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# **OPTIMIZATION OF PUBLIC TRANSPORT ORGANIZATION**

**CASE STUDY: TRANS METRO BANDUNG AND TRASMILENIO BOGOTA**

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A provision of public transportation plays an important role in term of sustainable transportation. With a larger capacity of its vehicle than private vehicle, public transportation can reduce the number of vehicle movement on the road that lead to reduction of traffic congestion; efficiency use of space and energy; and also reduce air and noise pollution. However, the provision of public transportation in developing countries mostly has a lack of service quality. There is improper form and mismanagement issues of public transport organization that often seen as a contributor to its lack of service quality. As the result, those conditions make public transportation becomes unreliable and fail to support sustainable transportation.

The main objective of this research is to identify the optimization of public transport organization that contributes to sustainable transportation by comparing two different case studies of Trans Metro Bandung (TMB) and TransMilenio, Bogota. The comparison used level of planning and control and also organizational form of public transportation as a basis comparison. This research revealed several key points that played important elements in order to optimize public transport organization: general aim to provide public transport service; translation of general aim to provide public transport service; service management; information and publication of bus service; financial aspect; bus operation; and fare collection. Those key points are used as a lesson learned to optimize public transport organization in order to achieve sustainable transportation.

*Key words: Public Transport, Sustainable Transport, Institutional Reform, Organization, Trans Metro Bandung, TransMilenio.*



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### 1.1 Problem in Public Transportation

An optimal public transportation service is important to reduce traffic congestion as a result of the increase of private vehicle movement in a limited road infrastructure (Han, 2010). The more number of idle running vehicles on the road as a result of traffic congestion consumes more energy and space, and also produces more gas emissions (Veeneman, 2002). This condition can lead to negative health impact, inefficient people mobility and exhaustion of finite fuel resource (Hidalgo and Huizenga, 2013).

A provision of public transportation in developing countries mostly has a lack of service quality (Iles, 2005). Improper form and mismanagement of the public transport organization are often seen as a contributor to its lack of service quality (Veeneman, 2002). As the result, those conditions can make public transportation becomes unreliable and fail to support sustainable transportation (Gilbert, 2008).

Vuchic (2005) argued that in order to provide an optimal and attractive public transportation service, one of the important requirements is a good organization. The organization becomes an important aspect since it links the different actors' task to provide and manage the service of the public transport (Veeneman, 2002).

In order to develop a reliable public transport system, the organization of public transport can change its internal structure (Veeneman, 2002). In line with Veneeman, Kim (2011) stated that the organizations or institutions are constructed from several constraints. It means that the organizations or institutions can be reformed or reconstructed to optimize their task in order to achieve a sustainable transportation.

Sustainable transportation refers to the ability of transportation system to provide transportation services without compromising the ability of future generations to meet their transportation needs (Richardson, 2005). A finite fuel resource and high pollution as a result of high number vehicle on the road can affect sustainability of future generation. Therefore, the greater number of vehicle on the road needs to be reduced.

The vehicle movement on the road cannot merely be limited to reduce its rapid growth without provides another options. It is because a great number of people's mobility can generate regional economic growth (Wegener and Fürst, 1999; Han, 2010). There is another complementary effort by providing a reliable public transport service that has larger capacity than private vehicles to reduce vehicle movement (Veeneman, 2002; Henning et al, 2010).

The provision of an optimal and attractive operation of public transportation can encourage shift of people mobility to use public transportation that has larger capacity than private vehicle. This shift of transportation mode can improve fuel efficiency and reduce air and sound pollution since it reduces number of idle running vehicles on the road that consumes more energy and space (Susniene and Jurkauskas, 2008).

## **1.2 Trans Metro Bandung and TransMilenio as Cases Study**

As a metropolitan area in developing country, Bandung, that located on the West part of Java Island, Indonesia, has a traffic congestion problem on their transportation system (Bandung Municipality, 2013). Related with this condition, in 2008 the government developed a bus-based public transportation system called Trans Metro Bandung (TMB) (Direktorat Jenderal Perhubungan Darat [Ditjenhubdat], 2010). The objectives of TMB are to accommodate mobility that can support economic growth of the city and reduce traffic congestion. However, the TMB operation failed to achieve their objectives. It can be seen the traffic congestion areas in the city still increasing after TMB operation (Bandung Municipality, 2013).

In contrast with the operation of TMB, Bogota as a capital city of Columbia has a successful TransMilenio, a bus-based public transportation service that developed by government to facilitate a greater number of movement of the city and to reduce traffic congestion and its negative impacts (Cain et al, 2006; Bocarejo et al, 2013). The implementation of TransMilenio becomes one of the most innovative and successful public transportation systems in the world (Cain et al, 2006; Ardila, 2007; Estupinan and Rodriguez, 2008; Bocarejo et al, 2013). The operation of TransMilenio has achieved its objective by shifting a greater number of passengers to use TransMilenio service (Hildago et al, 2013). Moreover the service has significantly reduced travel time

as well as traffic congestion that led to improvement of live quality in the city (Cain et al, 2006).

Based on two different situations above, a comparison analysis will be conducted in order to formulate optimization of public transport organization using level of planning and control, and also organizational forms point of view.

### **1.3 Research Objectives**

The provision of an optimal and attractive operation of public transportation is important, because it encourages shift of people mobility to use public transportation that can improve fuel efficiency and reduce air and sound pollution (Susniene and Jurkauskas, 2008; Han, 2010). Therefore, the main purpose of this research is to identify the optimization of public transport organization that contributes to sustainable transportation by comparing two different case studies of Trans Metro Bandung (TMB) and TransMilenio, Bogota.

### **1.4 Research Questions**

Based on the background that was described previously, there were several questions shall be answered in this research. The several questions are as follows:

- a. How is the existing public transport organization of Trans Metro Bandung (TMB) and TransMilenio that contributing or hampering sustainable transportation?
- b. What lesson could be learned from existing organization of TMB and TransMilenio to optimize a public transport organization?
- c. How the lesson learned from TMB and TransMilenio operations could be used to optimize a public transport organization?

## 1.5 Thesis Structure

The several stages of this research will be explained on six chapters, which is each chapter will contain different specific content of explanation. The chapters of this research described as follows:

### **Chapter 1: Introduction**

This section will explain briefly the background of the study, including the research problems, research objectives, research questions and the research structure.

### **Chapter 2: Theoretical Review**

The theoretical review will explore the public transportation system towards sustainable transportation, particularly in public transport organization from the academic point of view. The aim of this chapter is to build a theoretical framework based on literature review in order to know the ideal condition of public transport organization that can contribute to sustainable transportation.

### **Chapter 3: Methodology**

Chapter three will contain methodology of the research, where several methods will be illustrated. The purpose of this chapter is to generate the ideas of thinking to answer the research questions that have been explained in the first chapter.

### **Chapter 4: The Case Study**

In this chapter, the current management practice of the Trans Metro Bandung and TransMilenio will be described. The explanation will focus on level of planning and control in public transport and forms of public transport organization. The main idea of this chapter is to get empirical knowledge of existing management practice of both organizations.

### **Chapter 5: Comparison and Lesson Learn**

The characteristics of TMB and TransMilenio will be compared and analyzed to get overview of existing condition that might contribute or deter the sustainable transportation. Moreover, the lesson learned from comparison of both operations will



be analyzed to get useful practice for improving the organization of public transportation.

### **Chapter 6: Conclusion and Reflection**

The last chapter of this research will provide conclusion on optimization of public transport organization that contributes to sustainable transportation by answering the research questions of this research. Furthermore, a reflection will be given to provide information about limitation of this research that useful for future research in public transport field particularly in organizational issues.



## CHAPTER 2. THEORETICAL OVERVIEW

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The research objective of this research is to identify the optimization of public transport organization that contributes to sustainable transportation by comparing two different case studies of Trans Metro Bandung (TMB) and TransMilenio, Bogota. The optimization is important because it encourages shift of people to use public transportation that can improve fuel efficiency and reduce air and sound pollution. Therefore, in order to identify the optimization of public transport organization, the research will review the following theories: sustainable transport, public transport organization and institutional reform.

The sustainable transportation is a theory that will be used as an optimal situation that needs to be achieved in order to consider the sustainability of future generations to meet their transportation needs. Based on theory of sustainable transportation that mentioned by Banister (2008), there are three strategies towards sustainability of transportation system – avoid or reduce the need to travel; encourage the mode shift from private vehicle to an eco-friendly modes including public transport; and improve fuel efficiency and promote low-emission vehicles.

Public transportation that has large capacity becomes part of strategy towards sustainable transportation, since the service can reduce the number of vehicle movement on the road with a larger capacity than other vehicles (Hidalgo and Huizenga, 2013). In addition, the replacement private vehicle using public transportation service also can promotes fuel efficiency, moreover an attractive and optimal service of public transportation can encourage people to shift their mode of transportation from private vehicle to use public transportation service that provide by public transportation organization (Susniene and Jurkauskas, 2008).

Afterwards, the theory of public transport organization is explained as a guideline on to manage public transportation service in order to perform an optimal service. It is important to know how the organization can perform its function while managing the operation of public transport since the organization is a requirement to develop a public transportation system that safe, reliable, and sustainable (Susniene and

Jurkauskas, 2008). During its implementation, un-appropriate form and mismanagement of public transport organization emerges as problems that reduce service quality of public transportation (Veeneman, 2002). In order to deal with these problems, there is a possibility to reform the organization to be fitted with the existing condition (Kim, 2011). Therefore, institutional reform theory is used to give an understanding of why the reform is needed and how is it work in term of optimization of the public transport organization.

## 2.1 Sustainable Transport

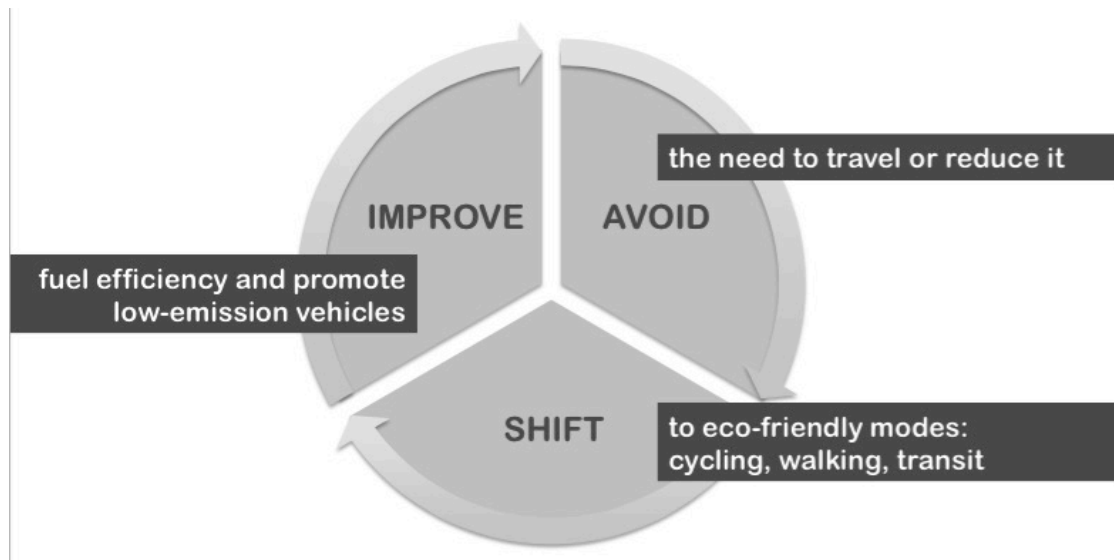
The sustainable development concept in general emerged in the 1987 when the Brundtland Commission gives an attention on their report about development that implies a systemic view of economy as well as ecology to protect the interest of future generations, which is the development have to meet the need of the present situation without reducing the ability of future generations to do the same thing (Goldmand and Gorham, 2006). The sustainable concept is about concerning the economy, social and environmental aspects. To be more specific, Rietveld and Stough (2004, p.708) stated the sustainable transport as:

*“The maintenance of mobility and accessibility at some socially predetermined level subject to selected social and environmental constraints, e.g. maintaining predetermined levels of environmental residuals”.*

In regards of sustainable transport, Goldmand and Gorham (2006) distinguish two different points of view to see the concept of sustainability. First, sustainability as a pathway that suggest policies as a force to push society along a path of “more sustainable” and measured through a set of indicators. The second point of view is sustainability as an end-state vision. In this point of view, sustainable transport is a system that limits emissions and waste within the ability of the earth to absorb them, the reduction of the negative impact from the transportation such as air and noise pollution is the main concern to achieve its sustainability.

Banister (2008) distinguishes three strategies towards sustainable transport, the first is to reduce the need to travel or avoid the travel by utilizing the information and

communication technology, the second is encourage the mode shift from the private vehicle to the eco-friendly modes such as cycling, walking and using a public transport with larger capacity than private vehicles. The last strategy is about improving the efficiency of the transport system to encourage the fuel efficiency and promote a low-emission vehicle.



**Figure 2-1: Strategies towards sustainable transport (Banister, 2008)**

In order to support the strategies towards sustainable transport, Goldman and Gorham (2006) stated that there are four innovative policies towards the sustainable transport - new mobility, city logistics, intelligent system management and livability. The new mobility is about a strategy to make the mobility more flexible, convenient and integrated with the other travel options. It needs to build a new service paradigm, which is the organization that provide a means to mobilize the individual daily activities have to reinvent themselves to be more customer oriented, not only providing the service, but also ensure the reliability of their service with a convenient, efficient and seamless mobility from origin to destination. The city logistic is addressing the kind of business of goods movement. The next innovative policy is about an intelligent system management, which is the innovative is focused on the organization that manages the transportation. Its organization can be reorganized to be more effective in term of facilitating the mobility. The last innovation is focused on livability, about how the society can make an interaction with the transportation systems.

Based on previous explanation, the sustainable transport seen as an ideal concept to provide a transportation system without compromising the ability of future generation to meet their transportation needs. The sustainability can be achieved through three strategies that supported by several innovative policies. The reduction or avoid the needs to travel by utilizing technology can be followed by encouraging people to use public transport that has larger capacity. The encouragement can be done through provision of optimal public transport service that finally can improve efficiency use of fuel and reduce the gas emissions. The organizations that provide transport service become important aspect since they become hub of different actors' task in order to provide and manage the service of public transportation (Veeneman, 2002). Therefore, the organizations of public transportation has to change their paradigm to be more customers oriented to attract more passengers to shift their mode by using public transportation service (Goldman and Gorham, 2006). The more passengers shift their mode to use public transport means the more number of private vehicles can be reduced and lead to the more efficiency of fuel usage.

## **2.2 Public Transport Organization**

A public transportation organization that manages its system plays a significant role in sustainable transportation (Susniene and Jurkauskas, 2008). They also mentioned that an optimal organization with efficient service encourage the shift of mode change from the private vehicle with lower capacity to public transport that has larger capacity, so it can reduce the number of private vehicle movement on the road. Finally, the energy use, air pollution as well as the noise pollution can be reduced and the transportation system can be improved efficiently. To support this effort in term of attracting more passengers, the public transport service must be provided at most of the times and the service should be safe, reliable, and attractive. In order to provide such service, the requirement is a good organization (Vuchic, 2005). In addition, the organization that provides public transportation service becomes important since it linked different actors task while providing and managing the service of public transportation (Veeneman, 2002) and therefore, organization point of view will be used as main perspective to analyze problem in this research.

## Level of Planning and Control in Public Transportation

Van de Velde (1999) divided organization of public transportation into three different levels based on their decision level in term of planning and control in the public transportation service. The top-level management has a strategic level, which have to formulate the general aims and general service characteristics. This level represents as the core of “entrepreneurship” because the direction of the service is defined here. Illes (2005), mentioned that top level is the smallest in number of employees with the highest-level task, this level defines goals and objectives of the public transport, including establishes overall operating policies as well as giving a general direction for relationships of labor groups of the organization and also gives rates of salary.

Decision level	General description	Decisions	
		“Software”	“Hardware”
<b>Strategic</b>  Long term (5 years)	<i>What do we want to achieve?</i>	<u>General Aims</u> Transport policy Market share Profitability <u>General service characteristics</u> Areas Target groups Intermodality	
<b>Tactical</b>  Medium term (1-2 years)	<i>Which services can help to achieve these aims?</i>	<u>Detailed service characteristics</u> Fares Image Additional services Vehicles Routes Timetable	
<b>Operational</b>  Short term (1-6 months)	<i>How to produce these services?</i>	<u>Sales</u> Selling activities Information to the public ...	<u>Production</u> Infrastructure management Vehicle rostering and maint. Personnel rostering and mngt

**Figure 2-2: The level of planning and control in public transport (van de Velde, 1999)**

The middle management has a tactical decision level; it is about making detailed decisions that can help to reach the general aims in an efficient way. The actual design of public transportation service such as the fares, type of vehicle, route, timetable, etc. takes place at this tactical level (van de Velde, 1999). On this level, performance guidance of service as well as measures to perform an efficiency service also made at this level management (Illes, 2005).

The lowest-level management has an operational decision level to make sure orders from the upper level are carried out appropriately through sales and production activities (van de Velde, 1999). This last level management is the organization that conducts daily operation of public transportation service (Illes, 2005).

### **Key Organization Roles of Public Transportation**

According to Finn (2012), public transportation system has three keys of organizational roles – system owner, system manager and asset manager. Finn explained the system owner refers to actor or organization that owns the system, which means the ultimate bearer of financial risk and takes all policy determination and strategic decision for networks, route and levels of service; system quality, standards and commitment to customers; basis for operator selection and relationship; tariff structure; and track-charges or other recovery of cost. Vuchic (2005) mentioned types of ownership of the public transport organizations could be fully owned by municipality or semi-independent agency that belongs to state, and also may be owned by the special governmental authority that created by legislation with certain powers and responsibilities.

The system manager of public transportation refers to actor or organization that manages the daily service performance on behalf of owner manager, either directly or through a specific contract management (Finn, 2012). Finn mentioned that the responsibilities of system manager relate to management and supervision of vehicle operation; management infrastructures; quality control and mitigation actions; marketing, provision of passenger information and service promotion.

According to Vuchic (2005), public transport organizations are usually managed by public agencies that provide all services as a monopoly in certain areas, and some of the others may have a contract of some or all services under specified conditions. However, it is also possible that the public transport is managed by private agencies or quasi/hybrid (public – private) in order to provide its transportation services (Illes, 2005).

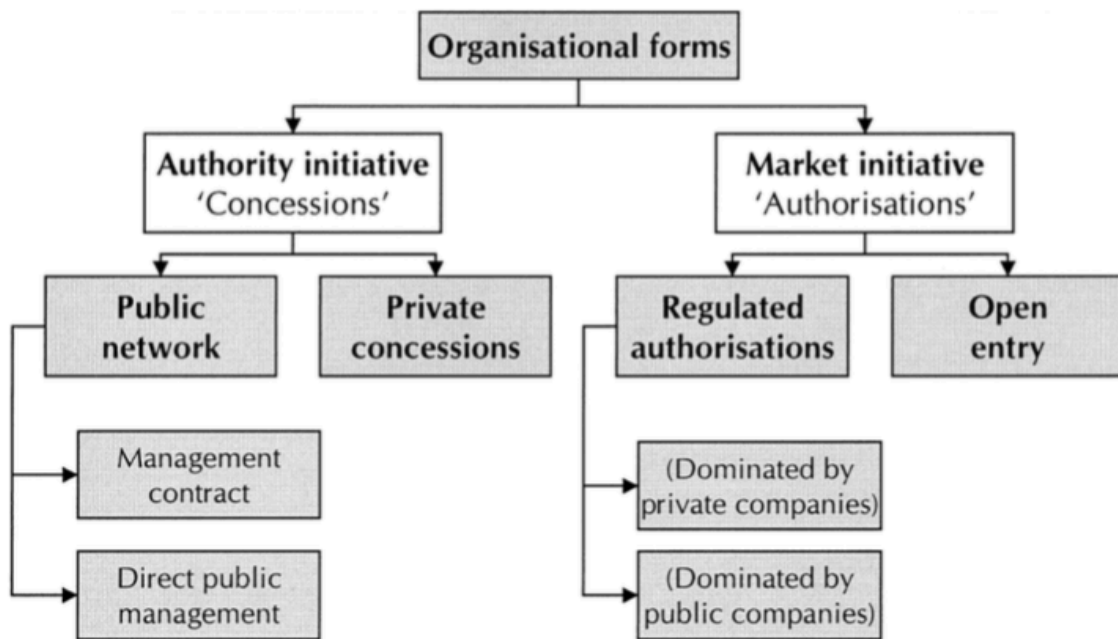


According to Iles (2005), there are two options for the public transport management; a single authority and several coordinated independent authorities through a regulatory body. The single authority is a common form in several cities that has a major disadvantage of the management in term of efficiency due to a large organization compares with the several coordinated independent authorities. On the other hand, the second form also has a disadvantage of longer bureaucracy because of its different organization body. Iles (2005) also stated that there are many subsidiary options than those two basic forms, such as single provider with separate organization body by regulation, or a state-owned operator supported by un-coordinated or even un-regulated private sector operators that run in competition.

The last key organizational roles of public transportation is asset manager, that refers to actor or organization that responsible for maintaining assets of bus operation such as running way, bus shelters and bus/vehicles (Finn, 2012). The asset that support the bus operator can be owned by the owner of bus system itself or own by separate organization (van de Velde, 1999).

### **Type of Organizational Form**

Based on initiative perspectives, van de Velde (1999) distinguished public transport organization into two different types of organization. First is an authority initiative through a legal concession – the public transport authority initiates a public transport service by a monopoly, and the initiation by autonomous market entry are legally impossible. Afterwards, the authority initiative divided into two different regimes – public network and private concessions. The public network means that public transportation system is owned by public sector through direct public management or delegation using management contract to private sectors. Under direct public management, the authority owns and operates their assets (bus and infrastructures). Meanwhile in delegation regime the authority delegates their assets to be operated by private sectors. In contrast with public network regime, the private concessions mean that the authority selects private company that has their own bus to provide public transportation services.



**Figure 2-3: The organizational form of public transport (van de Velde, 1999)**

Second type of organization is market initiative by an authorization. It means that the supply of transport service is provided by autonomous market entry as a result of a market process. However, the entry processes are mostly based on the required standard of the existing regulation. The initiative on this regime varies from the full competitive of open entry to the restricted entry by the regulations, while the regulated authorizations dominates either by private companies or public companies.

### **Efficiency in Public Transportation Service**

According to Veeneman (2002), the public transport management under a strong governmental surveillance has lack of effort to improve its service and also has lack incentives to produce their service efficiently. In line with this, Iles (2005) argued that most of state-owned public transport management under strong surveillance tends to have significant disadvantages than the private agencies. It can be seen in inappropriate staff selection procedures, lack of management incentive and the most critical problem is the political interference of the government that can influence the management decisions. Meanwhile, the hybrid type of management, which is mixed between government and private have an advantage in term of less political

interference. In term service efficiency, Batley (1999) also explained that authority should enable and regulate private sectors or other arm-length public agencies to provide public transportation service to promote efficiency and reduce the burden of authority itself.

### **2.3 Institutional Reform**

The development of a reliable public transport system becomes part of planning practice in certain metropolitan area. The planning practice need interaction and coordination between actors and organizations through institution in order to achieve several intended goals (Kim, 2011). However, the involvement of several actors and organizations during its practice can make the planning practice more complex and often make implementation of its plan not optimal (Healey, 2003). Therefore, in order to resolve planning problems, planners should not merely concern about technical aspects but also need to consider non-technical aspects such as social aspects (Brand and Gaffikin, 2007).

North (1991) explains institutions as the rules of the game – a constraint that structures interaction of political, economic and social aspects. The constraint can be informal rules (e.g., traditions, customs and taboos) or formal rules (e.g. laws, property rights and constitutions). The institutions or organizations are constructed from many constraints, it means the institutions or organizations can be reconstructed and the changes are very possible (Kim, 2011). According to Alexander (2005), the understanding of institutional reforms becomes a critical aspect of the planning practice because the planning is not merely about action but more about interaction between actors.

Organization as part of the institution is a collective activity of the common understanding and shared interpretations based on acceptable norms (Suddaby et al, 2010). The organization or reorganization needs an institutional design, the institutional design helps the actors or the planners to organize and implement the policies that encourage the reform of certain organization (Alexander, 2005).

*“The institutional design is designing the institutions: the devising and realization of rules, procedures, and organizational structures that will enable and constrain behavior and action so as to accord with held values, achieve desired objectives, or execute given tasks” (Alexander, 2005, p.213).*

## 2.4 Conceptual Framework

According to theoretical review, the main focus of this research is about how to optimize public transportation service from organization point of view in order to achieve sustainable transportation. Therefore, a conceptual framework of this research has been developed in the following figure to give a better understanding about the relation of each theory.

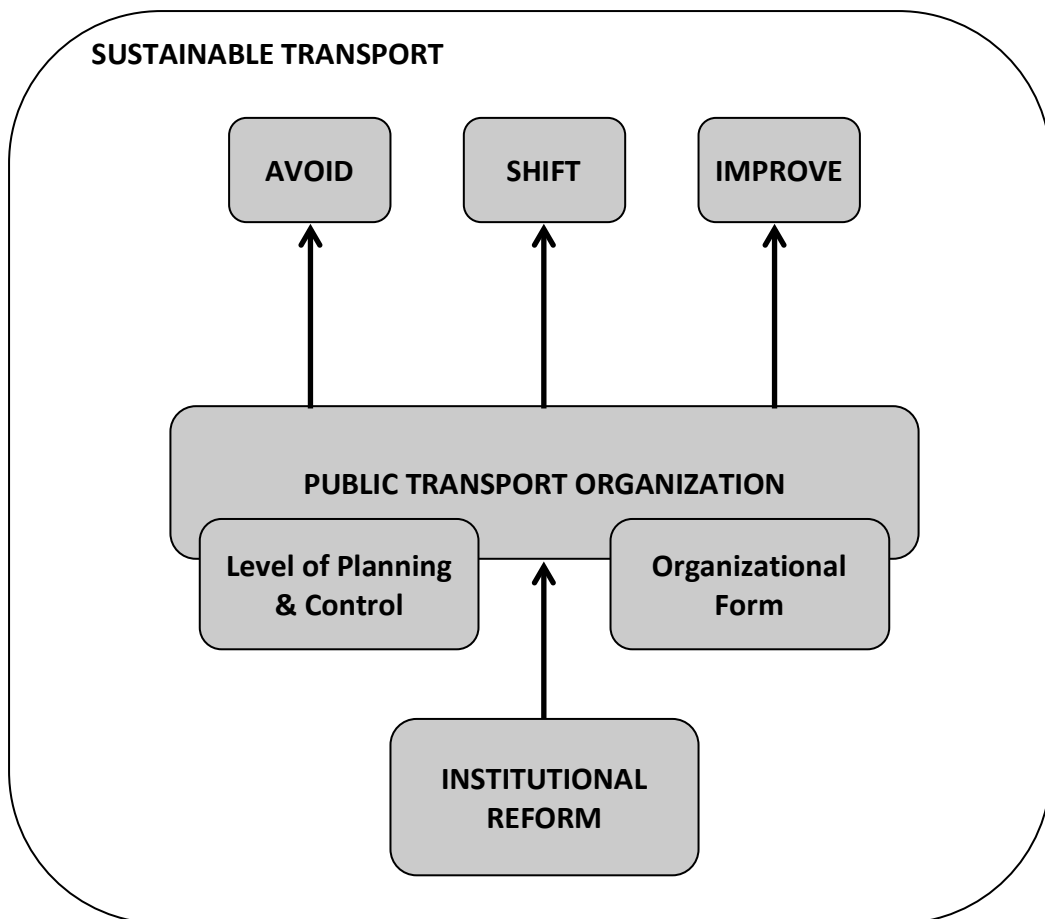


Figure 2-4: The conceptual framework (Author, 2015)

Based on figure 2-4, in order to achieve sustainable transport, there are three strategies that complimented to each other – avoid, shift and improve (Banister, 2008). These three strategies can be implemented through a provision of optimal public transportation (Susniene and Jurkauskas, 2008). The term of optimal in this explanation refers to provision public transportation service that can support three strategies towards sustainable transportation – an attractive public transportation can encourage people to shift their mode of transport to use public transport service that has larger capacity than private vehicles, it means the improvement of fuel efficiency and reduction of gas emission as well as noise pollution can be achieved (Hidalgo and Huizenga, 2013).

As organization becomes important requirement while providing public transportation service (Vuchic, 2005), it is important to know how organization can perform its task in order to support the strategies towards sustainable transport (Susniene and Jurkauskas, 2008). Therefore, public transport organization theories will be used to analyze implementation of public transportation service from organization point of view.

In order to structure and get a deeper analysis, the public transportation organization will classified using level of planning and control and also using classification of organizational form from initiative perspective. The level of planning and control can bring a better understanding of public transport service implementation in whole system since it will breakdown to three different level of management (top, middle and lowest level). In addition, the type organizational form can overview on how the provision of public transport service initiated.

As the provision of an optimal public transportation refers to achievement of sustainable transport, therefore each classification based on level of service and control and also organizational form then will be reviewed using key indicators of sustainable transport (avoid, shift and improve). It means the implementations of organization task that not support the sustainable transport can be changed or reformed through institutional reform, since the organization as part of institution can

be reconstructed or reformed to optimize its task in order to achieved the main objective of sustainable transportation (Kim, 2011).

## CHAPTER 3. METHODOLOGY

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Chapter three contains methodology to perform this research in a scientific way, where several methods will be illustrated in this chapter. The purpose of this chapter is to generate the ideas of thinking to answer research questions that have been explained in the first chapter. This research focuses on public transport organization that performs at certain institutional condition. It is about finding an appropriate form of public transport organization that can perform its tasks efficiently to support the concept of sustainable transport. The cases studies are reviewed with theories that relate to the issue using a literature review. Afterwards, to get a better overview of the public transport organization, the cases studies also will be compared to get lessons learned from two different implementation of public transport service.

The analysis section will use descriptive and comparative analysis based on the data collection. This research is interpreted as a qualitative research due to utilize more non-numerical data as a resource of its analysis (Punch, 2014). Furthermore, the next sub-chapter will describe more detail about the methodology that will be used to achieve the aim of this research.

### 3.1 Cases Selection

This research will use Trans Metro Bandung (TMB) and TransMilenio operation as cases studies. The TMB is chosen because this public transportation service cannot achieve its objective to reduce traffic congestion since the number of traffic congestion areas in Bandung still increasing after TMB operation (Bandung Municipality, 2013). Moreover, the TMB operation cannot significantly shifted people from using private vehicle to use public transportation service since its ridership still low (ITB Transportation Research, 2014). Meanwhile, the selection of TransMilenio as a case study is because the provisions of public transport service under TransMilenio becomes the most successful and innovative public transport operation in the world (Cain et al, 2006; Ardila, 2007; Estupinan and Rodriguez, 2008; Bocarejo et al, 2013). The TransMilenio operation has successfully reduce the traffic congestion in the city as well as noise and air pollution (Estupinan and Rodriguez, 2008). Moreover, the

attractiveness of TranMilenio also has shifted a greater number of people to use TransMilenio service than using private vehicles (Hildago et al, 2013).

### **3.2 Literature Review**

The review of several theories aimed to develop a theoretical framework as a conceptual thinking to answer the research questions. The review conducted by collecting some sources of theory (e.g. scientific journal, research reports, government publication, books and other relevant publications) that relate to sustainable transportation, public transport organization and institutional reform. The review on sustainable transport looked at the history of sustainable concept and the meaning of sustainable transportation in order to conceptualize its concept as a main objective to do optimization of public transportation. Afterwards, the review also looked at the strategies towards sustainable transportation to know how the sustainable can be achieved.

The next review was on public transport organization. The review started to look at the correlation of public transport organization with the sustainable transportation. Afterwards, the review became more specific looking at theories about level of planning and control in public transportation in order to get an understanding about provision of public transportation service as a system that consisted into several level management. The theories about key organization roles also reviewed to give understanding between owner and manager on the public transport operation. In addition, theories regarding type of organizational form was reviewed from initiation perspective to show the ways of provision public transport initiation. The last review on public transport organization theories was about efficiency in public transportation service, which seek theories that show inefficiency service based on nature operation of public transportation towards sustainable transportation strategies.

The last review on theoretical framework was institutional reforms theories, several theories reviewed to understand about the meaning of a reform and how it can work towards optimization of public transport organization. Furthermore, to gain understanding about institutional reform, the meaning about organization or institutional also explained based on several theories.



### 3.3 Data Collection

As a main input to support the analysis of this research, the method of data collection will be conducted by collecting information from many resources such as past studies, scientific journal, and government publication of both countries (Indonesia and Colombia) as well as the scientific resource. The data collections also will use mass media as a resource of information to extend the view of existing conditions in both countries.

In order to answer the research questions, the data collection will start from national regulation that mentioned general aim of provision of public transportation in both countries. Afterwards, the regulations in city level that translate general aim of national regulation will be viewed to seek mechanism of public transport operation in city context. After reviewed government regulation, the data collection process will start to collect data and information from past studies related to bus operations (Trans Metro Bandung and TransMilenio). The data collection also will use online sources such as government official website and online newspapers to get an existing information about bus operations.

The data collection will be focused on information regarding implementation of both systems operation including information about how the service management was conducted such as responsibilities of each actor or organization and mechanism of funding process etc. Specifically, the data collection should be able to explain the level of planning and control each level management including organizational forms of both operations. The detail of linkages between research question and data collection can be seen on the table 3-1.

**Table 3-1: Research Methodology (Author, 2015)**

Research Question	Data Requirements	Sources of Data	Method of Data Collection	Method of Analysis
<b>How is the existing public transport organization of Trans Metro Bandung (TMB) and TransMilenio that contributing or deterring sustainable transportation?</b>	Legal framework, operational data	Laws, policy documents, observation, past studies and government archives	Document and literature review	Qualitative content analysis
<b>What lesson could be learned from existing organization of TMB and TransMilenio to optimize a public transport organization?</b>	Local characteristic, legal framework, operational data	Past studies, and papers online or offline	Document and Literature review	Descriptive analysis
<b>How the lesson learned from TMB and TransMilenio operations could be used to optimize a public transport organization?</b>	Organization form, legal framework	Policies document, law, papers online or offline	Document and Literature review	Descriptive analysis

### 3.4 Analysis Process

The analysis process will follow a research framework that illustrated on figure 3-1. It starts with the theoretical review from several theories that related to the provision of public transportation service – sustainable transport, public transport organization and

organization reform. Based on those theories, the notions of optimal public transport organizational structured and will be used to the next step of analysis.

Second, the information from theoretical review will be used to analyze existing condition of Trans Metro Bandung and TransMilenio operations that has been structured through data collection process. The analysis of these processes will use quantitative content analysis, which is qualitative research refers to a whole way of thinking or approach to conceptualize the reality that involves a collection or cluster of methods using the non-numerical data (Punch, 2014).

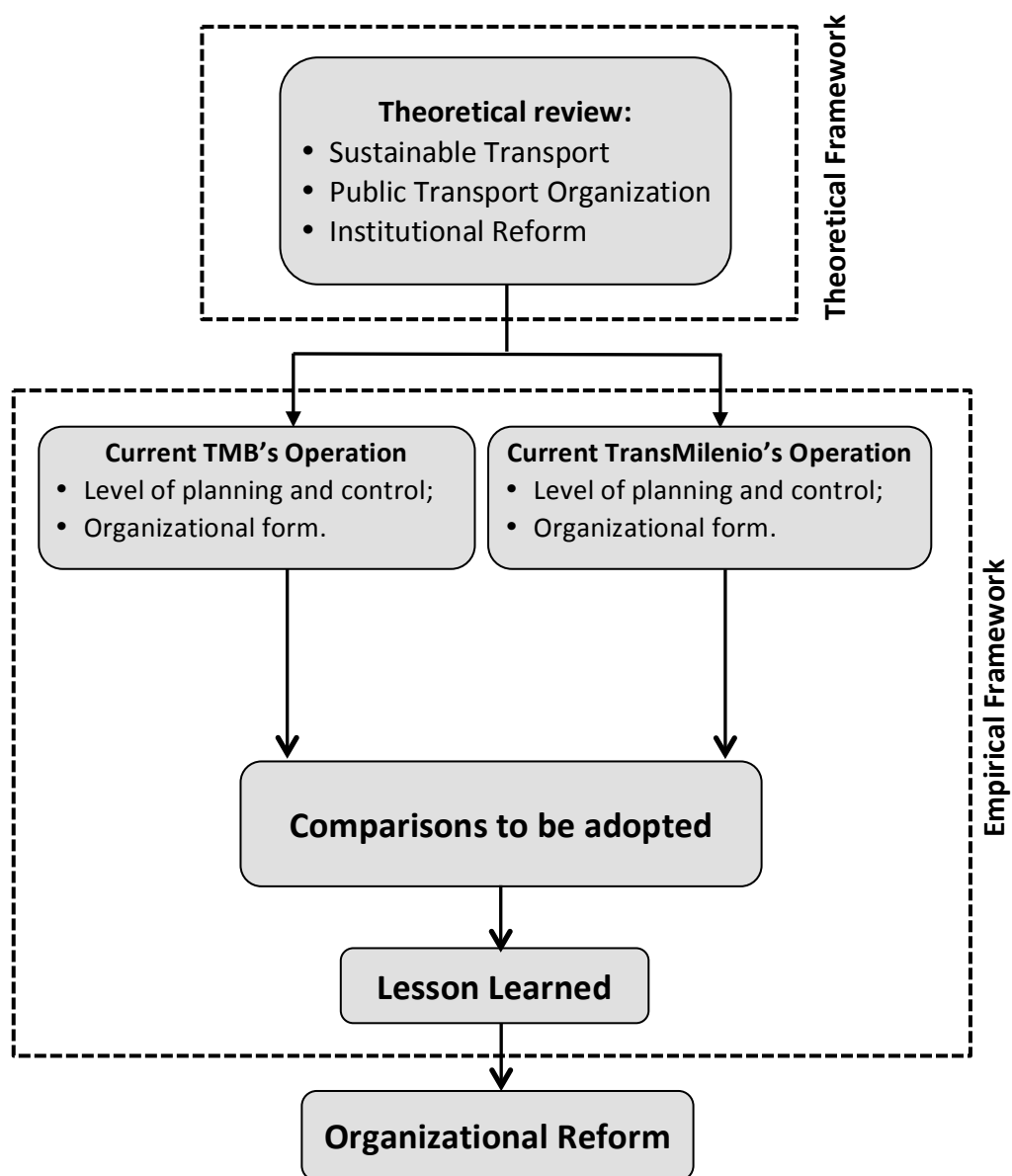


Figure 3-1: The research framework (Author, 2015)

In order to reduce unnecessary elements of the textual materials during the analysis process, three techniques of qualitative content analysis based on Hudalah (2010) will be performed. The following techniques are *summarizing* – the process of abstracting and reducing the overlapping information; *explicating* – clarification process of diffuse, ambiguous and contradictory passages by involving contextual material in the analysis; and the last technique is *structuring* – searching for types or formal structures and connections in the materials. For example, to show the increase of traffic congestion in Bandung from the unbalance growth of the road movement towards road infrastructure, the data can be overlap with the annual data of the congestion area in the city – different type or source of data with similar information. These data need to be abstracted by comparing each data and it process resulted in the most relevant and informative data to illustrate the increase of traffic congestion. In addition to that, the chosen data need to be explained towards the context of the research, which is to show that public transport has failed to reduce the road congestion. The explanation is important to avoid diffusion related to the context of research and avoid ambiguous information. The next step is to connect the failed public transport with the issue of the organization improvement using the relevant theories descriptively.

The third process after the analysis of existing conditions of both operations is comparison analysis. Level of planning and control and organizational forms by van de Velde (1999) are used as comparison indicators that will be compared each other. Those comparisons will use three strategies towards sustainable transport as optimal criteria, and the basis of comparison is from institutional point of view, which are the key points not merely compared from technical issue but also the process development of the key points. The comparison will be explained through descriptive analysis, which this method can be used to describe the fact in a particular issue systematically and accurately in order to shape and link the issue with the theoretical aspect (Vaus, 2001).

The forth process is formulation of lesson learned based on comparison result. The purpose of this empirical analysis is to get the lesson learn as an improvement to be used to optimize other public transportation operation that has similar issue.

According to forth processes above, by using the organizational point of view as a main interest on this research, the final output of the research is an organizational reform that accommodates lessons learned as a result of comparison analysis. The organizational reform as an output of this research can be used to make public transport operation become optimal to support strategies towards sustainable transportation.



## CHAPTER 4. THE CASES STUDY

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In this chapter, the existing condition of Trans Metro Bandung (TMB) and TransMilenio operation will be given to support the comparison analysis of the chapter five. The explanation of both existing condition will use classification of level of planning and control in public transportation and public organization forms by van de Velde (1999).

### 4.1 The Trans Metro Bandung (TMB)

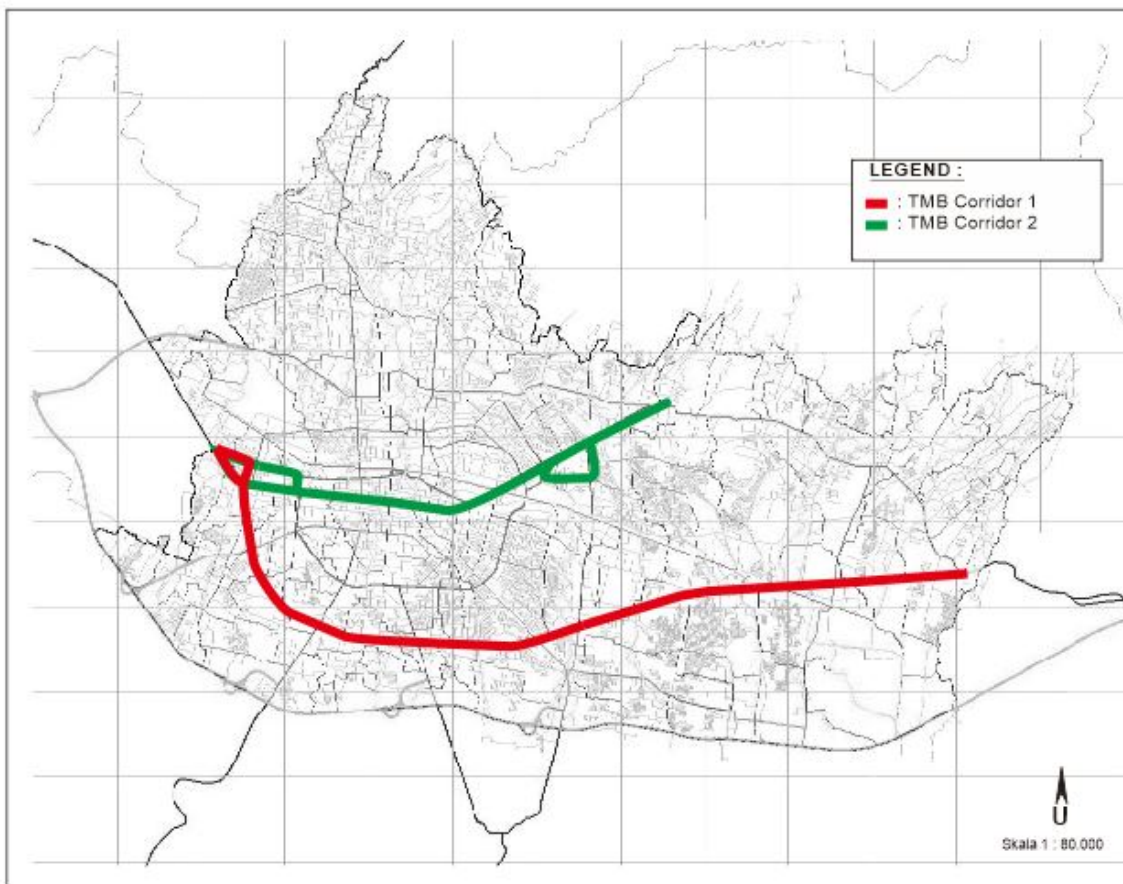
Bandung is one of municipality in Indonesia that covers 166,70 km<sup>2</sup> area in total with total population of 2,4 million people (*Badan Pusat Statistik* [BPS] Kota Bandung, 2013). The city has a strategic in term of communication and economic as it located on a highway axis of West Java Province (*Direktorat Jenderal Cipta Karya*, 2002; Malza, 2012). This condition makes the city become center of several activities including activities of its neighboring areas (Malza, 2012; ITB Transportation Research, 2014). The city generated 3.55 million people per day with the growth of its movement were 2.44% (Bandung Municipality, 2013). This condition created imbalance situation between supply of road infrastructures and demand of vehicle movement that increase the number of traffic congestion in the city (Bandung Municipality, 2013). This traffic congestion has caused losses in term of economic more than 1 billion rupiah (equivalent US\$ 111.111) as a result of work productivity reduction and wasted fuel (Malza, 2012).

In 2006, the Ministry of Transportation as a central government granted 20 buses to Bandung municipality to develop a new bus-based public transportation system in regards to facilitate the greater number of movement in the city and reduce the traffic congestion (Ditjenhubdat, 2010). Afterwards, the municipality developed Trans Metro Bandung (TMB) system and formed a new supporting and technical unit under *Dinas Perhubungan* (local transportation agency) called *Unit Pelaksana Teknis Daerah* (UPTD) TMB to manage the operation of TMB (ITB Transportation Planning Research, 2014).

In 2008, TMB started to operate in one corridor named Corridor 1. The route was 16 kilometers with 30 bus shelters and served by 10 buses (Ditjenhubdat, 2010). The TMB

is being built gradually and planned to have 13 corridors in total (Dinas Perhubungan [Dishub] Kota Bandung, 2013).

Currently, the TMB has 22 kilometers route operation divided into two corridors (Corridor 1 and Corridor 2) with 39 bus shelters and served 589 passengers per day (Ernst and Sutomo, 2010; Dishub Kota Bandung, 2013). According to ITB Transportation Research (2014), the existing operation of TMB cannot meet the requirement standard that was determined by the municipality – the requirement of average headway in each corridor is 15 minutes, however during the practice, the average bus headway on Corridor 1 is 57 minutes and 17 minutes in Corridor 2. In addition, after the operation of TMB, the number of traffic congestion in the city is increasing as the number of traffic congestion areas increased from 32 areas in 2009 to 44 areas in 2013 (Bandung Municipality, 2013).



**Figure 4-1: The two routes corridor of TMB (ITB Transportation Research, 2014)**



### 4.1.1 The Level of Planning and Control in Trans Metro Bandung

As mentioned previously, the explanation of existing condition will use classification of level planning and control in public transportation by van de Velde (1999). The explanation will start with the top-level management until the lowest-level management that related to the operation of the Trans Metro Bandung (TMB).

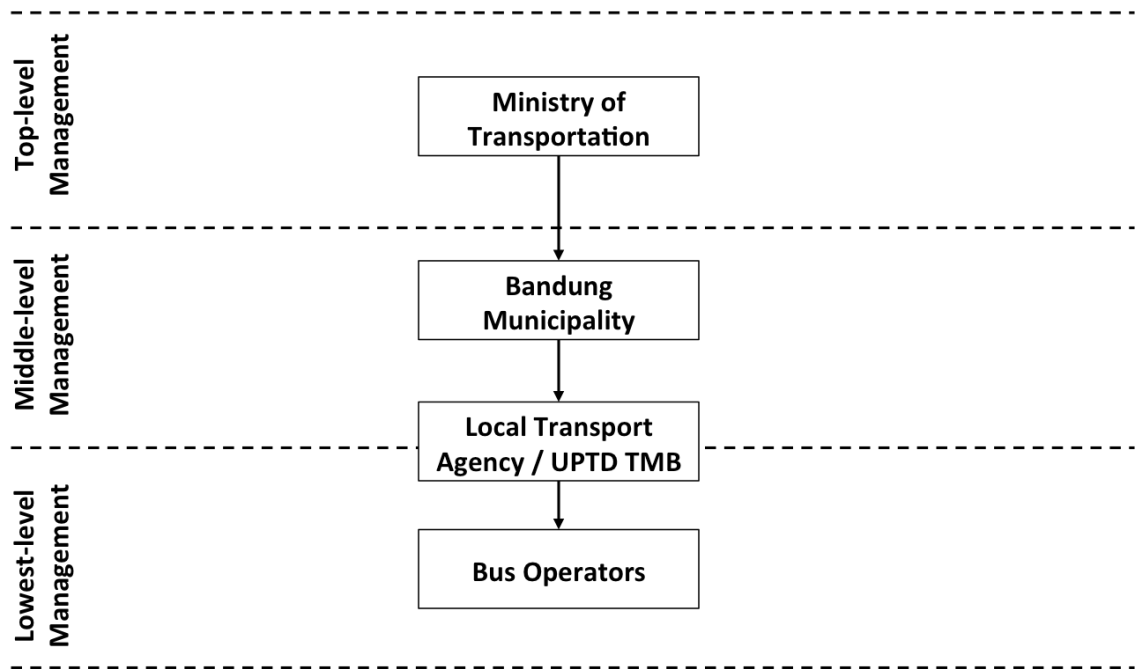


Figure 4-2: Level of planning and control of TMB (Author, 2015)

#### Top-level Management (Strategic Level)

##### *Ministry of Transportation*

In order to facilitate people mobility that can support economic growth of the country, Ministry of Transportation as a central government has the responsibilities to provide public transportation system that safe, comfortable and affordable including plans, development and surveillance process (Indonesian Traffic and Road Transport Act number 22 of 2009). Moreover, referring to Indonesian Government Regulation number 38 of 2007, the central government transferred their responsibility to provide and manage the public transportation system to local government. Afterwards,

Bandung Municipality as a local government through its local transportation agency needs to translate the responsibility to provide and manage a public transportation system into its city context in the next level of management.

### **Middle-level Management (Tactical Level)**

#### ***Bandung Municipality***

In this middle-level management, municipality translated the general aim of the provision of public transportation system through TMB operation (Bandung Municipal Decree number 551.2/Kep.646-Huk/2006, 2006). The municipality has responsibilities to determine the type of service and provide financial support to develop TMB system including fare approval of its operation (Bandung Municipal Decree number 551.2/Kep.694-Huk/2008, 2008; ITB Transportation Research, 2014). In addition, the municipality also determines standard requirement minima of the TMB operation by issuing Bandung Municipal Decree number 704 of 2008.

#### ***Unit Pelaksana Teknis Daerah (UPTD) TMB***

In order to manage the TMB operation, the municipality formed *Unit Pelaksana Teknis Daerah* (UPTD) TMB as a technical implementation unit under the local transportation agency (Bandung Municipal Decree number 265, 2008). UPTD TMB in this tactical level has responsibility to determine the technical aspects of TMB operation such as service route, frequency of service, calculation of ticket fare including provides buses as well as its supporting infrastructures (Dishub Kota Bandung, 2009b; ITB Transportation Research, 2014).

Regarding the provision of bus infrastructure, the UPTD TMB opens an opportunity to private companies for financing the construction of bus infrastructures (Bandung Municipality, 2011). In return, the private companies get a right to conduct advertisement business in bus shelters for specific period of time as a result of limited financial ability of the municipality (Adhipura, 2011).

In term of bus operation, the UPTD TMB owns the bus and gives rights to private operators for operating TMB bus on a fix route and fix service frequency under a concession in a period of time through a tendering process, as there are an issue about limitation of human resources and maintenance facilities (ITB Transportation Research,

2014). The bid evaluations of its tendering process are local experience in public transport operation and availability of maintenance facilities (*Layanan Pengadaan Secara Elektronik [LPSE]* Kota Bandung, 2015). In addition, the UPTD TMB also conducted surveillance activities towards bus operation including gives a sanction to bus operators (Dishub Kota Bandung, (2009a).

UPTD TMB pays private operators per kilometer logged by the buses instead of per passenger transported. In this regards, UPTD TMB has mechanism to check the kilometer operation of buses as part of its surveillance activities (ITB Transportation Research, 2014). The UPTD TMB uses fixed lump sum mechanism on their payment process with private operators. Therefore, there is no extra incentive to private operators while conducting bus operation (Dishub Kota Bandung, 2009a).

According to Bandung Municipal Decree number 265 (2008), funding resources of TMB operation are from *Anggaran Pendapatan dan Belanja Daerah/APBD* (expenditure and city revenue) and a grant from the Ministry of Transportation as an *Anggaran Pendapatan dan Belanja Negara/APBN* (expenditure and state revenue). The ticket revenue from bus operation cannot be used directly to cover daily operational cost. It is because the ticket revenue is classified as city revenue, not as TMB revenue since the UPTD TMB is part of government structure (ITB Transportation Research, 2014).

The fund disbursement process of the expenditure and city revenue to operate the TMB takes a long process as a result of its bureaucracy (ITB Transportation Research, 2014). In addition, the tendering process of TMB operation has to follow Presidential Decree number 70 (2012) that has several steps, therefore, the process takes approximately one month to get a winner of bus operator (ITB Transportation Research, 2014). Malza (2012) found on the beginning of 2012, the operation of TMB had temporary stopped due to a long and complicated process of its funding distribution. The operation of TMB back to normal on July 2012 after the UPTD finished the disbursement process of its funding and finished the tendering process.

In term of provision information relate to TMB operation, the UPTD TMB informed to public about the plan of first operation of TMB service through mass media (Malza,

2012). There is no official website or other online media that can be used to provide information to public (ITB Transportation Research, 2014).

### **Lowest-level Management (Operation Level)**

#### ***Private Operators***

On the lowest-level management there are private operators that operate buses of TMB under specific contract on a period of time (ITB Transportation Research, 2014). Based on contract agreement letter of local transportation agency number 05/KPA/TMB-BL/IX/DISHUB/2009 the private companies responsible to operate several buses of TMB by following a fix service frequency and fix route that was determined by UPTD TMB including a routine maintenance of its buses, and also should have drivers, maintenance engineers and other personnel that relate to bus operation as salaried employee (Dishub Kota Bandung, 2009a).

#### ***UPTD TMB***

The UPTD TMB also becomes part of the lowest-level management because the UPTD TMB conducted several operational services on each bus shelter such as fare collection, security and cleaning service (Dishub Kota Bandung, 2009b). The fare collection process is conducted by using outsource employee, and all fare that collected from bus operation has to be deposited to the municipality at least two days after the collection process (Dishub Kota Bandung, 2009b). This fare revenue is classified as city revenue not as TMB revenue, it because the UPTD TMB that manage the system is part of local government structure (ITB Transportation Research, 2014).

### **4.1.2 Organizational Form of Trans Metro Bandung**

The TMB system is managed using a public - private partnership mechanism, where the government provides buses and infrastructures for the provision of public transportation service including surveillance of its operation, meanwhile the private sector operators conducted the service delivery of public transport operation by following routes and service frequency that was determined by government (Dishub Kota Bandung, 2009; Malza, 2012; ITB Transportation Research, 2014).

The service provision of public transportation service is initiated by national government and translated into city context by local government through Trans Metro Bandung (Government Act number 23, 2014). The UPTD TMB as part of local government has legal monopoly to provide public transportation service by granting contract in a limited time to private operators due to lack of human resources and maintenance facilities (ITB Transportation Research, 2014).

#### **4.1.3 The TransMilenio Bogota**

Bogota is the capital city of Columbia that covers 1732.7 km<sup>2</sup> with total population of 7 million people in 2000 (Heres et al, 2013). As a capital city of Columbia that has very high population density, in 1995 Bogota generates 10 million trips per day (Echeverry et al, 2005; Cain et al, 2006; *Direktorat Bina Sistem Transportasi Perkotaan [Dit BSTP], 2009*; Bocarejo et al, 2013). In 1998, the growth of private vehicles in the city was high and occupied 64 percent of the road space, however the private vehicle only mobilized 19 percent of total population. As a result, traffic congestion was severe in several areas of city and it become the most contributor to air pollution (Echeverry et al, 2005).

In order to facilitate a greater number of movement in the city without create traffic congestion with standards of quality, efficiency and sustainability, the municipality developed a new bus-based public transportation system called TransMilenio (Dit BSTP, 2009; TransMilenio, 2014a). Afterwards, the municipality then formed TransMilenio S.A, a new public sector agency to manage the operation of TransMilenio (Cain et al, 2006).

In December 2000 the first route of TransMilenio was opened. This route was 15.5 kilometers, with 21 bus shelters/stations that served by 14 buses (Dit BSTP, 2009; TransMilenio, 2014a). The TransMilenio is being built gradually and planned to cover 80% of transportation needs of the city – 25 corridors that covers 386.6 kilometers in total (Hidalgo, 2002; Gilbert, 2008).

Currently, the TransMilenio has 155.5 kilometers route operation that divided into 12 routes corridor with 11,131 bus shelters in total and served 1,926,985 passengers per

day (TransMilenio, 2014a). The TransMilenio has successfully improved the transportation system of the city – the travel time was significantly reduced as well as the traffic congestion (Cain et al, 2006; Dit. BSTP, 2009). Moreover, the TransMilenio shifted a greater number of passengers to use its service for their mobility since it was operated – the demand has increased from 14,000 passengers per day in December 2000 to 1.7 million passengers per day (Hildago et al, 2013). Those achievements led to the improvement of the quality of live their citizen, it can be seen from the nine percent reduction of noise and air pollution in some areas of the city, and in term of safety, the accident rates dropped significantly by 90 percent (Estupinan and Rodriguez, 2008).

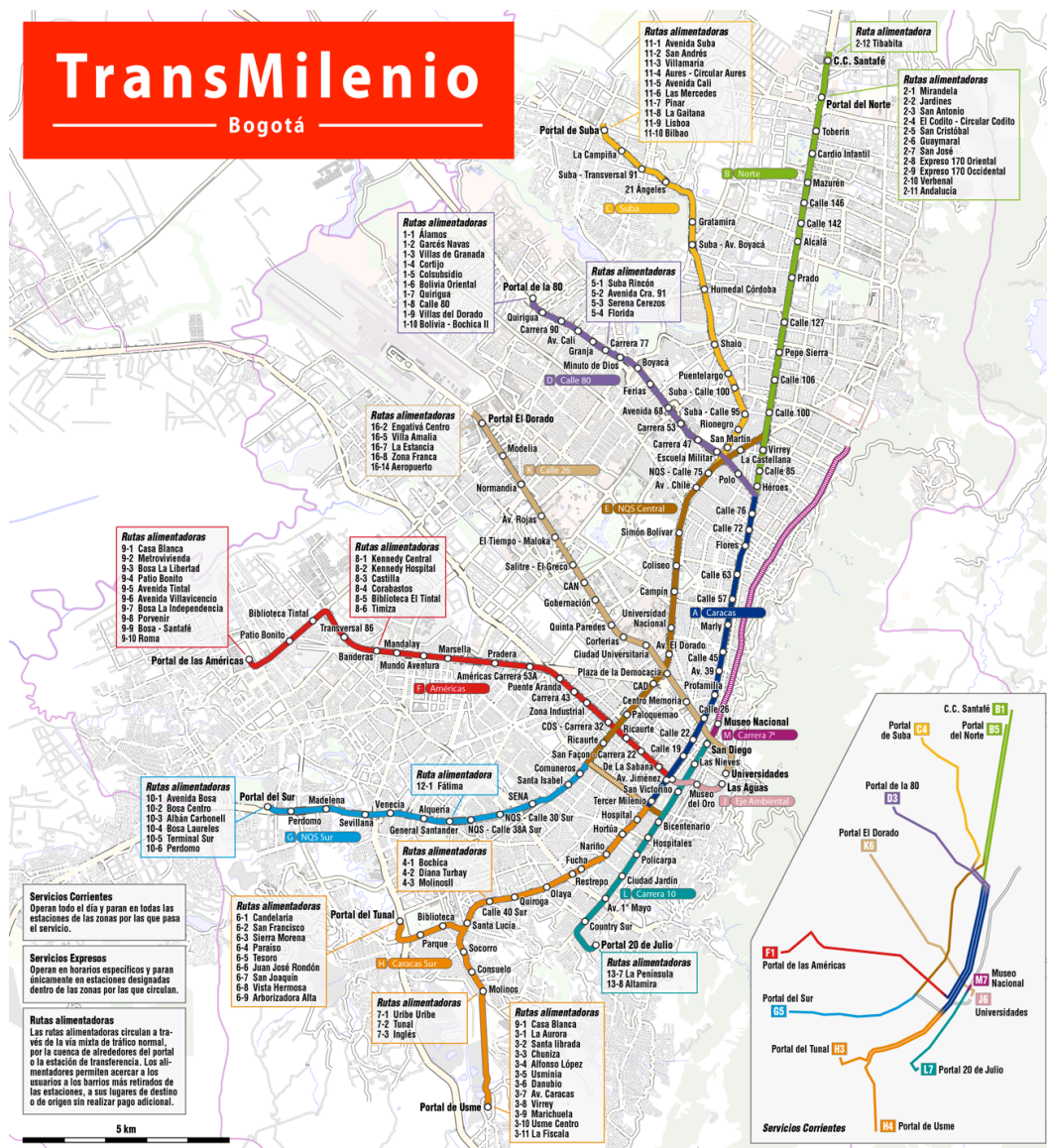


Figure 4-3: The 12 routes corridor of TMB (Dörrbecker, 2013)

#### 4.1.4 The Level of Planning and Control in TransMilenio

The explanation of this section used classification of level planning and control in public transportation by van de Velde (1999). The explanation divided into three levels management, which are Top-level Management; Middle-level Management; and Lowest-level Management.

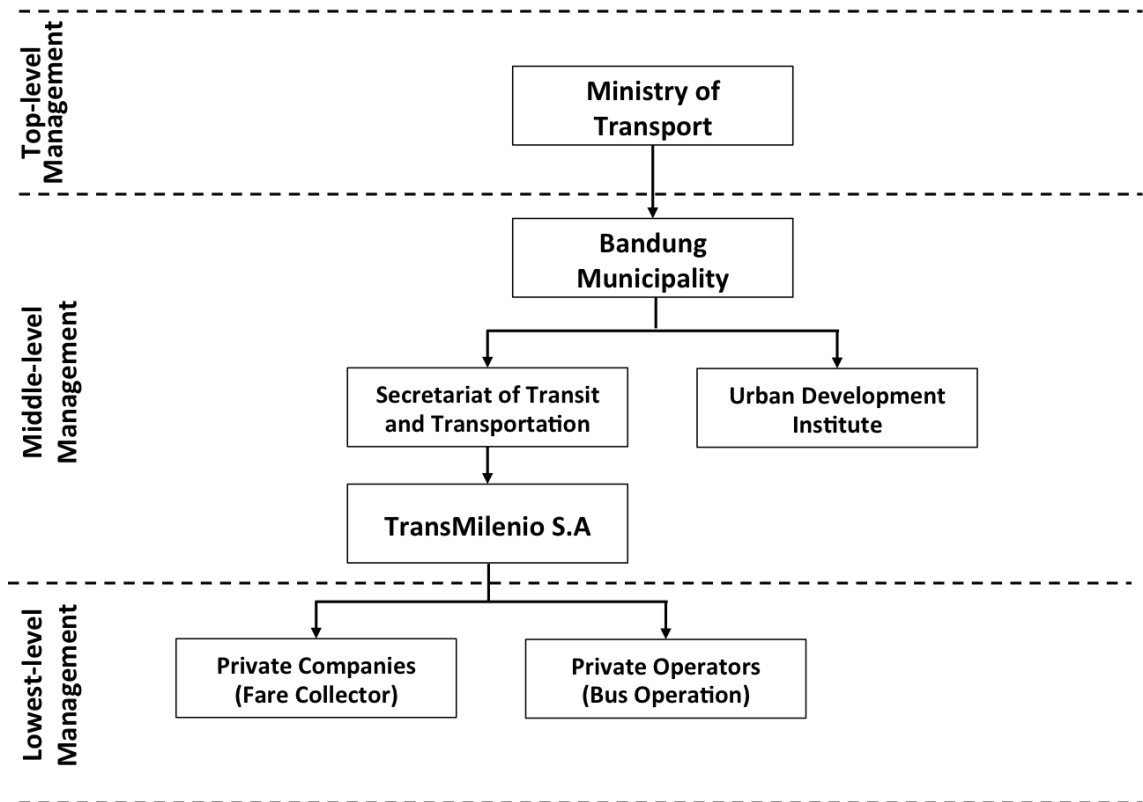


Figure 4-4: Level of planning and control of TransMilenio (Author, 2015)

#### Top-level Management (Strategic Level)

##### *Ministry of Transport*

The Ministry of Transport is top-level management that responsible to establish general frameworks and rules of public transportation system including plan, management and supervision process (Ardila, 2007). According to Columbian Law number 336 of 1996, the Ministry of Transportation transferred its responsibility for providing a public transportation service to municipality with standards of quality,

efficiency and sustainability. Afterwards, the municipality has to translate the responsibility based on the existing condition of Bogota city (Ardila, 2005).

### **Middle-level Management (Tactical Level)**

#### ***Bogota Municipality***

In middle level management, the municipality determined a bus rapid transit as a possible solution to improve their transportation system and then developed TransMilenio project (Ardila, 2005; Cain et al, 2006). The municipality made the TransMilenio as a very high priority that embedded in the city plan (Hidalgo, 2002). It can be seen from its development that was prepared with the participation of local and international consultants with a huge amount of fund capital investment (Hidalgo, 2002; TransMilenio S.A., 2014a). In addition to that, the municipality forced several banks in the city to give loans to bus operators in order to support the operation of TransMilenio and also provided financial support on beginning year of TransMilenio operation (Ardila, 2005; Cracknell, 2003).

#### ***Secretariat of Transit and Transportation (STT)***

There is Secretariat of Transit and Transportation (STT) as a representative of the Ministry of Transportation in a city level that support municipality to develop TransMilenio (Ardila, 2005). The STT has responsibilities to determine standard requirement minima and supervise the operation of TransMilenio including determined sanctions (Cain et al, 2006).

#### ***Urban Development Institute***

Regarding to the provision of bus infrastructure, there is Urban Development Institute as part of municipality that responsible to plan, construct and maintain the infrastructures (Hidalgo et al, 2013). Moreover, the funding resources to provide the infrastructures are from international loan, national government grants, local fuel taxes, and other local funds (Cain et al, 2006).

#### ***TransMilenio S.A***

The municipality created a new public sector agency named TransMilenio S.A that responsible to determine technical aspects such as service route, and calculation of ticket fare including daily service supervision and system planning of the bus operation



(Cain et al, 2006; Ardila, 2007). This organization becomes a managing body that coordinate different actors task in order to plan, manage and monitor the provision of TransMilenio service (TransMilenio S.A., 2014a). As a state-owned enterprise, the TransMilenio S.A has a possibility to have higher salary than the government agency. It allows the company to hire better-trained professionals that can support the planning and operation of TransMilenio (Ardila, 2007).

According to city regulation, the TransMilenio cannot own buses to perform a public transportation service (Ardila, 2005). Therefore, the TransMilenio S.A gives private operators that have their own buses a concession in a limited period of time to provide transportation service through a tendering process (Cain et al, 2006; Ardila, 2007). The bid evaluation of its tendering process included a local experience in public transport operation, environmental performance and cost per kilometer (Hidalgo, 2002).

The private operators only get a right to operate their own buses on certain routes that was determined by TransMilenio S.A., not including a right to own the routes. It makes the TransMilenio S.A has a flexibility to change the route design and schedule of its operation (Ardila, 2007). The TransMilenio has routes that can be changed depending on passenger demand, for example there are routes that operate throughout the day, others operate only during specific periods, and even has different route on weekend and weekday (Ardila, 2005). The aim of this flexible determination of route is to maximize its level of service by recognizing the importance of profit making that can be obtained by its operators (Ardila, 2005; Ardila, 2007).

The Transmilenio S.A pays the private operators per kilometer logged by the buses instead of per passenger transported through *fare box* mechanism. In this regards, the TransMilenio S.A supervises the operation of their buses by using Global Positioning System (GPS) and forms a team of inspectors (Ardila, 2007; Gilbert, 2008). Moreover, there is another incentive to provide a high-quality service to attract more passengers – if the number of passengers is exceeding the target, the operators can get extra revenue (Ardila, 2005).

The involvement of private operators in TransMilenio operation makes the TransMilenio S.A more focusing on its activities to plan and improve the system and also to share commercial risk such as passenger demand (Hidalgo, 2002). These activities are mainly funded with approximately 4% of the fare revenue including the income from ancillary activities such as publicity, technical assistance and consulting (Hidalgo, 2002; Cracknell, 2003).

The TransMilenio S.A developed company images through several proactive marketing strategies, for example by using health campaign that showed the important of using public transport which can reduce the gas emission (Cain et al, 2006). The company also provides transparent and clear information about the TransMilenio operation through their online website (<http://www.transmilenio.gov.co/en>) including their official social media account (Facebook, Twitter and YouTube).



Figure 4-5: Example of health campaign by TransMilenio S.A (Chain et al, 2006).

## Lowest-level Management (Operational Level)

### *Private Operator*

Private operators become the lowest-level management that has responsibility to provide, operate and maintain the provision of bus services (Cain et al, 2006). In order to perform the transport service, the private operators have buses, drivers, maintenance engineer and other personnel that relate to bus operation as a salaried

employee (Ardila, 2007; Gilbert, 2008). According to Ardila (2005), the TransMilenio operators make a profit above 18% per year. It is not merely because the higher number productivity of its buses, it is also because the operators own and operate their bus fleets, and consequently they can find innovation to perform an efficient service. For example, during the peak hours, the most fleets are available to transport passengers meanwhile on the off-peak hours the operators only operate certain number of bus in order to lower the operational cost (Ardila, 2005).

### ***Private Company***

Regarding to the fare collection, there is separate private company than the bus operators that collects the fares of bus operation (Gilbert, 2008). The private concessionaire of fare collection collected fares from passengers and deposited as a daily revenues in a trust fund (*fare box*) that distributed weekly to companies involved, including the TransMilenio S.A (Hidalgo, 2002; Cain et al, 2006). The fare collection are calculated under a system approach, which means the calculation is to cover all cost for operators, fare collectors and for revenue of TransMilenio S.A (Ardila, 2007). For example in 2005, the annual ridership was 315 million passengers, with total operating revenues was US\$ 171,820,000. The distribution of this revenue was 86% (US\$ 147.8M) to the bus operators, 10% (US\$ 6.9M) to the fare collector companies and 4% (US\$ 6.9M) to TransMilenio S.A for covering the system management and administration (Chain et al, 2006).

In the first two years of operation, the trust fund could not cover all cost of bus operation. Therefore, the municipality gave subsidy to support the TransMilenio operation (Cracknell, 2003). However, in the following years the effective and efficient daily operation of TransMilenio that attracts more passengers made the *fare box* revenue can cover all cost and actually generates profit for the TransMilenio S.A, it made the government only give fuel subsidy without another operational subsidies (Cain et al, 2006; Ardila, 2007; Gilbert, 2008).

## 4.2 The Organizational Form of TransMilenio

The TransMilenio system is managed using a public - private partnership mechanism. Government responsible for providing the infrastructures (Urban Development Institute) and also for planning, management and control of its service (TransMilenio S.A), meanwhile private sector contractors operated the daily operation and fare collection through concession contracts (Hidalgo et al, 2013).

The local government initiated the provision of public transportation service through TransMilenio (Ardila, 2005). The municipality formed TransMilenio S.A as state-owned enterprise that has a legal monopoly of initiative to provide a public transportation service by granting concession in a limited time to private operators (Ardila, 2007).

## CHAPTER 5. CASES COMPARISON

In order to develop new perspective for optimizing the organization of public transportation, it is important to use international comparison for analyzing implementation of two different public transport operation since a cross-national comparison has a great value to improve understanding of nature and operation of planning practice by bringing different situation as an alternative approaches and methods (Nadin and Stead, 2013). In this chapter, comparison between Trans Metro Bandung (TMB) and TransMilenio is given to formulate lesson learned that can be used to optimize organization of public transportation.

### 5.1 Comparison of Key Indicators

In this section, operation of TMB and TransMilenio is compared using classification of level of planning and control and also organizational forms (van de Velde, 1999). The comparisons can be seen on the following table (table 5-1 and table 5-2).

**Table 5-1: Comparison table of level of planning and control (Author, 2015)**

Management Level	Trans Metro Bandung	TransMilenio
<b>Top-level Management (Strategic Level)</b>	<u>Ministry of Transportation</u> <ul style="list-style-type: none"> <li>• Determines general aim of the provision of public transportation system, including general frameworks and rules;</li> <li>• Responsible for the provision of public transport system that safe, comfortable and affordable, including plan, management, control and supervision process;</li> <li>• Transfers the responsibility for providing public transport to local government.</li> </ul>	<u>Ministry of Transport</u> <ul style="list-style-type: none"> <li>• Determines general aim of the provision of public transportation system, including general frameworks and rules;</li> <li>• Responsible for the provision of public transport system to facilitate people mobility with standards of quality, efficiency and sustainability, including plan, management, control and supervision process;</li> <li>• Transfers the responsibility for providing public transport to local government.</li> </ul>

Management Level	Trans Metro Bandung	TransMilenio
<b>Middle-level Management (Tactical Level)</b>	<u>Bandung Municipality</u> <ul style="list-style-type: none"> <li>• Translates general aim of the provision of public transport into city context;</li> <li>• Plans and develops Trans Metro Bandung system, including determination type of service and fares approval;</li> <li>• Determines standard requirement minima of TMB operation;</li> <li>• Provides funding to TMB operation through expenditure and city revenue.</li> </ul>	<u>Bogota Municipality</u> <ul style="list-style-type: none"> <li>• Translates general aim of the provision of public transport into city context;</li> <li>• Plans and develops TransMilenio system as a high priority that embedded in city plan, including determination type of service and fares approval;</li> <li>• Provides funding on the beginning operation of TransMilenio;</li> <li>• Forces banks to give loans to bus operators.</li> </ul>
	<u>Local Transport Agency – UPTD TMB</u> <ul style="list-style-type: none"> <li>• Determines the technical aspect of TMB operation – fix service route, fix frequency of service and calculation of ticket fare;</li> <li>• Owns TMB bus;</li> <li>• Prepares bus infrastructures – planning, construction and maintenance process;</li> <li>• Cooperates with private companies to finance bus shelters construction;</li> <li>• Auctions TMB operation to private operators;</li> <li>• Pays the private operators based on per kilometer logged by the buses;</li> <li>• Supervise of TMB operation including determines and gives sanctions;</li> <li>• Provides information to public about the plan of first TMB operation</li> </ul>	<u>Secretariat of Transit and Transportation</u> <ul style="list-style-type: none"> <li>• Determines standard requirement minima of TransMilenio operation;</li> <li>• Supervises TransMilenio operation including determines and gives sanctions.</li> </ul>

Management Level	Trans Metro Bandung	TransMilenio
	through mass media.	
		<u>Urban Development Institute</u> <ul style="list-style-type: none"> <li>• Prepares bus infrastructures – planning, construction and maintenance process.</li> </ul>
		<u>TransMilenio S.A</u> <ul style="list-style-type: none"> <li>• Determines technical aspect of TMB operation – flexible service route, and calculation of ticket fare;</li> <li>• Auctions TMB operation to private operators;</li> <li>• Pays private operators based on per kilometer logged by the buses;</li> <li>• Initiates incentive mechanism to bus operators;</li> <li>• Conducts daily supervision of TMB operation;</li> <li>• Provides information to public about operation of TMB by online or offline media;</li> <li>• Develops image by attractive branding including public education campaign.</li> </ul>
<b>Lowest-level Management (Operation Level)</b>	<u>Private Operators (Bus Operators)</u> <ul style="list-style-type: none"> <li>• Operate TMB bus;</li> <li>• Conduct routine bus maintenance.</li> </ul>	<u>Private Operators (Bus Operators)</u> <ul style="list-style-type: none"> <li>• Operate their own bus;</li> <li>• Conduct routine bus maintenance;</li> <li>• Determines service frequency.</li> </ul>
	<u>Local Transport Agency – UPTD TMB</u> <ul style="list-style-type: none"> <li>• Provides ticketing, cleaning and security service on each bus shelter;</li> </ul>	<u>Fare Collectors (Private Companies)</u> <ul style="list-style-type: none"> <li>• Conducts fare collection;</li> <li>• Deposit the daily revenues in a trust fund (<i>fare box</i>);</li> </ul>

Management Level	Trans Metro Bandung	TransMilenio
	<ul style="list-style-type: none"> <li>• Conducts fare collection;</li> <li>• Deposits the daily revenues to municipality.</li> </ul>	<ul style="list-style-type: none"> <li>• Distribute the cash to each company (fare collectors, private operators and TransMilenio S.A).</li> </ul>

**Table 5-2: Comparison table of organizational form (Author, 2015)**

	Trans Metro Bandung	TransMilenio
<b>Initiation</b>	<u>Authority initiative – concessions:</u> The Municipality initiated TMB operation to facilitate mobility in the city	<u>Authority initiative – concessions:</u> The Municipality initiated TransMilenio operation to facilitate mobility in the city
<b>Type of operation</b>	<u>Public Network (management contract):</u> The UPTD TMB owns buses as well as infrastructures of TMB and delegates the daily operation to private operators through tendering process.	<u>Combination – Public Network (management contract) and Private concessions:</u> The TransMilenio S.A owns the infrastructures and delegates the operation to private operators that own buses through tendering process.

## 5.2 Comparison Analysis

According to comparison that showed on previous tables, the following differences between both operations will be analyzed on this section. The analysis will use three strategies towards sustainable transport as an optimal criterion, and the basis of comparison is from institutional point of view, which is the key point not merely compared from technical issue but also the process development of the key points.

### **General Aim to Provide Public Transport Service**

At top-level management, both bus operations has the similar mechanism, which is the central government determines general aim of the provision of public transportation system including its plan, management, control and supervision process, and then transferred that responsibility to local government (decentralize government system)



in order to meet its city context (Columbian Law number 336 of 1996; Indonesian Government Regulation number 38 of 2007). However, there is difference of the general aim of the provision of public transportation system, which the Ministry of Transport in Colombia has mentioned about standard of sustainability on its aim (Columbian Law number 336 of 1996) meanwhile the Ministry of Transportation in Indonesia determine their aim more general to provide public transportation system (Indonesian Traffic and Road Transport Act number 22 of 2009). The acknowledgement of sustainability issue in top-level management indicated that the plan of public transport provision in Colombia also concerns about sustainability of service towards sustainable transport not merely concern to provide a service. It means, referring to Goldmand and Gorham (2006) about the concept of sustainability, the provision of public transport in Columbia have putted a concept of sustainable transport as an end-state vision.

#### **Translation of General Aim to Provide Public Transport Service**

During translating general aim of central government to provide public transport service, Bandung municipality developed Trans Metro Bandung system including provided funding to bus operation and only focused on providing the service from technical aspects such as determination type of service and standard requirement minima of bus operation and also approval of service fare (ITB Transportation Research, 2014). In other hand, Bogota municipality not merely focused on technical aspects of bus operation, but also forced Banks to give loans to private operators for activities that relate to provision of TransMilenio (Ardila, 2005). This effort indicated that the Bogota municipality triggers private operators to improve their bus fleets for participating on TransMilenio operation. It means, the Bogota municipality has strong effort not only on technical aspect of bus operation but also concerns about non-technical aspect such as triggering a service improvement of private operators that can lead to improvement of TransMilenio service.

## **Service Management**

There are two differences between TMB and TransMilenio regarding to their service management. First, TMB is managed by government agency named UPTD TMB (Bandung Municipal Decree number 265, 2008) meanwhile the TransMilenio is managed by state-owned enterprise named TransMilenio S.A (Cain et al, 2006; Ardila, 2007). The UPTD TMB is technical implementation unit under local transport agency that owned buses and delegated bus operation to private operators through tendering process (ITB Transportation Research, 2014). Meanwhile, TransMilenio S.A that does not have buses granted private operators to operate their own buses under TransMilenio service (Ardila, 2005).

Second is about management scheme of bus operation, the UPTD TMB determined a fix service frequency per day and fix route of bus operation through its management contract (ITB Transportation Research, 2014), while the TransMilenio S.A determined flexible service route and also gave flexibility to private operators for deciding their own service frequency (Ardila, 2007).

Based on two differences in term of service management, the TMB operation has lesser flexibility in term of route operation and service frequency than TransMilenio operation. The flexibilities on TransMilenio made bus operation more efficient as it maximizes the transport service without ignoring the actual passenger demand. Moreover, this efficiency not only has advantage in term of operating cost reduction, it also reduces the number of vehicle on the road that can lower energy and space consumption, and reduce gas emission on the air.

## **Information and Publication of Bus Service**

Regarding publication of its service, the UPTD TMB informed public about the plan of first operation of TMB service through mass media and does not have online website or other media that can be accessed to get update information about TMB operation (Malza, 2012; ITB Transportation Research, 2014). Moreover, the UPTD TMB does not have marketing strategies to attract more people for shifting their mode of transportation to use public transportation (ITB Transportation Research, 2014). The less informative of bus operation and lack of marketing strategies on TMB can reduce

its attractiveness that can lead to decrease of TMB ridership, it is because the potential passengers cannot get sufficient information to use the service such as timetable, service route etc.

In contrary with TMB operation, TransMilenio S.A has online website (<http://www.transmilenio.gov.co/en>) and others online media such as official social media (Facebook, Twitter and YouTube) that can be accessed to get information of bus operation (Cain et al, 2006). Moreover, the TransMilenio S.A also has proactive marketing strategy to build a positive image about bus operation, the TransMilenio conducted campaign that showed several advantages of public transport through offline media and this effort successfully attracted more passengers (Cain et al, 2006). These efforts have significant impact to increase the number of people who shift their mode from private vehicle to TransMilenio.

### **Financial Aspect**

Bandung municipality financed TMB operation by using expenditure and city revenue as the TMB is managed and owned by UPTD TMB which part of government structure (Bandung Municipal Decree number 265, 2008). In other hand, Bogota municipality only provides financial support to TransMilenio operation on the beginning of its operation and afterwards the operational funding is from ticket revenue (Ardila, 2005; Chain et al, 2006).

The UPTD TMB pays private operators using government funds with fix lump sum without extra incentive mechanism. Using the government funds means that the UPTD TMB has to follow disbursement process that has a long bureaucratic mechanism. The process affected the tendering process of bus operation, because the UPTD TMB has to wait until the funding disbursement process has done and then start the tendering process. In addition, the UPTD TMB as a government organization could not directly use ticket revenue to finance the daily operation of TMB, because the revenue is classified as city revenue that not merely use to support the TMB operation (ITB Transportation Research, 2014). Therefore, TMB operation only relies on long process of disbursement of government funds that even created void operation on the beginning year (Malza, 2012). The lack of flexibility to use ticket revenue makes the

service not stable and lead to reduction of passenger number. Moreover, the absence of incentive mechanism create a lack of innovation to bus operation since the private operators cannot get extra incentive while improving its service to attract more passengers.

Comparing with the funding mechanism of TMB operation, the TransMilenio S.A as state-owned enterprise has more efficient funding mechanism than the government organization. The TransMilenio S.A can directly manage the ticket revenue through *fare box* mechanism to support the bus operation (Hidalgo, 2002; Cain et al, 2006), this organization also allowed to receive subsidies from the government such as subsidies on the beginning year of TransMilenio operation (Ardila, 2005; Cracknell, 2003). In addition, TransMilenio S.A also gave extra incentive to private operators – if number of passengers exceeds its target then the operators can get extra revenue (Ardila, 2005). This mechanism obviously triggers the private operators to improve their quality of service to attract more passengers. The more passengers of TransMilenio mean the more people shift their mode from using private vehicle to use public transportation service.

### **Bus Operation**

At lowest-level management of TMB operation, private operators operated buses that owned by UPTD TMB and following fix service frequency as well as route that have been determined by UPTD TMB (Dishub Kota Bandung, 2009a). This condition makes private operators do not have room for innovating its service in term of service frequency and bus arrangement. In addition, the UPTD does not offer incentive mechanism to triggers private operators for doing any improvement. It is obvious that this condition lead to lack of improvement of service quality that can reduce attractiveness of TMB operation.

In contrast with TMB operation, private operators in TransMilenio operated their own buses and only followed route that have been determine by TransMilenio S.A without any determination of service frequency (Ardila, 2005). This flexibility make the private operators can arrange the number of bus operation to be fitted with passenger demand, for example during the peak hours, the most fleets are available to transport

passengers meanwhile on the off-peak hours the operators only operate certain number of bus in order to lower the operational cost (Ardila, 2005). In addition, the incentive mechanism from TransMilenio S.A regarding bus operation also encouraged the private operators to find an innovation to improve their service quality through flexibilities of service frequency and bus arrangement.

### **Fare Collection**

According to fare collection mechanism, the UPTD TMB as organization that manages TMB system did the fare collection and also provided cleaning and security service on each bus shelter (Dishub Kota Bandung, 2009b). This condition makes the UPTD TMB as government organization has additional task apart from management of bus operation. Contrary with TMB, the TransMilenio S.A as organization that manages the TransMilenio used separate private companies than bus operation to do fare collection (Gilbert, 2008). With this mechanism, the TransMilenio S.A could concentrate more to its role as manager of TransMilenio operation.

## **5.3 Sustainable Transportation in Trans Metro Bandung and TransMilenio**

Sustainable transportation refers to an ability to provide a transportation system without compromising the ability of future generation to meet their transportation needs (Richardson, 2005). There are three strategies towards sustainable transport by Banister (2008) – avoid/reduce, shift and improve. Referring to that strategies, the provision of public transportation system through Trans Metro Bandung (TMB) and TransMilenio can be classified as strategy to achieve sustainable transport in term of encouraging people to shift their mode of transport from private vehicle to public transport vehicle with large capacity that can reduce the number of vehicle on the road and improve fuel efficiency. However there are several issues of its implementation that can hamper the sustainable transportation system and will be explained on this section by using three strategies towards sustainable transport as and optimum indicator.

### **Sustainability Awareness Issue**

General aim to provide public transport service becomes starting point to initiate the way public transport service can be implemented. The determination of general aim without acknowledgement of sustainable issues in TMB case can hamper the sustainable transportation. It is because there is lack of encouragements to all related organizations to perform more effective and efficient while supporting the public transport service, since the sustainable transport is not putted as end-state vision (Goldmand and Gorham, 2006). In contrast, the determination general aim in TransMilenio case has acknowledged sustainability issues. It means, this determination contribute towards sustainability transportation in Columbia.

### **Service Innovation Issue**

The determination of general aim affected local governments while translating the general aim to be fitted on city context. The general aim without concerning sustainability issues in TMB case make the provision only focuses on operation of bus service from technical aspect and ignore another efforts to sustain the service such as forces banks to give loans for bus operation, offers incentive mechanism, provides useful information using available media (online or offline), builds image of public transportation service through proactive campaign. Therefore, this issue creates lack of innovation while providing public transport service that reduces attractiveness of its service. Afterwards, this reduction can hamper the strategies towards sustainable transport in term of encouraging people to shift their mode of transport to public transportation.

Contrary with TMB case, as the sustainability issues already mentioned on general aim, it makes the provision of TransMilenio service not merely focuses on operation of bus service from technical aspect, but also concerns non-technical aspects by conducting several efforts that was mentioned on previous paragraph. This condition contributes to the strategies towards sustainable transport since the innovation can encourage more people to shift their mode to use public transportation.

### **Service Flexibilities Issue**

In TMB case, the lack flexibilities in term of service route, service frequency and bus arrangement lead to higher operation cost and wasted energy and space consumption since the number of bus and service frequency cannot be arranged to fit with actual demands. In addition, there is an issue of fund resources while operating the TMB buses. The ticket revenue cannot be used to finance bus operation since organization that managed bus operation is part of government structure. The financial support only relies on government funds that have complex and long bureaucratic process of disbursement. As result of these lack flexibilities, the TMB service cannot perform more optimal to reduce the number of vehicle movement on the road and cannot improve fuel efficiency from its transportation service. This condition obviously shows that the lack of flexibilities can hamper the strategies towards sustainable transportation.

In contrast, the TransMilenio has flexibilities in term of service route, service frequency, bus arrangement and financial mechanism. Those entire flexibilities make the TransMilenio service can be performed optimally to reduce the number of vehicle movement since the service route, service frequency and bus arrangement can be change to be fitted to the actual passenger demand. In addition, the TransMilenio operation also supported by effective financial mechanism since the ticket revenue can be used directly to cover bus operational cost. From this explanation, the flexibilities in TransMilenio operation can contribute to sustainability transportation as a result of reduction traffic movement on the road that can improve fuel efficiency.

### **Strong Government Control Issue**

In Bandung case, the government involved in every level of public transport management – as regulator in top-level management; as regulator and system manager of bus operation in middle-level management; as operator that collects ticket fare in lower-level management. This involvement followed by specific determination of service characteristic from government organization. Therefore, in TMB operation shows that the government has strong control in provision of its service. According to Veeneman (2002), public transportation management mechanism that has strong

government control has lack effort to make its service more efficient and also lack incentives to encourage service innovation. It is inline with the facts on previous explanation that showed several lack of flexibilities and innovations from provision of public transportation make provision of public transportation in Bandung is not optimal and hamper the sustainable transportation.

In TransMilenio operation, the government only involve on top-level management as regulator and middle-level management as regulator and system manager of bus operation. In addition, the involvement of government in TransMilenio case is followed by determination of service characteristics to be more general with several flexibilities and room of innovation. This condition shows that the role of government to control TransMilenio operation is not strong as Trans Metro Bandung, and therefore the TransMilenio has several flexibilities as well as incentives to make its service more optimal to contribute towards sustainable transportation.



## CHAPTER 6. CONCLUSION AND REFLECTION

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The last chapter of this research provided conclusion on optimization of public transport organization that contributes to sustainable transportation by answering the research questions of this research. Moreover, a reflection will be given to provide information about limitation of this research that useful for future research in public transport field particularly in organizational issues.

### 6.1 Conclusion

In order to answer the research questions, the level of planning and control and organizational form by van de Velde (1999) are used to compare the Trans Metro Bandung and TransMilenio. The comparison highlighted several key points that need to be considered to optimize public transport organization – general aim to provide public transport service; translation of general aim to provide public transport service; service management; information and publication of bus service; financial aspect; bus operation; and fare collection. Furthermore, based on those key points, there are several findings on implementation of public transportation service towards sustainable transportation – sustainability awareness, service innovation, service flexibilities and strong government control. Those key points and findings are used to formulate answer of research question of this research.

#### ***How is the existing public transport organization of Trans Metro Bandung (TMB) and TransMilenio that contributing or hampering sustainable transportation?***

The provision of public transportation service in both cases can contribute towards sustainable transportation since this provision may encourage people to shift their mode of transport from private vehicle to public transport vehicle with large capacity that can reduce the number of vehicle on the road and improve fuel efficiency.

According to the key points that need to be considered to optimize the public transport organization, there are several existing condition that hampering sustainable transportation system from organizational perspective:

- Determination of general aim to provide public transportation service without acknowledgement of sustainable issues on top-level management caused lack of encouragement to all related organizations of public transport to perform their task more effective and efficient while supporting the public transport service;
- Lack innovation of bus operation service that only focuses on bus service operation from technical aspects without concerning non-technical aspects on middle-level management reduced shift of people to use public transportation;
- Lack flexibilities of service route, service frequency, bus arrangement and financial mechanism that happened on middle-level and lowest-level management made public transport service could not optimally reduce the number of vehicle movement on the road and could not improve fuel efficiency from its transportation service;
- Strong government control on every level management of bus operation reduced efficiency of its service, it could not make bus operation works optimal to attract more passengers and reduce vehicle movement on the road.

***What lesson could be learned from existing organization of TMB and TransMilenio to optimize a public transport organization?***

By using existing condition of both operations, there are several lessons learned that could be used to optimize a public transport organization that has similar case with both operations:

- Acknowledgment of sustainable issues while determining general aim on top-level management to provide public transportation is important to make the implementation more concern to sustain its service and not merely concern about providing a service;
- Encouragement of service innovation can be done on middle-level management by concerning both aspects of bus operation, not merely concern on technical aspects but also on non-technical aspects;
- A flexible determination of service route, service frequency, bus arrangement and financial mechanism on middle-level and lowest-level management can lead to improvement of service quality;

- Task distribution of bus operation to private sectors can reduce government control in public transport operation that lead to improvement of service efficiency.

***How the lesson learned from TMB and TransMilenio operations could be used to optimize a public transport organization?***

In order to give empirical explanation regarding utilization of those lessons learned to improve public transport organization, the explanation will use Trans Metro Bandung case as an illustration.

- *Acknowledgment of sustainable issues while determining general aim on top-level management to provide public transportation is important to make the implementation more concern to sustain its service and not merely concern about providing a service.*

Referring this lesson learned, Ministry of Transportation as an organization in top-level management of TMB case should revise general aim regarding provision of public transportation to acknowledge issues of sustainability transportation and support the revision with clear legal framework.

- *Encouragement of service innovation can be done on middle-level management by concerning both aspects of bus operation, not merely concern on technical aspects but also on non-technical aspects.*

In TMB case, the UPTD TMB as government agency that manage TMB on middle-level management should develop media publication to provide useful information related to TMB operation as a part of their tactical level. This effort can be done by making an official website including another online media (e.g. Facebook and Twitter) and offline media (e.g. poster, flyer, etc.). In addition, the UPTD TMB should have proactive campaign such as health campaign on TransMilenio. Proactive campaign about advantages of using public transportation service can encourage people to shift their mode to use TMB. Furthermore, in order to develop incentive mechanism that can trigger private operators to innovate bus service, the UPTD TMB has to reform their organization first, since

the national rules do not allow government organization to use service revenue. The more explanation of organization reform can be found on last lessons learned.

- *A flexible determination of service route, service frequency, bus arrangement and financial mechanism on middle-level and lowest-level management can lead to improvement of service quality.*

UPTD TMB should change the determination of service route to be more flexible by offering different service route on particular circumstances (e.g. different route on daylight and night operation). The UPTD TMB also needs to rearrange the management contract of bus operation to give a room for flexibilities to private operators, for example without determine a fix service frequency.

- *Task distribution of bus operation to private sectors can reduce government control in public transport operation that lead to improvement of service efficiency.*

In TMB case, the UPTD TMB has three different roles in TMB operation – regulator, system manager and operator of fare collection. By using mechanism of TransMilenio, the role of system manager can be delegated to another organization that separates from government structures or the form of UPTD TMB might be changed (e.g. state owned enterprise). This separation also can solve problem funding mechanism issue if the organization that manages the TMB is non-government agency or special government agency (e.g. hybrid form).

## 6.2 Reflection

The research has a challenge on data collection process in term of resources limitation. Most of data collection to provide information on TMB operation cannot be accessed online. In addition, there is language issue when collected documents from online sources to provide information on TransMilenio operation, which is some of them only available in local languages (Spanish). Since the data for comparison mostly from document analysis, therefore, researcher has to be more aware about reliability and accountability issue of data sources. In order to improve the quality of this research, the future research can elaborate qualitative data with specific qualitative data such as number of passenger, number of vehicle on the road etc.

The research gained several findings and conclusion related to the optimization of public transport organization. By using those findings and conclusion, this research has contribution to the planning theory and practice particularly on transport planning. This research revealed that there are key points/instrument of public transport operation – general aim to provide public transport service; translation of general aim to provide public transport service; service management; information and publication of bus service; financial aspect; bus operation; and fare collection – which play an important role to improve public transport operation through optimization of its organization. The different context of both operation between TMB and TransMilenio gave broad understanding on different context of public transport implementation. The problem in planning practice is context specific, therefore, the lesson learned of this research only effective to be used to optimize public transportation that has similar issue and condition with both operations. Furthermore, the practitioners on transportation field can used this research to support optimization effort of public transportation service in the planning practice or develop a new way of thinking on planning theory.



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