regional revenue. As this is the case, it would be difficult to restrict vehicle ownership in Yogyakarta by controlling vehicle tax as this is the main regional source of revenue for Yogyakarta Special Region.

Actually, the local regulation also regulates progressive tax fees for subsequent vehicle ownership (the second, third and so on) of households registered at the same address. However, the level of progressive tax fees is still relatively low, about 2-3.5% for each vehicle. Furthermore, tax is only paid once a year, which probably puts no pressure on the owner. The informant mentioned that the government is aware that the number of private vehicles in Yogyakarta needs to be reduced due to the transportation problems they cause (such as traffic congestion and air pollution). On the other hand, it will be hard for the government to restrict private vehicle ownership as this would decrease their own revenues. This contradictory situation means that regulating vehicle tax to control private vehicle ownership in Yogyakarta is probably ineffective as a push strategy to decrease private vehicle use in Yogyakarta, even though the government is aware of the transportation problem due to the use of private vehicles in Yogyakarta. From another perspective, they really depend on vehicle ownership in Yogyakarta as it forms the government's main source of finance.

4.4.3 Challenges and Threats

An informant from the UPTD Trans Jogja and Infrastructure Development Section of Planning and Regional Development Agency stated that rigid bureaucratic processes with their many layers have become an indirect obstacle to the policy implementation process in solving Yogyakarta's transportation problems. For instance, to implement one or more policies and/or programs, policy-makers in technical agencies such as the Department of Transportation need to propose them to the executive board, and are only able to start working on a proposed policy at least two years after it has been approved by the executive board.

In addition, coordination between technical agencies sometimes lacks synchronization because of the different of interests they have in the implementation process. Each technical agency has its own concepts and ideas.

Apart from threats from within the government system, external threats apply to some aspects, in that people do not yet understand the importance of implementing transportation policy and are even less aware of urban transportation problems. Changing the mind-set of people is not an easy task that can be done in a short time, as it is embedded in a people's culture and behavior. In this case, comprehensive policy is needed to increase their awareness. An informant from the Infrastructure Development Section, Planning and Regional Development Agency stated that the government needs to show serious commitment in providing public transport services in order to build public trust and increase public awareness.

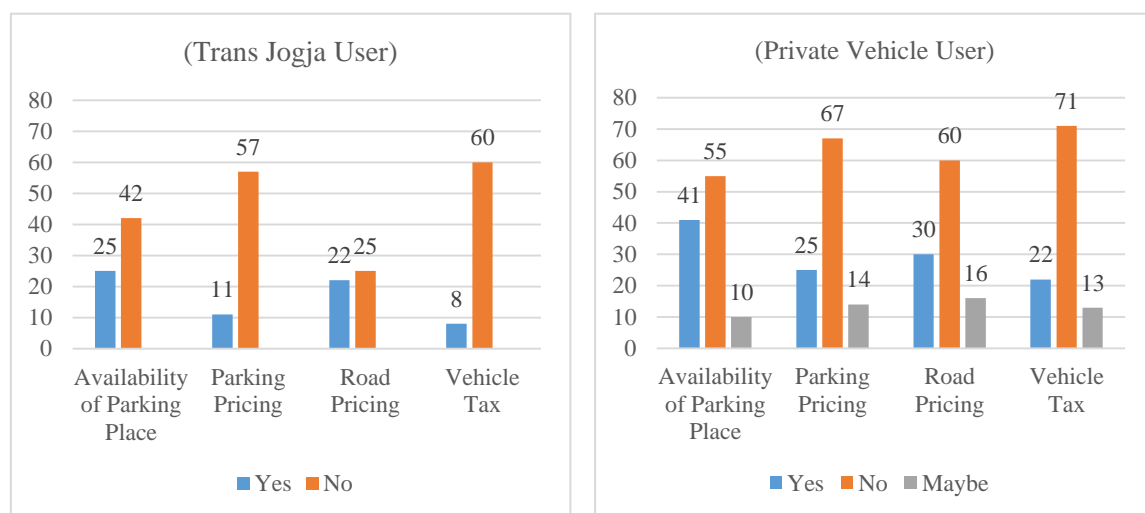
Above all, as stated by an informant from the SUTIP-GIZ, development plans and concepts will be implemented properly if there is a strong political will, especially in connection with

the need of a comprehensive policy in the form of push and pull strategies which require powerful coordination and synchronized policy among technical agencies connected with the implementation process of Yogyakarta's transportation policy.

4.4.4 Influence of Push Strategies on Making a Modal Shift

The result of interviews with key informants explains how there are three main transportation policies that can be defined as push strategies in transport demand management in Yogyakarta. These policies are parking management, restricted or controlling road use and capacity; and vehicle tax. Respondents to the surveys in two groups (Trans Jogja users and private vehicle users) were asked whether certain transportation policies would affect their decision to choose Trans Jogja as their main transportation mode, namely the availability of parking places, parking pricing, road pricing, and vehicle tax. To adjust with the results of interviews with the key informants, road pricing was representing as an example of policy for restricting or controlling road use and capacity.

Figure 12 Influence of Push Strategy on Use of Public Transportation



Source: Data Analysis, 2016

Based on their perceptions of both groups, transportation policies in the form of push strategies did not significantly influence respondents in choosing Trans Jogja as their mode of transportation. The answer “no” dominated all questions for both groups of respondents. It can be assumed that the implementation of transportation policies in the form of push strategies has little influence, both on users of Trans Jogja and private vehicle users, on making a modal shift to Trans Jogja.

The responses collected show that some respondents think that the availability of parking places in Yogyakarta still meets the needs of private vehicle users. This highlights the fact that most of their final destinations have parking places, so reducing public parking places will probably have little influence on reducing the use of private vehicles. Moreover, most respondents also stated that parking pricing in Yogyakarta is still affordable for them. However, parking pricing would have an impact on their decision if progressive parking pricing were to be implemented, whereby the price was per hour as this would put pressure on private vehicle users to minimize use of their own vehicles.

**Box 1 Direct Statement of Respondents on
Influence of Parking Management Strategy to Modal Shift**

Respondent No. 220: "Reducing public parking place would not affecting me or making me to use Trans Jogja, because the place where I work is providing enough parking lots".

Respondent No. 171: "I do not think increasing parking price would change my choice from using motorcycle to Trans Jogja. Because, I think parking price for motorcycle would not be more expensive than fare of Trans Jogja"

Respondent No. 155: "Increasing parking price probably would influence me to minimize the use of my motorcycle and make me use Trans Jogja, especially if the progressive parking price is applied, because it would also increase my daily travel cost and make it more expensive."

Source: Field Survey, 2016

Moreover, most respondents thought that vehicle tax also would not influence their decision when choosing a transportation mode, because they look upon paying tax as an obligation. Moreover, they only need pay vehicle tax once in a year, so they do not regard paying a high or low amount in vehicle tax as a problem, and it would not significantly influence their decision to switch to using Trans Jogja. However, some respondents said that many vehicles in Yogyakarta are from other cities, and these could not be affected by increasing vehicle tax in Yogyakarta and the use of private vehicles from other cities would probably still increase in Yogyakarta.

**Box 2 Direct Statement of Respondents on
Influence of Vehicle Tax to Modal Shift**

Respondent No. 148: "For me, paying vehicle tax is my responsibility because I have the vehicle. By not using private vehicle and choose to use Trans Jogja would not influence taxing value."

Respondent No. 177: "Many of vehicles in Yogyakarta are owning by people who are from other province (such as Middle Java and East Java). Yogyakarta have got the impact of the traffic congestion because of those vehicles, but they pay the tax in their own province out of Yogyakarta, so that Yogyakarta has a loss on it."

Source: Field Survey, 2016

The Chi-Square test was carried out to statistically measure the influence of push strategies on the decisions of respondents in making a modal shift to use Trans Jogja. This test was used because the available data on respondents' statements about 'willingness to make a modal shift' and the 'influence of push strategies to make a modal shift' were on a nominal measurement level.

**Table 12 Statistical Measurement for Influence of Push Strategies
on Respondents' Decisions to Make Modal Shifts to Use Public Transportation**

Chi-Square Tests				
Strategies		Value	df	Asymp. Sig. (2-sided)
Availability of Parking Place	Pearson Chi-Square	18,321 ^a	4	,001
	Likelihood Ratio	20,981	4	,000
	Linear-by-Linear Association	4,841	1	,028
	No. of Valid Cases	170		
Parking Pricing	Pearson Chi-Square	8,393 ^a	4	,078
	Likelihood Ratio	10,538	4	,032
	Linear-by-Linear Association	1,467	1	,226
	No. of Valid Cases	170		
Road Pricing (Controlling road use and capacity)	Pearson Chi-Square	10,119 ^a	4	,038
	Likelihood Ratio	12,002	4	,017
	Linear-by-Linear Association	,010	1	,919
	No. of Valid Cases	169		
Vehicle Tax	Pearson Chi-Square	8,355 ^a	4	,079
	Likelihood Ratio	11,834	4	,019
	Linear-by-Linear Association	2,619	1	,106
	No. of Valid Cases	170		

Source: Data Analysis, 2016

The statistical test shows that the availability of parking place and road pricing have a p-value ≤ 0.05 ($p = 0.001$; $p = 0.038$ respectively) which means that these strategies have a statistically significant different effect on decisions to make a modal shift. It can be assumed that, among other policies, the availability of parking places and road pricing (controlling road use and capacity) have a greater chance of reducing the extent of private vehicle use and influencing users to make a modal shift to Trans Jogja. For instance, if the availability of on-street parking places were to be reduced, there would be fewer parking places, and it would be difficult for private vehicle users to find parking spaces for their vehicles which may influence them to use public transport (Trans Jogja). In the same way, if road use is controlled, road access for private vehicle users would be restricted while road access to public transport would be easier, this would probably influence them to make a modal shift to use Trans Jogja.

4.5 Pull Strategy: Quality of Trans Jogja's Service Operation

There are eight indicators of pull strategy that represent the quality of Trans Jogja's service operation. These indicators are waiting environment; waiting time; headway/service interval; public transport interchange; operational bus hours; in-vehicle travel time; travel costs; and safety. Respondents were asked questions to measure Trans Jogja's service operation based on these eight indicators.

In conducting statistical measures for the indicators of pull strategy, the Mann-Whitney U-test in SPSS was used because all the data used for the analysis were at an ordinal measurement level and analysis was conducted by comparing two independent groups of respondents.

Statistical measurements using the Mann-Whitney U-test show a statistically significant difference for the indicator waiting environment ($U = 2224$; $p = 0.000$ (Mean); $p = 0.000$ (Median)). It shows that the group of Trans Jogja users has a higher mean rank than the group

of private vehicle users. Besides that, the median value for this indicator is 2, meaning that most of the respondents in two groups disagree for the statement that Trans Jogja has clean and comfortable waiting environment. Nonetheless, 57.4% respondents of Trans Jogja users have values more than median, while 74.8% respondents of private vehicle users have values less than median. This result indicates that Trans Jogja users have a positive view of the waiting environment of Trans Jogja, meaning they feel that the waiting environment of Trans Jogja is clean and comfortable enough for them. On the other hand, private vehicle users have a negative view which can be interpreted as meaning that they would feel uncomfortable with the waiting environment of Trans Jogja.

Figure 13 Bus Shelter (Station) of Trans Jogja



Source: Field Survey, 2016

For waiting time as an indicator, it shows that both groups of respondents have a statistically significant difference in which $p\text{-value} \leq 0.05$ ($U = 2362$; $p = 0.001$ (Mean); $p = 0.020$ (Median)). The median for this indicator is 4 meaning that both groups agree with the statement that Trans Jogja has long waiting time. However, this has the opposite condition of the previous indicator (waiting environment). It shows that the mean rank for private vehicle users is higher than the mean rank for Trans Jogja users. This indicates that private vehicle users much more agree with the statement that Trans Jogja has a long waiting time, than Trans Jogja users.

The statistical measurement of service interval as an indicator shows that there is no statistically significant difference between the groups of respondents. The value of p exceeds 0.05 ($U = 3139$; $p = 0.586$ (Mean); $p = 0.719$ (Median)). The median value for this indicator is 2 meaning that most of the respondents disagree with the statement that Trans Jogja has frequently bus arrival time and has fixed-on time schedule. It also has a mean rank with almost the same value. This indicates that both groups have similar opinions regarding the service interval of Trans Jogja. It is assumed that respondents feel that even though Trans Jogja does have frequent bus arrivals, it still does not have fixed on-time schedules which leaves passengers in uncertainty about bus arrival times.

Table 13 Statistical Measurement of Indicators of Pull Strategy

Indicators for Service Quality of Pull Strategy (Trans Jogja)	Group of Respondents	Mean		Median				
		N	Mean Rank	Median	> Median		< = Median	
Waiting Environment	Trans Jogja User	68	104,80	2	39	57.4%	29	42.6%
	Private Vehicle User	103	73,59		26	25.2%	77	74.8%
Trans Jogja has Long Waiting Time	Trans Jogja User	68	69,23	4	6	8.8%	62	91.2%
	Private Vehicle User	97	92,65		22	22.7%	75	77.3%
Service Interval	Trans Jogja User	68	85,34	2	22	32.4%	46	67.6%
	Private Vehicle User	97	81,36		34	35.1%	63	64.9%
Several Times Bus Transfer When Using Trans Jogja	Trans Jogja User	68	71,39	4	2	2.9%	66	97.1%
	Private Vehicle User	95	89,59		18	18.9%	77	81.1%
Trans Jogja has Adequate Operational Hours	Trans Jogja User	68	96,15	3	36	52.9%	32	47.1%
	Private Vehicle User	92	68,93		26	28.3%	66	71.7%
Travel Time	Trans Jogja User	67	93,03	2	16	23.9%	51	76.1%
	Private Vehicle User	106	83,19		19	17.9%	87	82.1%
Trans Jogja has Affordable Ticket Fare	Trans Jogja User	68	105,43	4	28	41.2%	40	58.8%
	Private Vehicle User	102	72,22		22	21.6%	80	78.4%
Safety	Trans Jogja User	68	104,13	2	40	58.8%	28	41.2%
	Private Vehicle User	105	75,91		32	30.5%	73	69.5%

Test Statistics^a

	Waiting Environment	Trans Jogja has Long Waiting Time	Headway/ Service Interval	Several Times Bus Transfer When Using Trans Jogja	Trans Jogja has Adequate Operational Hours	Travel Time	Trans Jogja has Affordable Ticket Fare	Safety
Mean								
Mann-Whitney U	2,223,500	2,361,500	3,139,000	2,508,500	2,064,000	3,147,000	2,113,000	2,405,500
Wilcoxon W	7,579,500	4,707,500	7,892,000	4,854,500	6,342,000	8,818,000	7,366,000	7,970,500
Z	-4,113	-3,211	-,544	-2,573	-3,861	-1,491	-4,522	-3,646
Asymp. Sig. (2-tailed)	,000	,001	,586	,010	,000	,136	,000	,000
Median								
N	171	165	165	163	160	173	170	173
Median	2.00	4.00	2.00	4.00	3.00	2.00	4.00	2.00
Chi-Square	17.923	5.448	.130	9.433	10.035	.902	7.556	13.649
df	1	1	1	1	1	1	1	1
Asymp. Sig.	,000	,020	,719	,002	,002	,342	,006	,000
Yates' Continuity Correction	Chi-Square	16.586	4.509	.037	8.004	9.022	.571	12.508
	df	1	1	1	1	1	1	1
	Asymp. Sig.	,000	,034	,847	,005	,003	,450	,010

a. Grouping Variable: Group of Responden

Source: Data Analysis, 2016

The indicator of public transport interchange was measured as having a statistically significant difference between the two group of respondents ($U = 2509$; $p = 0.010$ (Mean); $p = 0.002$ (Median)). The median value for this indicator is 4 meaning that both groups agree with the statement that several bus transfers would be needed if using Trans Jogja. However, it also shows that the mean rank for private vehicle users is higher than the mean rank for Trans Jogja users. This indicates that private vehicle users more likely to agree that several bus transfers would be needed if they were to use Trans Jogja to reach their final destination.

The indicator bus hours operated has a statistically significant difference with $p\text{-value} \leq 0.05$ ($U = 2064$; $p = 0.000$ (Mean); $p = 0.002$ (Median)). The media value for this indicator is 3 meaning that most of the respondents in both groups more likely to be neutral for the statement that Trans Jogja has adequate operational hours. However, it shows that the group of Trans Jogja users has a higher mean rank than that of the group of private vehicle users. It can be assumed that Trans Jogja users feel that Trans Jogja provides adequate operational hours for them, while private vehicle users feel that the operational bus hours of Trans Jogja do not offer them sufficient flexibility.

The statistical measurement of travel time as an indicator shows that the $p\text{-value}$ of travel ≥ 0.05 ($U = 3147$; $p = 0.136$ (Mean); $p = 0.342$ (Median)), which means there is no statistically significant difference between the two group of respondents towards travel time. The median value for this indicator is 2 meaning that respondents in both groups basically have a similar average travel time of about 15-30 minutes. However, the mean rank of Trans Jogja users is higher than private vehicle users, which indicates that Trans Jogja users have a longer travel time than private vehicle users. It can be assumed that using Trans Jogja would indeed take a longer travel time than using a private vehicle.

For travel costs as an indicator, the statistical measurement shows it has $p\text{-value} \leq 0.05$ ($U = 2113$; $p = 0.000$ (Mean); $p = 0.006$ (Median)) which means there is a statistically significant difference between the two group of respondents. The median of this indicator is 4 meaning that most of the respondents in two groups agree with the statement that Trans Jogja has affordable ticket fare. The mean rank of Trans Jogja users is higher than the mean rank of private vehicle users. It can be assumed that Trans Jogja users feel that the travel fare of Trans Jogja is affordable, while private vehicle users probably feel that the travel costs of Trans Jogja are still more expensive than the travel costs of a private vehicle.

Lastly, one of the indicators of pull strategy (quality of Trans Jogja's service operation), safety, was measured by looking at its security system, safety in respect of passenger's belongings, and the way in which its chauffeurs drive the buses. Statistical measurement using the Mann Whitney U-test shows that the $p\text{-value}$ is less than 0.05 ($U = 2405$; $p = 0.000$ (Mean); $p = 0.006$ (Median)) which means there is a statistically significant difference between the two group of respondents. The median for this indicator is 2 meaning that most of the respondents disagree with the statement that Transjogja has provided safety for the passengers. However, 58.8% of respondents in the group of Trans Jogja users have values more than median value, while 42.2% of respondents in the group of private vehicle users have values less than median value. The mean rank of Trans Jogja users is higher than that of private vehicle users. This indicates that Trans Jogja users have a positive opinion regarding the safety indicator of Trans Jogja. It can

be assumed that Trans Jogja users feel that Trans Jogja's system provides safety for them. On the other hand, private vehicle users probably feel that Trans Jogja's system is still unsafe for them, and they do not yet trust the system.

4.6 Influence of Commuter Characteristics on Modal Shift Decisions

The assumption is that commuter characteristics will influence the decision to make a modal shift, though these are not directly affected by TDM policy implementation. In this research, commuter characteristics were divided into two different variables, a control variable and social economic status as moderator variable. The control variable consists of age and gender, whereby these factors influence commuters in making decisions to make a modal shift, though these are not directly affected by TDM policy implementation (push and pull strategies). Social economic status is defined by education level and household income, and its affects commuter considerations about making a modal shift after they become aware of the impact of TDM policy implementation.

In analyzing commuter characteristics, use was made of two different methods of analysis using SPSS. The Chi-Square test was used to test the influence of gender on decisions to make a modal shift, because data available on gender was at a nominal measurement level (male and female), and data on 'possibility of using Trans Jogja in the future' are also in the form of nominal measurement data which were divided into three groups of answers (Yes; No; Maybe).

A non-parametric Kruskal-Wallis test was conducted to measure the influence of age, education level, and personal income. Data available on these variables (age, education level, and personal income) were at an ordinal measurement level, while data on 'possibility of using Trans Jogja in the future' were in the form of nominal measurement data which were divided into three groups of answers (Yes; No; Maybe).

Table 14 Statistical Measurement of Influence of Commuter Characteristics on Making Modal Shift Decisions

Chi-Square Tests				
		Value	df	Asymp. Sig. (2-sided)
Gender	Pearson Chi-Square	1,285 ^a	2	,526
	Likelihood Ratio	1,288	2	,525
	Linear-by-Linear Association	,013	1	,910
	N of Valid Cases	170		

Ranks			
	Possibility To Use Trans Jogja in The Future	N	Mean Rank
Age	Yes	114	83,75
	No	42	89,63
	Maybe	14	87,39
	Total	170	
Education Level	Yes	114	92,14
	No	42	76,32
	Maybe	14	58,93
	Total	170	
Personal Income	Yes	114	88,83
	No	42	81,20
	Maybe	14	71,25
	Total	170	

Test Statistics ^{a,b}			
	Age	Education Level	Personal Income
Chi-Square	,498	8,470	2,185
df	2	2	2
Asymp. Sig.	,780	,014	,335

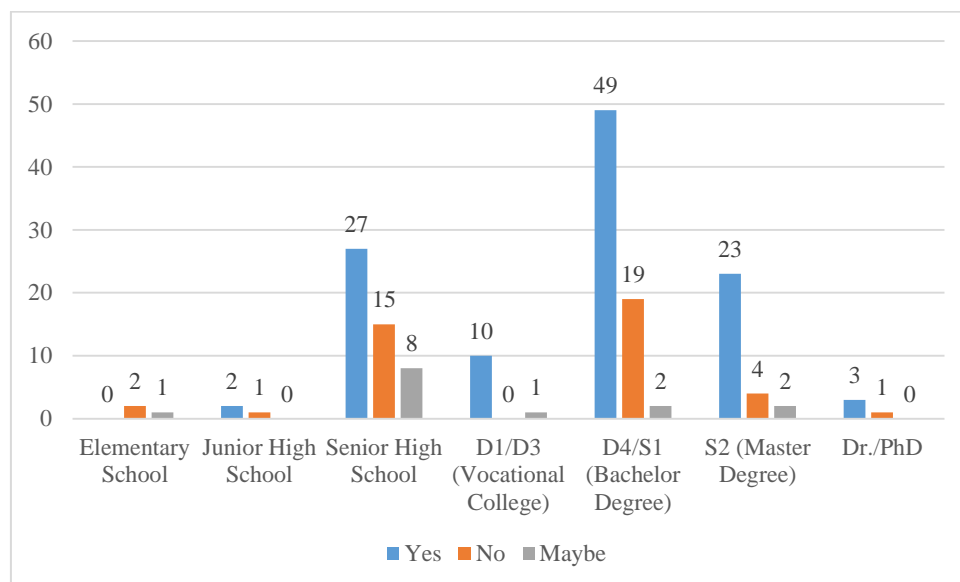
a. Kruskal Wallis Test

b. Grouping Variable: Possibility of Using Trans Jogja in The Future

Source: Data Analysis, 2016

Statistical measurement shows that the p-value of gender, age, and personal income exceeds 0.05 (0.526; 0.780; and 0.335 respectively) which indicates that these variable do not have a statistically significant difference. It can be assumed that these variable have less influence on respondents in replying about the possibility of using Trans Jogja in the future. It is clear for the age and personal income variable that these data have almost the same mean rank for the three groups of answers.

Figure 14 Willingness To Use Trans Jogja Based on Education Level



Source: Data Analysis, 2016

The statistical analysis results show that education level has a p-value ≤ 0.05 , which means that there is a statistically significant difference in the effect of education level on the possibility that respondents will use Trans Jogja. It can be assumed that the education level of respondents influences their decision to make a modal shift from private vehicle use to public transport (Trans Jogja). Furthermore, looking at the mean rank based on education level, the “yes” choice has a higher mean value than the other choices. The interpretation of this result is that people who will tend to use Trans Jogja in the future have a higher level of education than people who will continue using their own private vehicle. **Figure 14** shows that people who are willing to use Trans Jogja have a higher level of education. The majority of these people (49) have a bachelor’s degree.

Chapter 5: Conclusions and Recommendations

5.1 Data Analysis

This section of the data analysis is a discussion of the main findings of the research based on the data collected. The analyzed data are divided into four sub-sections, whereby each is expected to supply answers to the research objective, the main research question, as well as the sub-research questions. This part of the analysis is divided into a discussion of the willingness of respondents to make a modal shift, the influence of push strategies on modal shifts, the influence of pull strategies on modal shifts, and the influence of commuter characteristic on modal shifts. This discussion is based on the collected data compared with the theory used in this research.

5.1.1 Willingness To Make a Modal Shift

Paulley, Balcome, et al. (2006) stated that people who choose to use public transportation tend to be more flexible in terms of destination and travel time. This is in line with these research findings, which show that 34% of the respondents use Trans Jogja for recreational purposes, 26% respondents choose Trans Jogja as their modal choice to visit friends/family, while 28% of them use Trans Jogja for work. Current Trans Jogja users do not use Trans Jogja for all their trip purposes. Some only use Trans Jogja for certain trip purposes, and most of these are trip purposes with a high degree of flexibility.

Flexibility is influenced by passengers' travel time. Satiennam, Jaensirisak, et al. (2015) highlighted that it is important to reduce travel time from home to final destination if passengers are to choose the bus as their transport mode. Therefore, 60% of respondents are expected to have a bus waiting time shorter than 10 minutes, with a travel time on bus shorter than 15 minutes. This means they were willing to make a modal shift if the total travel time was about 25 minutes. However, travel time on the bus depends on the distance travelled too. Currently, the average total time travelled by Trans Jogja is more than 30 minutes. Thus, Trans Jogja is still less attractive for people in Yogyakarta, because the total travel time is longer than the desired travel time.

Travel costs has been indicated as having an effect on the modal choice of commuters (Satiennam, Jaensirisak, et al., 2015). However, previous research on transportation modal choice in Jakarta, Indonesia (Kawaguchi, Wachi, et al., 2010) showed that private vehicle users prefer flexibility and comfort rather than travel time and travel costs. The findings in the field survey reveals that 40% of respondents would be willing to use Trans Jogja as long as a good and comfortable service is provided. This shows that quality of service is more important than travel costs in getting them to make a modal shift. Furthermore, based on the research findings, respondents would still use their private vehicles even if they could travel free of charge, if this is not in combination with the provision of a good service.

5.1.2 Influence of Push Strategies on Modal Shifts

The first sub-research question for this research is “*How do push strategies make private vehicle use unattractive?*”. This part will explain the supply answers for the sub-research question based on the findings on the study.

Three transportation policies were implemented as push strategies in Yogyakarta, namely parking management, restricted road policy, and taxation on cars and fuel. Based on the results of this study, these transportation policies did not significantly influence respondents in choosing Trans Jogja as their mode of transportation. They had less influence on both users of Trans Jogja and private vehicle users in making a modal shift to Trans Jogja.

Boaddus, Litman, et al. (2009) stated that generally implementing a ‘social service’ approach to parking, with easy access and an abundant supply of parking places, encourages people to use private vehicles. This research found that some respondents stated that the availability of parking places in Yogyakarta still meets the needs of private vehicle users, because most of their final destinations have parking places, so reducing public parking places would probably not influence them to switch to Trans Jogja.

Moreover, Boaddus, Litman, et al. (2009) also mentioned that it is important that management is demand-driven rather than supply-oriented in order to reduce the extent of private vehicle use. However, this research finds that parking management in Yogyakarta is still supply-oriented rather than demand-driven. The government still takes into consideration the dependence of people on parking places, so the government has refrained from reducing parking place availability. In order to support public transport on roads, governments have tried to reduce the amount of on-street parking and replace it with off-street parking (parking buildings). They are choosing to relocate parking facilities instead of reducing the availability of public parking places.

In relation to parking pricing, most respondents stated that parking pricing in Yogyakarta is still affordable for them, so current parking management policies in Yogyakarta place less pressure on them and they still feel comfortable about using their own private vehicle. Actually, some respondents stated that parking pricing would have an impact on their decision if progressive parking pricing were to be implemented. In fact, the government tried to implement progressive parking pricing in 2009. This did not work effectively at that time, however, because parking facilities in all areas eventually charged the same price as the core zone of the urban area, and in the end it had no effect on reducing private vehicle use in urban area.

Besides parking management, restricted road use is another transportation policy used as a push strategy in Yogyakarta. This has been implemented in the form of a pedestrian development zone in the Malioboro area. The main objective of this program is in line with the statement of Beirao and Cabral (2007), who said that the main objective of pedestrian-only zones is to limit access for private vehicles by providing more access to pedestrians or giving sole access to pedestrians, non-motorized transportation, and public transportation in certain areas (Beirao and Cabral, 2007). However, this program has only recently been implemented (in 2016) by relocating the parking places for motorcycles along the main streets to off-street parking (a parking building). The pedestrian paths in that area are currently in the process of returning to

their original function. All vehicles are still free to pass through the area's main street, so it does not have any significant influence on reducing the amount of private vehicle use, apart from relocating the parking of motorcycles from pedestrian paths along the area's main street to the off-street parking building that has been provided.

Taxation on cars and fuel is the last transportation policy considered as a push strategy in Yogyakarta. Eriksson, M. Nordlund, et al. (2010) stated that taxation on cars (private vehicles) is one of the policies for controlling growth in private vehicle ownership. However, the mere implementation of tax would not have any effect on reducing private vehicle use.

In the case of Yogyakarta, where taxation on vehicles is the main source of regional revenue, it would be difficult to restrict vehicle ownership in Yogyakarta by controlling vehicle tax. Although the government has become aware of the transportation problems caused by the use of private vehicles in Yogyakarta, on the other hand they are extremely dependent on vehicle ownership in Yogyakarta as a main source of government revenue. Moreover, vehicle tax is paid only once a year, which will place little pressure on vehicle owners to make less use of their private vehicles on roads. In addition, most respondents look upon paying tax as an obligation, so it would not significantly influence their decision to make less use of their private vehicles and change their modal choice to Trans Jogja.

In fact, those three implemented transportation policies currently have given less influence to respondents in making modal shift from private vehicle use to Trans Jogja. Nonetheless, statistical test using the Chi-square test shows that availability of parking places and restricted road policy have significant possibility to influence people make a modal shift. It would be related to the assumption that the government in Yogyakarta is still supply-oriented rather than demand-management. If the government change the objective of transportation policy as demand-management by controlling availability of public parking places, there would be fewer parking places, and it would be difficult for private vehicle users to find parking spaces for their vehicles which may influence them to use public transport (Trans Jogja). In the same way, if road use is controlled, road access for private vehicle users would be restricted while road access to public transport would be easier, this would probably influence them to make a modal shift to use Trans Jogja.

5.1.3 Influence of Pull Strategy on Modal Shifts

The second sub-research question for this study is ***"To what extent do the indicators of pull strategies influence a modal shift of private vehicle users to public transportation?"***. To answer the sub-research question, findings of this study are explained in this part.

Paulley, Balcombe, et al. (2006) indicated service quality as an important factor of a BRT system that will influence the decisions of commuters to make a modal shift. In this research, there were eight indicators for measuring the quality of Trans Jogja's services, namely waiting environment, waiting time, headway/service interval, public transport interchange, bus hours operated, in-vehicle travel time, travel costs, and safety. Based on the finding of this research, Trans Jogja users and private vehicle users have different and almost opposite opinions regarding these indicators. This is probably because the opinions of Trans Jogja users are based on their experience of using the service, while the opinions of private vehicle users were formed

without ever having experienced using Trans Jogja, because most respondents in the group of private vehicle users have never used Trans Jogja.

This research finds that most private vehicle users still think they would find the waiting environment of Trans Jogja uncomfortable, even though in the opinion of Trans Jogja users the waiting environment is quiet and comfortable. According to a statement of dell'Olio, Ibeas, et al. (2011), if passengers can depend on bus service information (real arrival time and bus route networks) they will feel comfortable and place their trust in the service. However, the current Trans Jogja service does not provide a fixed on-time schedule for bus arrival times, which may be the reason why private vehicle users do not trust the system. This could be related to waiting time and in-vehicle travel time, about which private vehicle users also have a negative opinion. Boaddus, Litman, et al. (2009) pointed out that giving real-time information on bus arrivals could help to reduce the perceived waiting time of passengers. Without a fixed on-time schedule of bus arrival times, potential passengers (private vehicle users) will think that using Trans Jogja will take a longer waiting time for a bus, and it also portrays an image that using Trans Jogja is less flexible because bus arrival times are unpredictable. Nonetheless, result of this research showed that travel time did not significantly influence respondents in making decision on modal shift, because the travel time for both groups almost similar. The statistical measurement using the Mann-Whitney U showed that 76.1% respondents from Trans Jogja users and 89.1% respondents from private vehicle users had average travel time 15-30 minutes on road. However, this research did indeed reveal that the average travel time of Trans Jogja users is longer than the average travel time of private vehicle users. Satiennam, Jaensirisak (2015) highlighted that if the total travel time can be reduced, the percentage of modal choice for a BRT system would increase. Therefore, if the average travel time with Trans Jogja cannot be shorter than the travel time of private vehicles then it will be difficult to encourage people to make a modal shift.

Waiting time and total travel time are also related to the headway/service interval of the bus. Previous research conducted by Satiennam, Jaensirisak, et al. (2015) indicated that increasing the service frequency will have an effect in reducing total travel time, which significantly affects a modal shift to a BRT system. Adding more units of buses seems important to increase the frequency of bus arrivals, and reduce waiting times for buses. Moreover, providing more extensive routes is also important to attract private vehicle users to make a modal shift. This relates to public transport interchanges, whereby both groups of respondents felt that using Trans Jogja requires several bus transfers or using other modes of transportation at an interchange. This indicates that the current routes of Trans Jogja are limited, so private vehicle users prefer to use their own vehicles rather than using Trans Jogja, as they would need several bus transfers. This also influences their travel costs, as it is assumed that making use of several bus transfers will increase the travel costs. Based on research conducted by Satiennam, Jaensirisak, et al. (2015), a modal shift of private vehicle users to a BRT system would increase if travel costs were decreased. Nonetheless, previous research on transportation modal choice in Jakarta, Indonesia (Kawaguchi, Wachi, et al., 2010) showed that private vehicle users prefer flexibility and comfort rather than travel time and travel costs. Although there are indications that the quality of service is more important than travel costs for private vehicle users in Yogyakarta, travel costs using a private vehicle will still be lower than using Trans Jogja, so

they will continue to use their own private vehicles even though public transportation is provided with cheap travel fares.

Lastly, dell'Olio, Ibeas, et al. (2011) mentioned the importance of increasing the perception of safety when traveling by public transportation in order to improve the attractiveness of public transportation. Nonetheless, based on the findings of this study, private vehicle users still feel that the Trans Jogja system is unsafe, and they do not yet trust the system. Trans Jogja seems to have a negative image in the eyes of private vehicle users. It will be difficult to encourage them to make a modal shift if they continue to regard public transportation as untrustworthy. It is important that private vehicle users develop trust in public transportation if Trans Jogja wants to realize the objective of attracting people to use it and reducing the use of private vehicles. Building a positive image by providing a trustworthy high-quality service is important to attract private vehicle users to make a modal shift.

5.1.4 Influence of Commuter Characteristics on Modal Shifts

The third sub-research question for this research is *“To what extent do commuter characteristics affect the decisions of commuters to make a modal shift”*. However, this research did less to explore the influence of commuter characteristics on modal shifts, although commuter characteristics seem to have no influence on the decisions of commuters to make a modal shift.

Limtanakool, Dijst, et al. (2006) revealed that commuters aged 18-29 years travel most by private vehicle, and Satiennam, Jaensirisak, et al. (2015) pointed out that older private vehicle users have a greater tendency to switch to BRT than younger private vehicle users. Nonetheless, respondents in this study are predominantly people in the age-groups 17-25 and 26-35 years. Therefore a tendency to make modal shift based on age was not clearly evident. In the same way, the influence of gender on decisions to make a modal shift also seems weak. Satiennam, Jaensirisak et al. (2015) stated that female private vehicle users were more likely to make a modal switch to a BRT system than male private vehicle users. Although the numbers of respondents in this study did not differ widely (almost 50/50), there was no statistically significant difference. This means that the responses of respondents in this study were fairly equal. In Yogyakarta, both males and females have the same chance and ability to choose their mode of transportation, so gender does not seem to have any significant influence on making a modal shift.

The influence of income on modal shift was also less explored in this study. Less than 20% of the respondents in this study have a monthly income in excess of IDR 5,000,000 (a high income), so it is difficult to state whether private vehicle users from low-income and middle-income households would be more likely to make a modal shift to the BRT system (Kawaguchi, Wachi, et al., 2010) or whether it would be very difficult to encourage private vehicle users from high-income families to use public transport. Moreover, statistical measurements show that this variable has no statistically significant difference based on the Kruskal Wallis test, as the respondents gave similar opinions that were not influenced by their income.

Based on the data analysis of this study using the Kruskal-Wallis test, only education level significantly influences the decisions of people to make a modal shift. People who will tend to

use Trans Jogja in the future have a higher level of education (a bachelor's degree) than people who will continue to use their own private vehicle. However, this also related to the number of respondents, whereby people in the age-groups 17-25 and 26-35 years predominated, the majority of whom have a bachelor's degree.

5.2 Conclusions and Recommendations

5.2.1 Conclusions

The main research question for this study is *“How do push and pull strategies influence a modal shift from private vehicle use to public transportation in the case of Trans Jogja in Yogyakarta, Indonesia?”*. This study revealed some findings to answer the research question.

Based on the conceptual framework of this research, modal shift as choice of mode of commuters was measured by looking at the commuter's trip purpose, expected total travel time, and willingness to pay (see Figure 3). Currently, Trans Jogja is mostly used for trip purposes with a high degree of flexibility such as leisure trip purposes. Commuters do not seem to choose Trans Jogja for their daily travel activity as it can be assumed that the services provided by Trans Jogja still have less flexibility, because bus arrival times are unpredictable. Nonetheless, the significant influence of travel time on modal shift was not found in this research. Even though it was revealed that total travel time by bus is longer than when using a private vehicle, so it is less attractive for private vehicle users to make a modal shift to Trans Jogja. Based on the study, the commuters have expected to have travel time less than 15 minutes by bus. However, the average travel time of commuters (as respondents) in this research were almost similar, so that they prefer to choose private vehicles because of the flexibility. Therefore, it is important to provide flexibility on Trans Jogja, such as by increasing the number of buses operated, and extend the routes, as this would increase the bus frequency and provide a wider range of services. So that Trans Jogja will be used not only for the leisure trip, but also for other trip purposes in regard to reduce the use private vehicle in Yogyakarta. Moreover, this research also revealed that quality of service is more important in getting them to make a modal shift than travel costs, related to the commuter's willingness to pay for the service.

For the comprehensive implementation of push and pull strategies as independent variable for this research, the study found that the government has tried to implement transportation policies comprehensively by combining push and pull strategies. However, the government is still supply-oriented rather than demand-driven in respect of Yogyakarta's urban transportation problems. The policies implemented seem to put little pressure on private vehicle users to reduce the use of private vehicles. The quality of Trans Jogja's services also needs to be improved, especially with regard to waiting environment; reducing waiting time and reducing the number of public transport interchanges by increasing the frequency of buses and providing more extensive bus routes; providing adequate operational hours and affordable ticket fare; and also ensuring safety of passengers when using Trans Jogja. Those indicators are expected to have significant influence to attract more people to use Trans Jogja based on the data analysis using the Mann-Whitney U test.

Looking at the conceptual framework, the literatures used in this study indicated that a control variable represented by age and gender would influence commuters in making a modal shift,

though these are not directly affected by TDM policy implementation. Meanwhile, social economic status (education level and income) would affect commuter considerations in making a modal shift once they became aware of the impact of TDM policy implementation. However, this study found that only education level which influenced commuter considerations in making a modal shift. Nonetheless, this finding could not be generated and made a conclusion that age, gender, as well as personal income per month do not influence commuter decision to make a modal shift at all. It would be related to the reliability and external validity of this research. It was undeniable that the respondents for this research were dominated by the people from the group of age of 17-25 and 26-35, and also were dominated by the respondent with personal income per month IDR 1,550,000 – IDR 3,000,000 and IDR 3,050,000 – IDR 5,000,000. That condition made the variable of age and personal income did not have statistical significant difference in the data analysis process. Therefore, the finding was still less reliable to be generated in making conclusion that those variable do not affect the commuter decision to make a modal shift. So that the finding of this research related to the a control variable and social economic status could be used as a consideration for future studies, yet would not change the conceptual framework formed by referring to the literatures.

5.2.2 Recommendations for Further Studies

This research revealed that push and pull strategies in the case of Trans Jogja have less influence on modal shift, even though it has been implemented comprehensively. It is because the development of transportation policies still supply-oriented rather than demand management, so that the policies implemented give less pressure and still give comfort for commuters to use private vehicles. Besides that, it also revealed that Trans Jogja has a negative image in the eyes of private vehicle users, and make it less attractive to commuters. The following recommendation are expected could help the improvement of transportation policies implemented through further studies.

- The development of transportation policies should be demand-driven management and give more pressure to private vehicle users. The supply-oriented transportation policies need to be diminished in order to give less comfort for private vehicle users;
- The quality of Trans Jogja's service need to be improved, because study revealed that the quality of service is more important to attract commuters to use Trans Jogja;
- Since the flexibility of transportation was revealed as an indicator sought by commuters in choosing mode of transportation, further research is needed to find out how flexibility of public transportation such as time and range of services would influence commuters on modal shift;
- Apart from improving the quality of Trans Jogja's service, promoting public transportation is also important in order to attract more people to use Trans Jogja. This could be done, for instance, by ensuring easier access and by providing incentives for people who use public transportation.

Bibliography

- icity, 2009. Yogyakarta: .
- Local Regulation of Yogyakarta City Number 19 of 2009 on On-Street Parking Levy, 2009. Yogyakarta: .
- Local Regulation of Yogyakarta Special Region Number 3 on 2011 on Regional Tax, 2011. Yogyakarta: .
- Yogyakarta Special Region Local Regulations No. 6 of 2013 on Medium-term Development Plan in 2012-2017, 2013. Yogyakarta: .
- Yogyakarta Governor Regulation No. 26 of 2014 on Regional Development Work Plan 2015, 2015. Yogyakarta: .
- Alul, 2015. Implementasi Kebijakan Trans Jogja. Available at: <http://dokumen.tips/documents/implementasi-kebijakan-transjogja.html> [Accessed 2016].
- Banister, D., 2008. The sustainable mobility paradigm. *Transport Policy*, 15 pp. 73-80.
- Beirao, G. and Cabral, J. A. S. 2007. Understanding attitudes towards public transport and private car: A qualitative study. *Transport Policy*, 14 pp. 478-489.
- Boaddus, A., Litman, T. and Menon, G., 2009. Transportation Demand Management: Training Document. Eschborn: Deutsche Gesellschaft fur Technische Zusammenarbeit (GTZ) GmbH.
- Central Bureau of Statistics, 2014. Daerah Istimewa Yogyakarta in Figures. 34563.14.12), Yogyakarta: BPS-Statistics of Yogyakarta Special Region.
- Dalkmann, H. and Brannigan, C., 2007. Transport and Climate Change Modul 5e Sustainable Transport: A Sourcebook for Policy-makers in Developing Cities. Eschborn: Deutsche Gesellschaft fur Technische Zusammenarbeit (GTZ) GmbH.
- dell'Olio, L., Ibeas, A. and Cecin, P. 2011. The quality of service desired by public transport users. *Transport Policy*, 18 pp. 217-227.
- Department of Transportation Communication and Informatic, 2014. Final Report of Urban Public Transport and Taxi Performace in Yogyakarta Special Region. Yogyakarta: Department of Transportation, Communication, and Informatic.
- Dijst, M., Rietveld, P. and Steg, L. 2013. Individual needs, opportunities and travel behaviour: a multidisciplinary perspective based on psychology, economics and geography. In: B. Van Wee, J. A. Annema and D. Banister eds., 2013. *The Transport System and Transport Policy*. Cheltenham: Edward Elgar. pp. 19-50.

- Doi, K. and Kii, M. 2012. Looking at sustainable urban mobility through a cross-assessment model within the framework of land-use and transport integration. *IATSS Research*, 35 pp. 62-70.
- Dorsey, B., 2005. Mass transit trends and the role of unlimited access in transportation demand management. *Journal of Transport Geography*, 13 pp. 235-246.
- DPPKA-DIY, 2015. Peta DIY (Map of Yogyakarta Special Region). Available at: <http://dppka.jogjaprov.go.id/peta-diy.html> [Accessed 2016].
- Eriksson, L., M. Nordlund, A. and Garvil, J. 2010. Expected car use reduction in response to structural travel demand management measures. *Transportation Research Part F*, 13 pp. 329-342. Available at: www.elsevier.com/locate/trf .
- Fadhilla, I., 2015. Trans Jogja Kenapa Kamu Jadi Begini. Available at: <http://www.idntimes.com/dhilla/trans-jogja-kenapa-kamu-jadi-begini> [Accessed 2016].
- Garling, T. and Schuitema, G. 2007. Travel demand management targeting reduced private car use: effectiveness, public acceptability, and political feasibility. *Journal of Social Issues*, 63 (1), pp. 139-153.
- Habibian, M. and Kermanshah, M. 2011. Exploring the role of transportation demand management policies' interactions. *Scientia Iranica*, 18 (5), pp. 1037-1044.
- Institute for Transportation and Development Policy, 2013. Practical Guidebook: Parking and Travel Demand Management Policies in Latin America. IDB-MG-151), Washington: Inter-American Development Bank.
- Kawaguchi, H., Wachi, T., Alvinsyah, Hamada, K., et al., 2010. Transition in mode choice due to motorization and improvement of public transportation system in Jakarta, Indonesia. *WCTR*, 12th .
- Limtanakool, N., Dijst, M. and Schwanen, T. 2006. The influence of socioeconomic characteristics, land use and travel time considerations on mode choice for medium- and longer-distance trips. *Journal of Transport Geography*, 14 (5), pp. 327-341. Available at: <http://www.sciencedirect.com/science/article/pii/S0966692305000438> .
- Lindau, L. A., Hidalgo, D. and de Almeida Lobo, A. 2014. Barriers to planning and implementing Bus Rapid Transit systems. *Research in Transportation Economics*, 48 pp. 9-15. Available at: www.elsevier.com/locate/retrec .
- Litman, T. and Burwell, D. 2006. Issues in sustainable transportation. *Int. J. Global Environmental Issues*, 6 (4), pp. 331-347.

- Marchau, V., Walker, W. and van Duin, R. 2008. An adaptive approach to implementing innovative urban transport solutions. *Transport Policy*, 15 pp. 405-412.
- Mega, M., 2011. Jalur Trans Jogja Butuh Diperluas. Available at: http://www.kompasiana.com/mariamegacap/jalur-trans-jogja-butuh-diperluas_55007628a333115372510fdd [Accessed 2016].
- Miles, M. B. and Huberman, A. M. 1994. *Qualitative Data Analysis: An Expanded Sourcebook*. [Accessed 10/3/2016 7:21:40 AM].
- Ministry of Education and Culture, 2015. Peta Budaya Indonesia (Map of Culture of Indonesia). Available at: <http://petabudaya.belajar.kemdikbud.go.id/> [Accessed 2016].
- Mulyono, S., 2015. Trans Jogja vs Kopata. Available at: http://www.kompasiana.com/sidikmulyono/trans-jogja-vs-kopata_54f8fcbda333111d618b460f [Accessed 2016].
- Neuman, W. L., 2006. Qualitative and quantitative smapling. Qualitative and quantitative smapling. 2006. *Social research mehtods and quantitative approaches* (sixth edition). Boston: Pearson, Allyn and Bacon. pp. 219-245.
- Newcomer, K. E., Hatry, H. P. and Wholey, J. S., 2015. *Handbook of Practical Program Evaluation*. 4. New Jersey: John Wiley & Sons.
- Nicolas, 2013. Perbaiki Transportasi Publik 'Trans Jogja'. Available at: <https://www.change.org/p/walikota-yogyakarta-haryadi-suyuti-perbaiki-transportasi-publik-trans-jogja> [Accessed 2016].
- Nykvist, B. and Whitmarsh, L. 2008. A multi-level analysis of sustainable mobility transitions: Niche development in the UK and Sweden. *Technological Forecasting & Social Change*, 75 pp. 1373-1387.
- Ongkittikul, S. and Geerlings, H. 2006. Opportunities for innovation in public transport: Effects of regulatory reforms on innovative capabilities. *Transport Policy*, 13 pp. 283-293.
- Paulley, N., Balcombe, R., Mackett, R., Titheridge, H., et al., 2006. The demand for public transport: The effects of fares, quality of srvice, income and car ownership. *Transport Policy*, 13 pp. 295-306.
- Perschon, J., 2012. Sustainable Mobility. *Policy Paper 36 of the Development and Peace Foundation*, 36 pp. 1-12.
- Pohan, M. R., 2008. Trans Jogja Salah Tujuan. Available at: <http://www.kabarindonesia.com/beritaprint.php?id=20080128120055> [Accessed 2016].

- Satiennam, T., Jaensirisak, S., Satiennam, W. and Detdamrong, S. 2015. Potential for modal shift by passenger car and motorcycle users towards Bus Rapid Transit (BRT) in an Asian developing city. *IATSS Research*, .
- Spickermann, A., Grienitz, V. and von der Gracht, Heiko A 2013. Heading toward a multimodal city of the future? Multi-stakeholders scenarios for urban mobility. *Technological Forecasting & Social Change*, xxx pp. xxx-xxx.
- Thiel, S. v., 2014. Operationalization. Operationalization. 2014. Research methods in public administration and public management : an introduction. London: Routledge. pp. 43-53.
- Verschuren, P. and Doorewaard, H. 2010. Research strategies. Research strategies. 2010. Designing a research project. The Hague: Eleven International Publishing. pp. 155-186.
- Wright, L., 2012. Transport for green cities. Transport for green cities. 2012. Mandaluyong City: Asian Development Bank. pp. 175-215.
- Yin, R. K., 2009. Case Study Research. Case Study Research. 2009. Design and Methods. Thousand Oaks: Sage Publications.
- Yogyakarta City Government, 2015. Map of Greater Yogyakarta. Available at: <http://jogjakota.go.id/roadmap/detail/37> [Accessed 2016].

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Annex 1: Research Instruments

A. Questionnaire for Private Vehicle Users

Role of Push and Pull Strategies in Influencing a Modal Shift from Private Vehicle Use to Public Transportation in the Case of Trans Jogja, in Yogyakarta, Indonesia.

Dear Sir/Madam,

I am Yescha N. E. Danandjojo, master student at the Institute for Housing and Urban Development Studies (IHS), Erasmus University Rotterdam, the Netherlands. I am conducting research on how transportation policy in the form of push and pull strategies influences commuters decisions to make a modal shift from private vehicle to public transportation. In particular, this research discusses the service quality of Trans Jogja, as public transportation provided by the government.

Related to the main objective of this research, I would appreciate your help by completing this questionnaire. Data and information gathered from the questionnaires will be processed collectively, so your personal data and opinions will be treated confidentially. In addition, data and information will be processed for academic purposes only and will not be used for any other interests.

Thank for your participation and for taking the time to fill in this questionnaire. If you have any further questions about this research, you can contact me at yescha.danandjojo@gmail.com.

Respondent Number: ...

A.1 Commuter Characteristics

1. Gender

☐ Male

☐ Female

2. Age

☐ < 17

☐ 46 – 55

☐ 17 – 25

☐ 56 – 65

☐ 26 – 35

☐ > 65

☐ 36 – 45

3. Education Level

☐ Elementary School

☐ D4/S1 (Bachelor's Degree)

☐ Junior High School

☐ S2 (Master's Degree)

☐ Senior High School

☐ Dr./PhD

☐ D1/D3 (Vocational College)

☐ Other. Please specify ...

4. Please indicate your monthly income.

☐ Less than IDR 1,500,000

☐ IDR 1,550,000 – IDR 3,000,000

☐ IDR 3,050,000 – IDR 5,000,000

- ☐ More than IDR 5,000,000

A.2 Choice of Transportation Mode

This part asks about your choice of transportation mode, and some choices of conditions that would probably affect your decision to use Trans Jogja.

5. Do you have your own vehicle?

☐ Only a motorcycle
☐ Only a car

☐ Both a car and a motorcycle
☐ No, I do not.
6. Do you have driving license?

☐ Yes, I do.
☐ No, I do not, because.....
7. Have you ever used Trans Jogja?

☐ Every day
☐ 4-6 days in a week
☐ 1-3 days in a week
☐ 1 time per 2 weeks
☐ 1 time per month
☐ Occasionally

☐ Only if there is a problem with my private vehicle
☐ Only 1-5 times (2008-2016)
☐ Only 6-10 times (2008-2016)
☐ Other.
 Please specify
8. What modes of transportation do you usually use every day for the following trip purposes?
 (Please place an X in the table. Combination answers are possible, max. 3 choices)

Trip Purpose	Mode of Transportation					
	Motorcycle	Private Car	Taxi	Trans Jogja	Bicycle	Walking
Work/office						
School						
Visit family/friends						
Social events (e.g. wedding, religion event, etc.)						
Leisure activities (e.g. shopping)						
9. How much time is usually involved when travelling from your home to your final destination for your daily trip activity?

☐ 1 – 10 min.
☐ 11 – 20 min.

☐ 21 – 30 min.
☐ More than 30 min.
10. How long do you usually spend on your daily trip from your home to your final destination if you use Trans Jogja?

☐ Less than 15 min.
☐ 16 – 30 min.
☐ 31 – 45 min.

☐ 46 – 60 min.
☐ More than 60 min.
☐ Don't know

11. In your opinion, using Trans Jogja is:
 - ☐ Faster than using my own private vehicle
 - ☐ Longer than using my own vehicle
12. If using Trans Jogja takes longer than using your own private vehicle, would you switch to Trans Jogja if the travel time became faster than using your own vehicle?
 - ☐ Yes, I would change my transportation mode choice.
 - ☐ No, I would still travel using my own vehicle
because
13. How much do you usually spend on transportation costs each week (including parking and fuel)?

<input type="checkbox"/> Less than IDR 20,000	<input type="checkbox"/> IDR 51,000 – IDR 60,000
<input type="checkbox"/> IDR 21,000 – IDR 30,000	<input type="checkbox"/> IDR 61,000 – IDR 70,000
<input type="checkbox"/> IDR 31,000 – IDR 40,000	<input type="checkbox"/> IDR 71,000 – IDR 80,000
<input type="checkbox"/> IDR 41,000 – IDR 50,000	<input type="checkbox"/> More than IDR 80,000
14. The current Trans Jogja fare is IDR 3,500 for one trip. If you count for a round trip (IDR 7,000) per day, and sum up your transportation costs in one week, it would be:
 - ☐ Less than my weekly travel costs
 - ☐ More than my weekly travel costs
15. I would probably switch to using Trans Jogja if
 - ☐ Bus waiting time is 0-5 min.
 - ☐ Bus waiting time is 6-10 min.
 - ☐ Bus waiting time is 11-15 min.
 - ☐ Bus waiting time is 16-20 min.
 - ☐ Bus waiting time is 21-25 min.
 - ☐ I will continue to use my private vehicle
16. I would probably switch to using Trans Jogja if
 - ☐ Travel time with Trans Jogja to my final destination is 5-10 min.
 - ☐ Travel time with Trans Jogja to my final destination is 11-15 min.
 - ☐ Travel time with Trans Jogja to my final destination is 16-20 min.
 - ☐ Travel time with Trans Jogja to my final destination is 21-25 min.
 - ☐ Travel time with Trans Jogja to my final destination 26-30 min..
 - ☐ I will continue to use my private vehicle
17. I would probably switch to using Trans Jogja if:
 - ☐ The fare is free
 - ☐ The fare is around IDR 1,000 – IDR 2,000
 - ☐ The fare is around IDR 2,100 – IDR 3,000
 - ☐ The fare is around IDR 3,100 – IDR 3,500
 - ☐ Whatever the costs, as long as the service is good and comfortable for passengers.
 - ☐ I would continue to use my own vehicle, even if it were free
because
18. In your opinion, what is the most important indicator that would probably encourage you to use Trans Jogja?

- | | |
|--------------------------------------------------------------|--------------------------------------------------------------|
| <input type="checkbox"/> Comfortable waiting environment | <input type="checkbox"/> A short in-vehicle travel time |
| <input type="checkbox"/> A short bus waiting time | <input type="checkbox"/> Affordable travel costs |
| <input type="checkbox"/> High frequency of bus | <input type="checkbox"/> Reliable security and safety system |
| <input type="checkbox"/> Fewer public transport interchanges | <input type="checkbox"/> Other. Please specify..... |
| <input type="checkbox"/> Adequate operational bus hours | |

A.3 Influence of Push and Pull Strategies on Modal Shifts

A.3.1 Pull Strategies (Quality of Trans Jogja's Services)

This part asks for your opinion on the quality of Trans Jogja's services. Please choose your answers based on your personal opinion. Your opinion is represented by 5 expressions: Strongly Disagree; Disagree; Neutral; Agree; and Strongly Agree

19. Trans Jogja's station is within a reasonable walking distance (100 m – 1 km) from my home.

- | | | | | | |
|--------------------------------------------|-----------------------------------|----------------------------------|--------------------------------|-----------------------------------------|-------------------------------------|
| <input type="checkbox"/> Strongly disagree | <input type="checkbox"/> Disagree | <input type="checkbox"/> Neutral | <input type="checkbox"/> Agree | <input type="checkbox"/> Strongly Agree | <input type="checkbox"/> Don't know |
|--------------------------------------------|-----------------------------------|----------------------------------|--------------------------------|-----------------------------------------|-------------------------------------|

20. I think the waiting environment in the station is comfortable.

- | | | | | | |
|--------------------------------------------|-----------------------------------|----------------------------------|--------------------------------|-----------------------------------------|-------------------------------------|
| <input type="checkbox"/> Strongly disagree | <input type="checkbox"/> Disagree | <input type="checkbox"/> Neutral | <input type="checkbox"/> Agree | <input type="checkbox"/> Strongly Agree | <input type="checkbox"/> Don't know |
|--------------------------------------------|-----------------------------------|----------------------------------|--------------------------------|-----------------------------------------|-------------------------------------|

21. I think the waiting area is clean.

- | | | | | | |
|--------------------------------------------|-----------------------------------|----------------------------------|--------------------------------|-----------------------------------------|-------------------------------------|
| <input type="checkbox"/> Strongly disagree | <input type="checkbox"/> Disagree | <input type="checkbox"/> Neutral | <input type="checkbox"/> Agree | <input type="checkbox"/> Strongly Agree | <input type="checkbox"/> Don't know |
|--------------------------------------------|-----------------------------------|----------------------------------|--------------------------------|-----------------------------------------|-------------------------------------|

22. I think Trans Jogja's station has good security.

- | | | | | | |
|--------------------------------------------|-----------------------------------|----------------------------------|--------------------------------|-----------------------------------------|-------------------------------------|
| <input type="checkbox"/> Strongly disagree | <input type="checkbox"/> Disagree | <input type="checkbox"/> Neutral | <input type="checkbox"/> Agree | <input type="checkbox"/> Strongly Agree | <input type="checkbox"/> Don't know |
|--------------------------------------------|-----------------------------------|----------------------------------|--------------------------------|-----------------------------------------|-------------------------------------|

23. I think Trans Jogja has long waiting times.

- | | | | | | |
|--------------------------------------------|-----------------------------------|----------------------------------|--------------------------------|-----------------------------------------|-------------------------------------|
| <input type="checkbox"/> Strongly disagree | <input type="checkbox"/> Disagree | <input type="checkbox"/> Neutral | <input type="checkbox"/> Agree | <input type="checkbox"/> Strongly Agree | <input type="checkbox"/> Don't know |
|--------------------------------------------|-----------------------------------|----------------------------------|--------------------------------|-----------------------------------------|-------------------------------------|

24. I think Trans Jogja has frequent bus arrival times.

- | | | | | | |
|--------------------------------------------|-----------------------------------|----------------------------------|--------------------------------|-----------------------------------------|-------------------------------------|
| <input type="checkbox"/> Strongly disagree | <input type="checkbox"/> Disagree | <input type="checkbox"/> Neutral | <input type="checkbox"/> Agree | <input type="checkbox"/> Strongly Agree | <input type="checkbox"/> Don't know |
|--------------------------------------------|-----------------------------------|----------------------------------|--------------------------------|-----------------------------------------|-------------------------------------|

25. As far as I know, I need to transfer several times to reach my final destination if I use Trans Jogja.

- | | | | | | |
|--------------------------------------------|-----------------------------------|----------------------------------|--------------------------------|-----------------------------------------|-------------------------------------|
| <input type="checkbox"/> Strongly disagree | <input type="checkbox"/> Disagree | <input type="checkbox"/> Neutral | <input type="checkbox"/> Agree | <input type="checkbox"/> Strongly Agree | <input type="checkbox"/> Don't know |
|--------------------------------------------|-----------------------------------|----------------------------------|--------------------------------|-----------------------------------------|-------------------------------------|

26. I think the operational hours of Trans Jogja are adequate.

- | | | | | | |
|--------------------------------------------|-----------------------------------|----------------------------------|--------------------------------|-----------------------------------------|-------------------------------------|
| <input type="checkbox"/> Strongly disagree | <input type="checkbox"/> Disagree | <input type="checkbox"/> Neutral | <input type="checkbox"/> Agree | <input type="checkbox"/> Strongly Agree | <input type="checkbox"/> Don't know |
|--------------------------------------------|-----------------------------------|----------------------------------|--------------------------------|-----------------------------------------|-------------------------------------|

27. Trans Jogja's services do not have a fixed on-time schedule.

- | | | | | | |
|--------------------------------------------|-----------------------------------|----------------------------------|--------------------------------|-----------------------------------------|-------------------------------------|
| <input type="checkbox"/> Strongly disagree | <input type="checkbox"/> Disagree | <input type="checkbox"/> Neutral | <input type="checkbox"/> Agree | <input type="checkbox"/> Strongly Agree | <input type="checkbox"/> Don't know |
|--------------------------------------------|-----------------------------------|----------------------------------|--------------------------------|-----------------------------------------|-------------------------------------|

28. I think Trans Jogja's fares are affordable

- ☐ Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree ☐ Don't know
29. I think Trans Jogja's chauffeurs drive the buses well.
- ☐ Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree ☐ Don't know
30. I think passengers' belongings are safe in Trans Jogja.
- ☐ Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree ☐ Don't know

A.3.2 Push Strategies (Legislative and Economic Policies)

This part asks to what extent transportation policies that may be implemented by the government will influence your choice of transportation mode.

31. Would you change your transportation mode to Trans Jogja if the supply of land for parking is reduced?
- ☐ Yes, I would.
 Because
- ☐ No, I would not.
 Because
32. Would you change your transportation mode to Trans Jogja if parking prices increase?
- ☐ Yes, I would.
 Because
- ☐ No, I would not.
 Because
33. Would you change your transportation mode to Trans Jogja if you were charged for road use?
- ☐ Yes, I would.
 Because
- ☐ No, I would not.
 Because
34. Would you change your transportation mode to Trans Jogja if taxation on cars increases?
- ☐ Yes, I would.
 Because
- ☐ No, I would not.
 Because

B. Questionnaire for Trans Jogja Users

Role of Push and Pull Strategies in Influencing a Modal Shift from Private Vehicle Use to Public Transportation in the Case of Trans Jogja, in Yogyakarta, Indonesia.

Dear Sir/Madam,

I am Yescha N. E. Danandjoojo, master student at the Institute for Housing and Urban Development Studies (IHS), Erasmus University Rotterdam, the Netherlands. I am conducting research on how transportation policy in the form of push and pull strategies influences commuters decisions to make a modal shift from private vehicle to public transportation. In particular, this research discusses the quality of Trans Jogja services, as public transportation provided by the government.

In connection with the main objective of this research, I would appreciate your help by completing this questionnaire. Data and information gathered from the questionnaires will be processed collectively, so your personal data and opinion will be treated confidentially. In addition, data and information will be processed for academic purposes only and will not be used for any other interests.

Thank you for your participation and for taking the time to fill in this questionnaire. If you have any further questions about this research, you can contact me at yescha.danandjojo@gmail.com.

Respondent Number: ...

B.1 Commuter Characteristics

1. Gender

☐ Male

☐ Female

2. Age

☐ < 17

☐ 46 – 55

☐ 17 – 25

☐ 56 – 65

☐ 26 – 35

☐ > 65

☐ 36 – 45

1. Education Level

☐ Elementary School

☐ D4/S1 (Bachelor's Degree)

☐ Junior High School

☐ S2 (Master's Degree)

☐ Senior High School

☐ Dr./PhD

☐ D1/D3 (Vocational College)

☐ Other. Please specify ...

2. Please indicate your monthly income

☐ Less than IDR 1,500,000

☐ IDR 1,550,000 – IDR 3,000,000

☐ IDR 3,050,000 – IDR 5,000,000

☐ More than IDR 5,000,000

A.2 Choice of Transportation Mode

This part asks about your choice of transportation mode, and some choices of conditions that would probably affect your decision to use Trans Jogja.

5. Do you have your own vehicle?

☐ Only a motorcycle
☐ Only car

☐ Both a car and a motorcycle
☐ No, Do not.
6. Do you have driving license?

☐ Yes, I do.
 ☐ No, I do not because.....
7. How often do you use Trans Jogja?

☐ Every day
☐ 4-6 days in a week
☐ 1-3 days in a week
☐ 1 time in 2 weeks
☐ 1 time in a month
☐ Occasionally

☐ Only if there is a problem with my private vehicle
☐ Only 1-5 times (2008-2016)
☐ Only 6-10 times (2008-2016)
☐ Other.
 Please specify
8. What modes of transportation do you usually use every day for the following trip purposes?
 (Please place an X in the table. Combination answers are possible, max. 3 choices)

Trip Purpose	Mode of Transportation					
	Motorcycle	Private Car	Taxi	Trans Jogja	Bicycle	Walking
Work/office						
School						
Visit family/friends						
Social events (e.g. wedding, religion event, etc.)						
Leisure activities (e.g. shopping)						

9. If you chose more than 1 option for a trip purpose(s), why do you combine transportation modes?

10. Do you need to use interchange transportation modes to reach the nearest Trans Jogja bus station from your home?

☐ Yes
 ☐ No
11. How long do you usually wait at the Trans Jogja bus station?

☐ Less than 15 min
 ☐ 46 – 60 min.

- ☐ 16 – 30 min.
 ☐ More than 60 min
☐ 31 – 45 min.
12. How much time does it take you by bus to reach your final destination?
- ☐ Less than 15 min
 ☐ 46 – 60 min.
☐ 16 – 30 min.
 ☐ More than 60 min
☐ 31 – 45 min.
13. How much time does it take you to walk from the nearest Trans Jogja bus station to your final destination?
- ☐ 1 – 10 min.
 ☐ 21 – 30 min.
☐ 11 – 20 min.
 ☐ More than 30 min.
14. Do you need to use interchange transportation modes to reach your final destination from the nearest Trans Jogja bus station?
- ☐ Yes
 ☐ No
15. How much do you usually spend on transportation costs per week? (only for travel costs with Trans Jogja and interchange transport modes if applicable (*becak, ojeg, angkot*))
- ☐ Less than IDR 20,000
 ☐ IDR 41,000 – IDR 50,000
☐ IDR 21,000 – IDR 30,000
 ☐ IDR 51,000 – IDR 60,000
☐ IDR 31,000 – IDR 40,000
 ☐ More than IDR 60,000
16. How much do you usually spend on transportation cost per week for your private vehicle? (include parking costs)
- ☐ Less than IDR 20,000
 ☐ IDR 51,000 – IDR 60,000
☐ IDR 21,000 – IDR 30,000
 ☐ More than IDR 60,000
☐ IDR 31,000 – IDR 40,000
 ☐ None
☐ IDR 41,000 – IDR 50,000
17. Do you intend to use Trans Jogja in the future? Please explain your answer
-
-

B.3 Influence of Push and Pull Strategies on Commuter Decisions on Making a Modal Shift

B.3.1 Pull Strategies (Quality of Trans Jogja's Services)

This part asks for your opinion on the quality of Trans Jogja's services. Choose your answers based on your personal opinion. Your opinion is represented by 5 expressions: Strongly Disagree; Disagree; Neutral; Agree; and Strongly Agree

18. Trans Jogja's station is within a reasonable walking distance (100 m – 1 km) from my home.
- ☐ Strongly disagree
 ☐ Disagree
 ☐ Neutral
 ☐ Agree
 ☐ Strongly Agree
 ☐ Don't know

19. The waiting environment in the station is comfortable.
- ☐ Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree ☐ Don't know
20. The waiting area is clean.
- ☐ Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree ☐ Don't know
21. Trans Jogja's station has good security.
- ☐ Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree ☐ Don't know
22. Trans Jogja has long waiting times.
- ☐ Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree ☐ Don't know
23. Trans Jogja has frequent bus arrival times.
- ☐ Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree ☐ Don't know
24. I need to transfer several times to reach my final destination if I use Trans Jogja.
- ☐ Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree ☐ Don't know
25. Trans Jogja has adequate operational hours.
- ☐ Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree ☐ Don't know
26. Service of Trans Jogja does not have a fixed on-time schedule.
- ☐ Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree ☐ Don't know
27. Trans Jogja has affordable ticket fares.
- ☐ Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree ☐ Don't know
28. Trans Jogja's chauffeurs drive the buses well.
- ☐ Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree ☐ Don't know
29. Passengers' belongings are safe in Trans Jogja.
- ☐ Strongly disagree ☐ Disagree ☐ Neutral ☐ Agree ☐ Strongly Agree ☐ Don't know
30. In your opinion, what are the most important indicators that encourage you to use Trans Jogja? (Please choose 3 answers that represent your opinion)
- ☐ Comfortable waiting environment ☐ A short in-vehicle travel time
- ☐ A short bus waiting time ☐ Affordable travel costs
- ☐ High frequency of bus ☐ Reliable security and safety system
- ☐ Fewer public transport interchanges ☐ Other. Please specify.....
- ☐ Adequate operational bus hours

B.3.2 Push Strategies (Legislative and Economic Policies)

This part asks to what extent transportation policies that may be implemented by the government would influence your choice of transportation mode.

31. Does the availability of land for parking purposes affect your use of Trans Jogja?
- ☐ Yes, it does.
Because
- ☐ No, it does not.
Because
32. Does current parking pricing influence your use of Trans Jogja?
- ☐ Yes, it does.
Because
- ☐ No, it does not.
Because
33. Would road pricing affect your use of Trans Jogja?
- ☐ Yes, it would.
Because
- ☐ No, it would not.
Because
34. Does taxation on private vehicles influence your use Trans Jogja?
- ☐ Yes, it does.
Because
- ☐ No, it does not.
Because
35. Are there any other factors that would influence your use of Trans Jogja? Please explain your answer.
-
-
-
-

C. Interview Guide for Transportation Policy Operator/Developer

C1. Operator of Trans Jogja: PT-Jogja Tugu Trans

C.1.1 Pull Strategies (Quality of Trans Jogja's Services)

1. How would you describe the current public transportation system in Yogyakarta?
2. How would you describe the level of usage of Trans Jogja during its operational period (2008 – 2016)?
3. What factors do you think encourage people to use Trans Jogja? Please explain your answers.
4. What factors do you think make people prefer not to use Trans Jogja and instead to use their own private vehicle? Please explain your answers.
5. What do you think about the quality of the services provided by Trans Jogja?
 - a. Waiting time of passengers;
 - b. Availability of bus station;
 - c. Quality of bus station;
 - d. Travel time on bus;
 - e. Travel costs;
 - f. Frequency of buses;
 - g. Operational hours of the service;
6. To what extent do you think the services provided meet passengers' demands?
7. How did you determine the in-vehicle travel time on bus?
8. How did you determine the system's operational hours?
9. What standard do you use to maintain passenger safety?
10. What could the company do to improve the quality of services provided by Trans Jogja in order to increase the number of Trans Jogja passengers?
11. What challenges does the company face in delivering the services?
12. Why do you think these challenges exist?

C.1.2 Push Strategies (Legislative and Economic Policies)

13. Do you think it is important to combine implementing the Trans Jogja system with other transportation policies?
14. What transportation policy do you think needs to be developed in combination with Trans Jogja?

C.2. Regulator of Trans Jogja

C.2.1 Pull Strategies (Quality of Trans Jogja's Services)

1. How would you describe the level of usage of Trans Jogja during its operational period (2008 – 2016)?
2. What factors that you think encourage people to use Trans Jogja?
3. What factors that you think make people prefer not to use Trans Jogja and instead prefer to use their own private vehicle?
4. What do you think about the quality of services provided by Trans Jogja?
 - a. Waiting time of passengers;
 - b. Availability of bus station;
 - c. Quality of bus station;
 - d. Travel time on bus;
 - e. Travel costs;
 - f. Frequency of buses;
 - g. Operational hours of the service;
5. How did you determine the in-vehicle travel time on bus?
6. How did you determine the system's operational hours?
7. What standard do you use to maintain passenger safety?
8. How do you regulate the bus routes?
9. How do you set up the interchange points of bus routes/networks?
10. What factors needed to be considered to provide a bus route?
11. What factors need to be considered to set up a bus station?
12. Do you also consider integrating the system of transportation between Trans Jogja and other transportation modes?
13. What challenges exist in providing and regulating the services?
14. Why do you think these challenges exist?

C.2.2 Push Strategies (Legislative and Economic Policies)

15. How do you integrate the Trans Jogja system with other transportation policies?
16. Is it important to combine implementing the Trans Jogja system with other transportation policies?
17. What transportation policy do you think needs to be developed in combination with Trans Jogja?
18. How effective are push and pull strategies in influencing a modal shift from car use to Trans Jogja?

C.3 Transportation Policy-Maker and/or Developer (Push and Pull Strategies)

1. How effective do you think implementing Yogyakarta's transportation policy is in reducing the extent of private vehicle use?
2. Which transportation problem is likely to be solved by introducing Trans Jogja in Yogyakarta?
3. What do you think of TDM?
4. Is transportation demand management (TDM) important?
5. Why do you think TDM is or isn't important?
6. How do you develop transportation policy for TDM?
7. What factors make you feel that TDM policy is important in Yogyakarta?
8. How do you implement TDM policy in Yogyakarta?
9. What transportation policy is already being implemented as a form of TDM policy?
10. What transportation policy is going to be implemented as a form of TDM policy?
11. Do you implement physical measures as a form of TDM policy?
12. What challenges exist in implementing TDM policy?
13. Why do you think these challenges exist?

Annex 2: Time Schedule of Thesis Writing

No.	Thesis Writing Process		MAR	APRIL					MAY					JUNE					JULY					AUG					SEPT					OCT	
			V	I	II	III	IV	V	I	II	III	IV	V	I	II	III	IV	V	I	II	III	IV	V	I	II	III	IV	V	I	II					
1	Research Proposal																																		
	1.a	Submission First Draft	29																																
	1.b	Submission Second Draft				22																													
	1.c	Submission Final Draft								27																									
	1.d	Submission Final Research Proposal										10																							
2	Field Work																																		
	2.a	Preparation for Field Work																																	
	2.b	Questionnaire Distribution																																	
	2.c	Interviews																																	
	2.d	Secondary Data Collection																																	
	2.e	Eid Mubarak Holiday																																	
3	Data Analysis and Thesis Writing																																		
	3.a	Quantitative Data Analysis																																	
	3.b	Qualitative Data Analysis																																	
	3.c	Conclusion and Recommendation																																	
	3.d	First Draft Submission																																	
	3.e	Thesis Draft Revision																																	
	3.f	Final Submission																												3					