A study on rearrangement of commuting allowance policy among government officials to promote public transport use: The case of Vientiane, Lao PDR

公務員への通勤手当施策の見直しによる公共交通利用促進に関する研究: ラオス・ビエンチャンの事例

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Abstract

Vientiane's public transport (PT) modal share decreased by 70% from 2007 to 2019, and due to COVID-19, only eight city bus routes are operating in 2023 (50% decrease from 2019). Private modes are increasing since they are reliable and comfortable but at the cost of traffic congestion and environmental degradation. Shifting to PT is needed to reverse this trend, however, the state bus operator Vientiane State Bus Enterprise (VCSBE) cannot improve services without financial support. This study aimed to clarify the feasibility of a commuting allowance policy that will improve PT services and encourage PT mode shift among government officials due to the high concentration of government workplaces in the center business district (CBD). The research objectives include understanding officials' preferences towards PT to promote ridership, determining the acceptance of the commuting allowance policy, evaluating the acceptance and demand of Demand Responsive Transport (DRT), and proposing policy interventions to increase PT use. JICA Person-Trip survey data, a questionnaire survey to Government Officials and Vientiane commuters were used for analysis. Findings indicated that current PT users are primarily from low-income households, without private vehicles. Conversely, non-PT users prioritize reliability, service time, and accessibility, incurring additional expenses due to inadequate allowances for fuel costs.

Further statistical analysis and Multinomial Logit Model identified obstacles to PT use, such as poor accessibility and unpunctual services. A preference for a free PT policy was especially notable among lower-income officials, whereas higher-income groups and middle-aged officials expect

improved PT services. The study also explored the acceptability of DRT through the Commuters Questionnaire, revealing a strong inclination towards DRT combined with Bus Rapid Transit (BRT), with the potential to increase mode share significantly. Using a SWOT framework, the research outlines strategic interventions including: the reallocation of commuting allowances towards PT options and subsidization for officials; enhancement of PT infrastructure; incentives and subsidies to bolster PT operation; formulation of a more structured DRT to complement BRT services; and the need for consistent policy review and adaptability. The study's comprehensive approach identifies critical pathways and interventions to make PT a more appealing choice for government officials in Vientiane, which could serve as an example for other regions facing similar challenges.

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List of Abbreviations

BRT	Bus Rapid Transit
CA	Commuting Allowance
CBD	Central Business District
DRT	Demand Responsive Transport
JICA	Japan International Cooperation Agency
LAK	Lao Kip
LDC	Least Developed Country
LOS	Level of service
MNL	Multinomial Logit
OD	Origin-Destination
PDR	People Democratic Republic
PT	Public Transport
PT data	Person-Trip data
QOL	Quality of life
RHS	Ride Hailing System
SEA	Southeast Asia
SP	Stated Preference
VCSBE	Vientiane Capital State Bus Enterprise
VSUTP	Vientiane Sustainable Urban Transport Project
VTMP	Vientiane Transport Master Plan

Chapter 1. Introduction

Vientiane is the capital city of Lao PDR. There are nine districts with 969,000 population (2021). The total land area is 3,920 km^2. The average population density is 247 people/km^2 (2015). The study area is the Vientiane CBD which is the location of most government offices (Fig.1). Around 17% of the commuting population in Vientiane are government officials (the Japan International Cooperation Agency (JICA)).

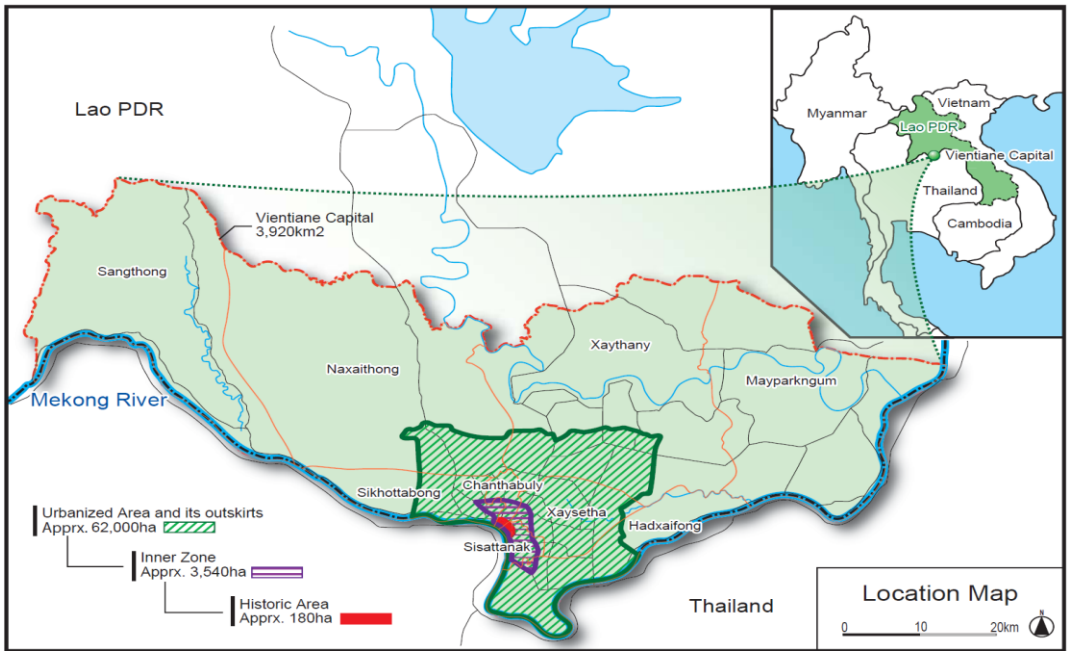


Figure 1 Map of Vientiane City

Public Transport (PT) in Vientiane includes bus and paratransit. The city bus is operated by the government. Paratransit is operated by private companies and individual operators, under associations. Compared to the city bus system, paratransit has more registered vehicles in Vientiane.

Modal share in Vientiane is dominated by motorcycles. From 2019, private cars have more than doubled from 2007 records. Notably, mode share

of bus, bicycle, and walking have decreased by 16% combined. Figures 2-3 below shows this trend.

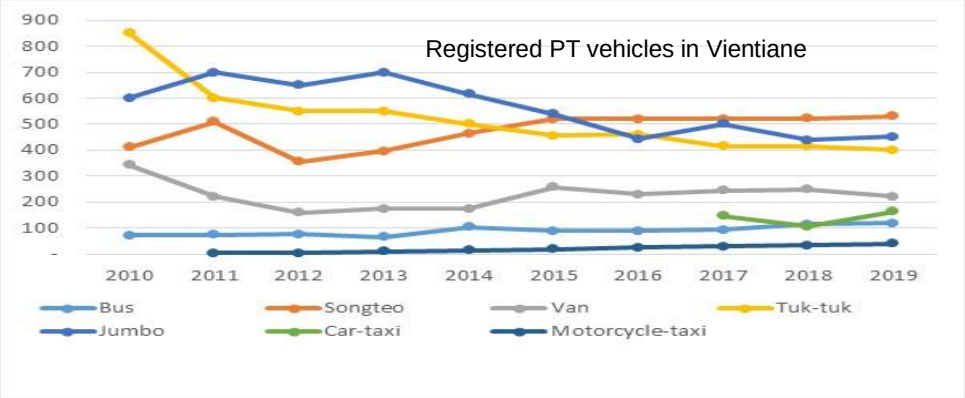


Figure 2 Registered PT vehicles in Vientiane 2010-2019

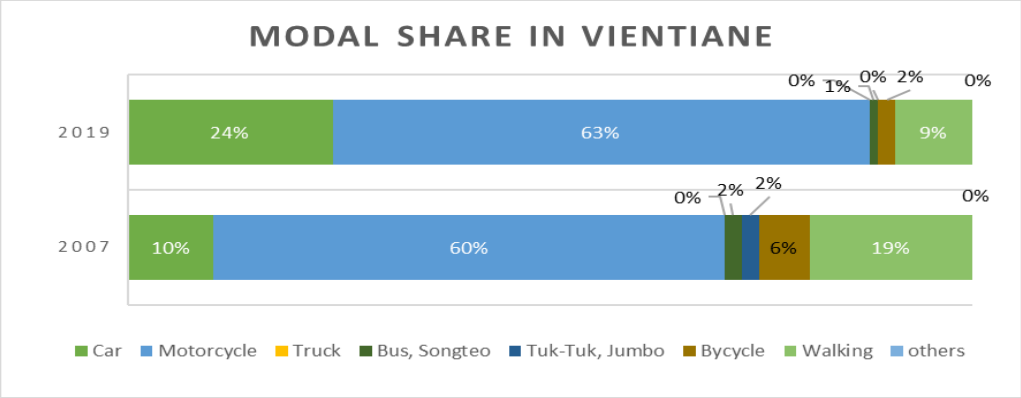


Figure 3 Modal share in Vientiane 2007 and 2019

From Vientiane's modal share trends, urban transport problems associated with an increase in private motorization include the decrease in PT use, straining PT finances, and resulting in service restrictions that impact ease of use, as well as accessibility. PT in the target area already presents significant impacts from multiple efforts to bring the state bus operator to profitability, with only 16% of the city routes currently being serviced and PT commonly being described as of poor quality and low level of service (LOS). Moreover, paratransit competes with the formal PT, offering a much more compelling

service for many with its flexible routes and 24/7 availability. This convenience of paratransit and the effects of weak ridership for the city bus have contributed to the drastic decrease in PT's modal share, from 5.4% in 2007 to 1.4% in 2019. Furthermore, these factors translate into losses for the bus company leading to the worsening of the current situation. Without policy intervention, the mode share of PT will continue to decrease, hence policy actions need to be studied.

1.1. Background of the study

In Vientiane, the capital city of Lao PDR, the PT system has been undergoing critical difficulties. A combination of increased use of private vehicles, widely known as motorization, low coverage of the bus network, and strong competition from informal transportation (paratransit), has led to a decline in the use of PT. A study by the JICA highlights a dramatic decrease in the mode share of PT from 5.4% in 2007 to 1.4% in 2019. Compounding these issues, the Vientiane Capital State Bus Enterprise (VCSBE) has financial instability, significantly due to the lack of government subsidies, which is making it tough for the VCSBE to make its services better and meet the growing demands of passengers. A debilitated PT system in the form of not being able to improve quality and having limited services impacts accessibility of citizens, potentially contributing towards social issues, such as inequality. Consequently, the decreasing quality and reach of PT services are among the pressing concerns that need to be addressed.

This research aims to focus on the preferences of government officials in Vientiane, noting that a large number of officials regularly commute to the central business district (CBD) (17% making trips to CDB). The number of

government official in Vientiane is 3.4% of population in Vientiane, 20% of government official in whole country. Their predominant use of private vehicles has exacerbated the traffic situation. Moreover, the increased travel length (as measured by vehicle-km) and travel time in Vientiane accounts for a loss of 69B USD each year (ADB, VSUTP, 2021).

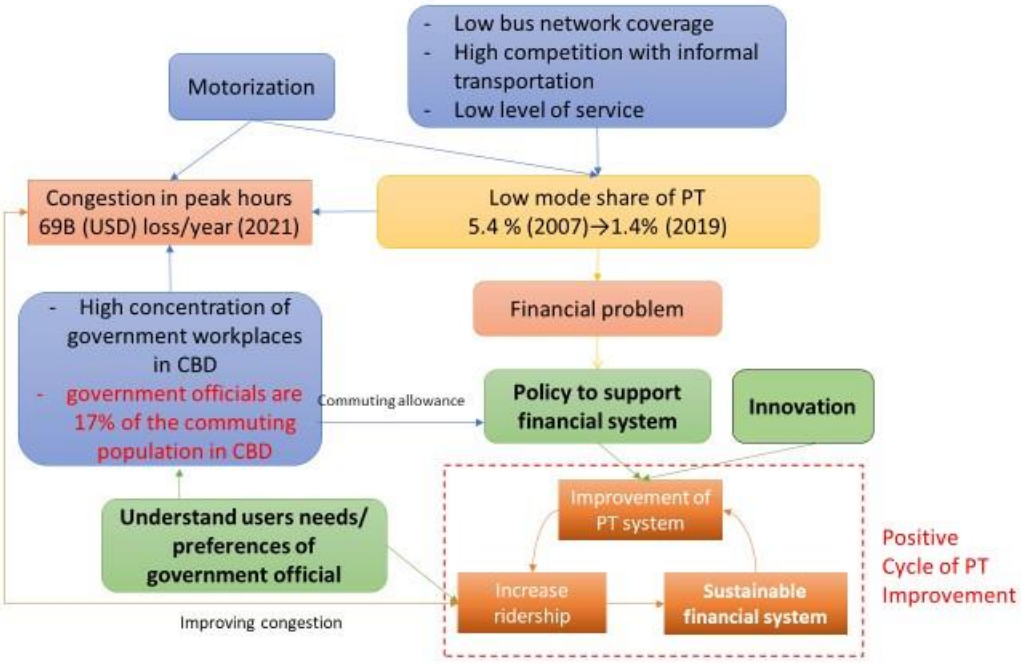


Figure 4. Research background

By understanding government officials' needs and considering innovative policies such as the reallocation of commuting allowances to support PT, this research aims to develop strategies that could incentivize the use of public services (Fig.4). Implementing such measures may lead to enhanced public transport services, fostering a sustainable increase in ridership and initiating a constructive cycle of PT improvements in Vientiane.

Moreover, there are important PT-sector issues experienced by commuters in Laos, particularly in Vientiane CBD. Socio-economic issues

include road safety with 1,281 deaths in 2019 according to WHO (ADB, nd.). Incidence of road crashes include lack of driver's licenses, no helmet, and drunk driving. Lack of driving regulation, vehicle policy, and funding are difficulties (Laos National Road Safety Action Plan). Transport sector air pollution increased 42% annually across all pollutants from 2013-2019 (O'Neil, et.al 2024). Motorization, narrow roads, and illegal parking, contribute to traffic congestion. Lastly, mode choice in Laos shows inequality among users, higher income can afford cars/MC and lower income choose motorcycle (Vongpraseuth, T., et.al 2022). The lowest income relies on inadequate PT (Vientiane only), paratransit, and walking.

The Laos government is interested in information technology (IT) based transport solutions. These include the recent popularity of ride hailing services in Vientiane. In this regard, this research will examine the potential application of DRT as an IT-based solution for the problems on paratransit and high motorization.

1.2. Statement of the problem

Government officials receive a fuel ticket allowance that promotes private vehicle usage for work-home trips. This is a problem since the government officials contribute to motorization and traffic congestion because of this policy. The fuel ticket is explained as follows: government officials receive a salary including a cash allowance and a commuting allowance (fuel ticket), with the amount being determined by the rank of the government official. The fuel ticket is exchanged at Lao State Fuel Company gas stations and costs around 50,000 – 700,000 LAK/month (3 – 41 USD). However, since global

costs of fuel have been increasing, the current amount is not enough to cover the trip expenses. As a result, officials need to pay additional fuel costs on their own. Thus, government officials end up paying the cost of fuel and any related vehicle maintenance. Hence, the fuel ticket policy needs to be reconsidered in a way that supports the needs of government officials and limits private car use. This research will study a new commuting allowance (CA) policy to support PT services improvements and increase bus ridership among government officials.

There are 25,177 government officials in Laos who receive fuel tickets, amounting to USD 2.7M per year. This CA policy promotes private vehicle usage for work-home trips. It is a problem that government officials contribute to motorization, traffic congestion, and vehicle air pollution in the CBD. Thus, a PT improvement policy is necessary, but no data and lack of funding are challenges. To use available funding and collect reliable data, the study considered government officials to determine suitable polices for promoting PT use. This research will study a policy to support and expand PT service by using government officials' CA and create the policy to increase access for low-income users and lessen negative impacts of motorization in Vientiane, CBD.

1.3. Objectives of the study

This research aims to clarify the feasibility of a CA policy that will improve PT services and can encourage PT mode shift among government officials.

There are four specific objectives for the study:

1. To identify user characteristics and preferences of government officials to PT for promoting ridership;

2. To examine the acceptance and the potential of using government officials' CA for financially support improvements in PT;

3. To analyze the acceptance and demand estimation of DRT as a supplement to fixed-route PT; and

4. To propose policy interventions aimed at increasing PT ridership.

1.4. Significance of the study

Policy research and academic studies made by Lao people are limited. Many LDCs adopt international policies that may not be suited to technical, financial, and cultural elements. This research collected research data and analyzed the potential of CA as PT subsidy. This is significant in understanding the real situation and actual solutions for making an effective PT policy in Lao, PDR.

The specific academic contribution is to show analysis and evidence-based insights for understanding the current situation and study the potential of introducing PT policy for Lao PDR. As mentioned in the literature review, other SEA countries have a CA Policy that promotes private cars among government officials. This study can become a model how to change the policy to improve PT instead. This study also offers a robust policy framework for international organizations in Laos, with broader implications for Southeast Asia and beyond. It provides actionable insights into enhancing PT through financial strategies and connectivity improvements, potentially informing sustainable urban mobility policies across varied urban landscapes.

1.5. Scope and limitations

The scope of the research is limited to the 2019 person-trip survey from JICA's VTMP, which sampled 4,700 households in Vientiane, a 2022 questionnaire which targeted 1,490 government officials from the Ministry of Public Works and Transport (MPWT), Ministry of Education and Sports, Ministry of Defense, Ministry of Technology and Communication, National University of Laos, and Cabinet Office of Vientiane Capital and 300 Vientiane commuters. Findings are expected to support the promotion of a modal shift to PT in a key segment of commuters in Vientiane's CBD, help identify means to financially support PT in Vientiane, as well as contribute to the overall efforts of promoting sustainable mobility in Lao PDR.

This research focused on government officials since they are 17% of the total commuting population in Vientiane. Moreover, this segment of the population is considered as a key group for targeting a modal shift to PT due to the existence of a CA in the form of fuel tickets, exclusive to government officials. These fuel tickets are exchangeable for fuel at the gas stations from the Lao state fuel company, with monthly amounts given to each official depending on rank. Thus, with important budget constraints, targeting a significant segment of commuters through the modification of an existing CA scheme is considered to have a higher degree of feasibility and potentially have a significant impact in the modal choice of a major segment of commuters.

1.6. Organization of the study

The research begins with Chapter 1 an "Introduction" to outline the study's goals, the context of Vientiane's transportation issues, and its significance. Chapter 2 "Literature Review" delves into existing studies on PT challenges and solutions worldwide, providing a background to the research problem and presenting research gaps that the study will address. Chapter 3 the "Conceptual Framework and Methodology" chapter lays out the theoretical underpinnings and the research methods utilized.

Chapters 4-6 present the empirical studies conducted to answer the research objectives. In "PT User Characteristics and Preferences," the demographic and preferences of government PT users in Vientiane are analyzed. "Policy for CA" explores potential government policies that could encourage PT use through financial incentives. "Demand Responsive Transit (DRT) System Acceptance and Demand Estimation" examines the viability and user receptiveness towards a DRT system.

Chapter 7 the "Discussion" synthesizes findings, correlates them with the literature, and contextualizes their significance. Finally, Chapter 8 "Conclusions and Recommendations" summarizes the study's outcomes and suggests actionable strategies for enhancing Vientiane's sustainable PT system to increase ridership and suggests studies for further research.

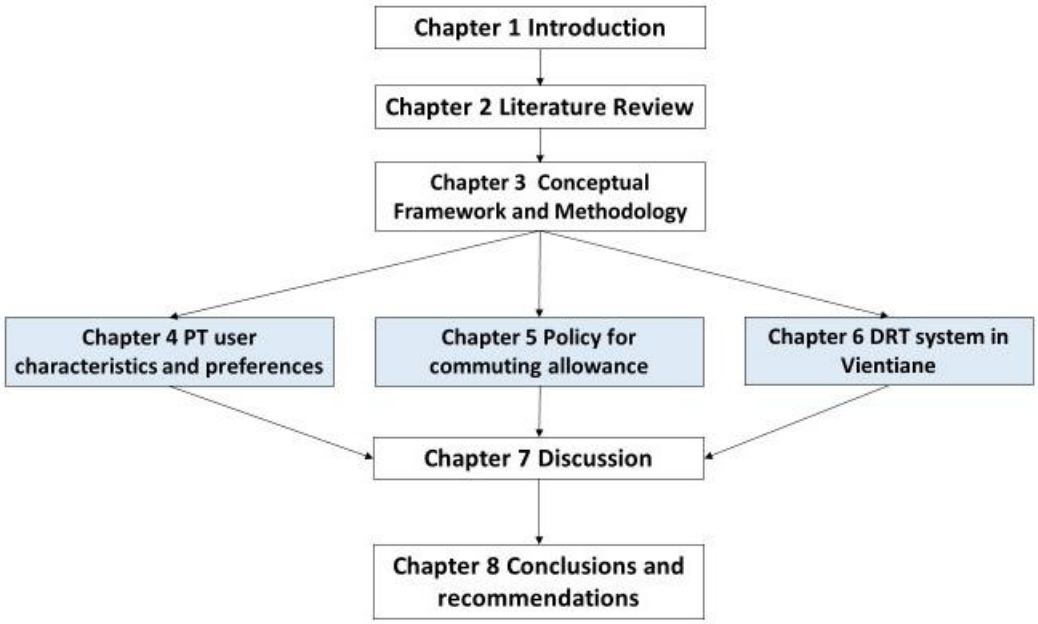


Figure 5 Organization of the study

Chapter 2. Literature Review

2.1. Concept and theory

Within the context of developed countries, it is commonly held that ensuring transport systems develop in the way that is most conducive to the overall development of the country can have far-reaching benefits (Iles, 2005). Literature on the area is vast, with overall benefits being discussed by authors such as Stanley J. and Stanley J. (2020), Buchanan M. (2019), and Bristow A. et al. (1991), while others have focused on studying specific potential benefits of PT such as managing traffic congestion and mobility (Nguyen-Phuoc et al., [2018]; Anderson M., [2014]; Nelson P. [2007]), air pollution (Cropper M. and Suri P., [2024]; Dirgahayani P., [2013]), and possible economic and social benefits (Bhatta S. and Drennan M. P., [2003]; Goldsmith S. et al., [2006]).

Although research has pointed toward numerous potential benefits, in developing countries, PT services have provided substandard quality and limited capacity (Ngoc, 2017). PT in developing countries is often characterized by unreliable, uncomfortable, and inconvenient systems which in many cases cause their modal share to decrease, affecting the ability of providers to make improvements and perpetuating a downward cycle of PT deterioration. Therefore, understanding the traveling behavior, perceptions, and satisfaction of citizens after experiencing PT services is crucial to the delineation of efficient future mobility programs (Vicente, 2016) and key in the broader scope of PT-related policy making.

2.2. Bus Rapid Transit (BRT) Systems

BRT is a system based on using buses to replicate the performance and amenities of modern light and heavy rail systems, including segregated rights of way, closed stations, and pre-board ticketing (Nguyen & Pojani, 2018). However, in comparison to rail-based systems, BRT has significant advantages. For instance, BRT is considered to have lower construction costs, short implementation periods, [ability to accommodate] many route permutations, and flexibility to adapt to a range of urban conditions (Pojani, 2014). Therefore, BRT has been acknowledged as one of the best solutions [in] developing countries where there [is] growing passenger demand and limited financial resources (Takeshita, Kato, Hayashi, & Shimizu, 2009).

Since the first appearance of BRT in Curitiba, adoption has been rapidly growing. As of July 2024, there are around 5,842km of BRT corridors spread over 191 cities that serve over 31.5 million passengers every day, with 58.56% of these passengers being mobilized by BRT systems in Latin America (Global BRT Data, 2024). Prominent implementations of BRT in this region include Trolebus in Quito (1995), TransMilenio in Bogota (2000), Metrobus in Mexico City (2005), and TranSantiago/RED in Santiago (2007).

While BRT has enjoyed success in many cities, it is important to note that there have also been failures. The introduction of BRT usually requires complex planning taking into account not only technical, financial, and design aspects but also local institutional, legislative, and political contexts (Nguyen & Pojani, 2018). Therefore, considering the context of the present dissertation in which BRT is in the process of being implemented in Vientiane, it becomes

crucial to gather insights on potential target users and policies that can support the strengthening of PT as a whole.

2.3. Commuting allowance policy

CA policy in developed countries combine benefits for PT and private car. It also includes bicycle-related facilities in the workplace. This section describes examples from Japan, USA and Europe for CA benefits. Japan offers financial support to employees for their daily travel expenses to and from work. This policy includes various types of transportation, such as provisions for car and toll road expenses, train tickets, and even support for bicycle commuting (Qi CHENG, 2009). The aims of this policy are multifaceted to lessen the financial burden on employees, promote the use of environmentally friendly transport options like PT and bicycles, and reduce the reliance on private cars.

Commuting benefits in the US often vary by employer and include options like pre-tax commuter benefits for PT and parking. Additionally, some employers may provide subsidies for bicycle commuting (Potter et al., n.d.). In addition, in the US, High-Occupancy Vehicle lanes, also known as carpool or commuter lanes, serve as an incentive for carpooling and are a relevant factor in commuting policies (A Review of HOV Lane Performance and Policy Options in the United States, 2008). Employers may encourage the use of HOV lanes by supporting or creating carpool programs and offering CA for employees who participate in such programs.

European countries offer a range of CA and incentives designed to facilitate employee travel to work, reduce reliance on single-occupancy

vehicles, and promote environmental sustainability. These measures often include partial or full reimbursements for PT, tax exemptions or deductions, and incentives for cycling (Haubold, 2014).

CA policies in Southeast Asia vary widely due to the diversity in the economic development, transportation infrastructure, and government policies of each country in the region. While there is no uniform approach across Southeast Asia, some countries offer certain types of CA or incentives, such as fuel ticket allowance for private cars, assignment of cars and drivers for higher positions, and a cash commuting allowance included in the salary. For instance, in Singapore, government officials can use car or PT for commuting purposes, while in the Philippines officials have a free ride on one train line.

2.4. Mode choice and PT subsidy

Traditionally, the study of factors influencing modal choice has been the subject of a wide range of research from the general view of the overall population, without a particular focus on government officials. For instance, mode choice is affected by subjective emotional feelings toward the mode (Shiftan, 2015) and improvements to PT in the form of increased frequencies, convenient drop-off locations, and reduction of travel time are key factors influencing the selection of PT as transport mode (Kingham et al., 2001; Hess et al., 2002). Moreover, time, convenience, and degree of comfort have also been identified as crucial factors in determining modal choice for work trips (Popuri, 2011; Algers, 1975).

The effects of transport subsidy policies on potentially incentivizing a modal shift from private vehicles to PT have also been previously studied from different perspectives. Research on the effects of free PT fares has arrived at different conclusions, with some studies finding a low potential for modal shift (Baum, 1973; De Witte et al., 2006; De Witte et al., 2008; Chen et al., 2001), while others reporting a positive influence by increasing PT ridership (Van Goeverden et al., 2006; Thørgersen & Møller, 2008; Cools et al., 2016; Cats et al., 2017). Furthermore, major concerns with free PT fares have been raised from the potential increase in trips, making the environmental effect less attractive than anticipated, and imposing a higher burden on taxpayers (Van Goeverden et al., 2006). Thus, the adoption of subsidies to allow for free PT fares has been at a rather slow pace mainly as temporal schemes, with not all full free PT experiments being successful and with many schemes being discontinued over the years (UITP, 2020).

In Asian developing countries, such as Cambodia, Indonesia, Philippines, Thailand, and Vietnam, PT subsidies mainly consist of providing of subsidies for public buses and in some cases paratransit. These subsidies are provided to meet the demand for those who do not have access to private modes (Muromachi, et. al, 2015).

A different type of PT subsidy may come in the form of CA. While in most developed countries CA can consist of providing a company car or bicycle to employees, the possibility of deducting commuting expenses from taxes may constitute a form of financially supporting PT. For instance, in France, Belgium or Austria employees can get tax-free reimbursement of PT tickets (Holger,

2014). Furthermore, in the context of allowances to government officials within Asian countries, CA for officials in Japan, Singapore, Philippines, Malaysia, Indonesia, and India account for reimbursement of PT fares, and in some cases reimbursement of private vehicle costs, at varying degrees.

Although mobility management measures may have the potential effect of favoring more sustainable transport modes (Nijland, 2015) and subsidies, as well as the short travel distances could promote a shift from private vehicles to bicycle and PT for commuting trips (Cheng, 2009), schemes that use CA as a form to promote more sustainable transport modes, such as PT, among government officials are not common and are rarely discussed in existing literature.

In Laos, empirical studies on decision-making for PT revealed age and income status influence mode choice for PT in Laos (Ueasin, 2020). Related studies in Vientiane confirmed insufficient PT and the relationship between income and transport mode. High-income groups were confirmed to most likely use private vehicles, while lower-income groups tend to use motorcycles for trip-making. When this is combined with a PT having a low level of service, the situation can widen the mode choice inequality among income levels (Vongpraseuth, et.al., 2022).

Subsidies to PT have the tendency to achieve improvements in service frequency and a reduction of fares (Bly & Oldfield, 1986), while also having distributional effects (Tscharaktschiew & Hirte, 2014). Thus, to reverse the trend for decreasing levels of PT ridership in Vientiane, while accounting for

limited prospects for new governmental subsides, the promotion of PT through the existing CA system for government officials is an important first step.

Previous research includes studies conducted on the effect of transport policies and behaviors related to modal choice for predicting the willingness of private vehicle users to shift to PT (Urbanek, 2021; Lai & Chen 2011), as well as the vast research on the examination of the factors influencing a shift to PT by improving the service level and operation of PT, in addition to the adoption of transport demand management measures (de Witte, et.al 2008; Tuan, 2015; Hansson, 2019; Hamre & Buehler, 2014). However, only a few studies have focused on commuter's mode choice behaviors towards PT. Existing studies revealed that cost is not the main factor influencing modal choice. Instead, time, convenience, and degree of comfort are crucial factors determining modal choice for work trips (Popuri, et.al 2011; Algers, et.al 1975).

Many studies that focus on factor influence in passenger perceptions and satisfaction by using factor analysis and regression models have found that reliability is the critical factor affecting perception and satisfaction level (Ismail, 2013; Nwachukwu, 2014; Stojic, 2020; Lunke, 2020) followed by comfort and safety. Nonetheless, further research is needed to study the factors influencing PT use within the context of a developing country. Especially, the study of factor influence on government officials' perception and satisfaction through factor analysis and linear regression analysis has not been carried out yet.

2.5. Demand Responsive Transit (DRT)

In the 1970s, DRT emerged as a transport solution aimed at extending the reach of traditional fixed-route transportation networks. Its primary objective was to cater to specific demographics, such as the elderly and individuals with special needs, as well as regions characterized by lower demand densities (Enoch, et.al., 2006; Davidson, et.al, 2012; Cervero, 1997. With the rise of interactive and intelligent information platforms, including smartphone applications and websites, DRT service systems have become increasingly popular and effective. Pilot and revenue initiatives have been operated in numerous countries and cities (Enoch, et.al., 2006; Navidi, Z, et.al., 2018; Koffman & Program, 2004).

Modern many-to-many DRT operates with flexible scheduling and routing based on the real-time demand from passengers (Huang, et.al., 2020; Ciaffi, et.al., 2012; Errico, et.al., 2013; Huang, et.al., 2020-2). DRT services have and do use several different algorithms to plan their routes. All these algorithms have the same aim: to optimize their routing and minimize the travel time and waiting time for passengers and operators. In short, a DRT algorithm is a solution to an optimization problem, which generally uses a heuristic to “solve” the problem (Chevrier, et.al., 2012; Cordeau & Laporte, 2007). The problems these algorithms are trying to solve are generally referred to as the Dial a Ride Problem (DARP) or the Vehicle Routing Problem (VRP) (Errico, et.al., 2013; Chevrier, et.al., 2012; Cordeau & Laporte, 2007; Vanteenswegen, et.al., 2022).

It is proposed that DRT lines may be introduced in three different operation scenarios (Enoch, et.al., 2004): (1) as an interchange, serving as a feeder to public transit (so-called, Demand Responsive Connector) (Koffman & Program, 2004); (2) as a minor network in specific areas, complementary to fixed-route public transit; (3) destination-specific, running in a specific area (e.g. in an airport, office complex, etc.); and (4) replacement for a fixed-route transit line or even full city network. Selecting the right DRT service for any specific area primarily hinges on addressing issues related to access to PT, notably the last-mile problem (Schaschè, et.al., 2022). Since a significant proportion of the population resides in rural areas in developing countries, where paratransit services are often unaffordable (Cervero, 2000), transport service providers must also consider financial constraints and profitability, especially if the operator will be private (as paratransit typically is).

For DRT to be successful, minimum passenger densities are required (Errico, et.al., 2013; Quadrifoglio and Li, 2009). Many researchers have explored the feasibility of integrating fixed PT and DRT to address peak and off-peak hours (Calabrò, et.al., 2022). Modeling has shown that integrating fixed PT with DRT is possible while maintaining service quality (Calabrò, et.al., 2022). In practice, many DRT schemes have failed (Enoch, et.al., 2006; Currie and Fournier, 2020). Research suggests that many DRT schemes offer too much flexibility, which can seriously affect operation costs and therefore overall system efficiency (Currie and Fournier, 2020).

While there is little research from the developing world for proposals of DRT, researchers have shown that DRT systems, combined with fixed-route

buses could be a viable solution for PT in developing nations (Anburuvel, et.al., 2022; Almeida Marins, 2019; Finn, 2012; Ndibatya and Booysen, 2020) in part due to the widespread use of flexible paratransit (Davidson, et.al., 2012). For example, Uber runs a semi-flexible bus system in Cairo, Egypt [26], and another similar service, Swvl, is an Egyptian/Dubai-based startup that provides a technology platform to enable shared transportation services for intercity and intracity trips, mostly in developing nations. Swvl's platform is designed to either replace or modernize and digitize existing paratransit services that are already common in many developing nations.

2.6. Summary of the literature gaps

The literature review reveals gaps in the study of CA and their impact on transportation choices particularly among government officials. There is limited research on how CA influence the use of PT by government officials. This gap indicates an opportunity to study the potential of such allowances to enhance the ridership of PT among this specific group.

Comparative policy analysis indicates further gaps, a disparity exists among countries regarding the provision of CA to government officials, with some providing none. In countries that do offer CA to government officials, most of them compensate on a mileage basis for both private car use and PT. It is also observed that few countries have specific incentives that actively use CA to promote the use of PT among government officials. There is a notable research opportunity to explore and potentially advocate for policies that could lead to increased PT ridership through targeted allowances. These literature gaps highlight the need for further research to understand the broader

implications of CA on transportation choices, particularly in the context of government officials and their role as potential initiatives for sustainable commuting practices.

Chapter 3. Conceptual Framework and Methodology

3.1. Conceptual framework

The conceptual framework (Fig. 6) shows the situation of Lao PDR and the future direction related to this study. Lao PDR is currently a least developed country (LDC). Often LDC members have limited finance and poor technical capacity for PT development. In addition, Lao PDR still lack capable human resources in many sectors. From a behavioral perspective, it is common for people to dream of owning a car due to social constructs of PT being associated as having a lower social status appeal and of being of inferior quality. Lack of policy awareness and weak implementation also affect behavior to not follow rules.

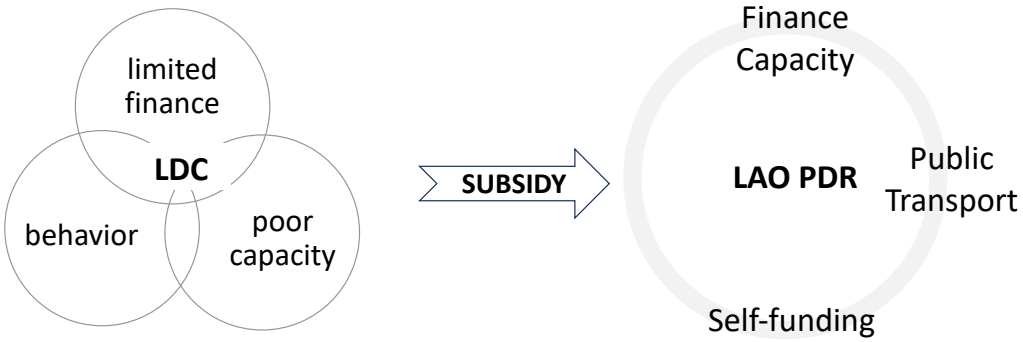


Figure 6. Conceptual framework

To exit this scenario, Lao PDR can consider PT Subsidy. Introducing subsidies can create mobility management and good PT, creating a positive cycle of finance capacity and self-funding. Therefore, this research aims to use CA as financial support to PT. In the future, when PT is improved, finance capacity and self-funding will join a positive cycle for Lao PDR's development.

3.2. Methodology

A medium-sized city in a least developed country like Vientiane needs a PT system to avoid traffic congestion, road accidents, and environmental problems. It is necessary to have a supporting PT system to accommodate future urban development. Since 2008, Vientiane has had low PT ridership wherein mode share is predominantly motorcycle and private car. The systematic neglect of PT service and continuous motorization is not recommended for the future. To create a policy to increase PT ridership and limit motorization, it is necessary to carefully understand the situation of Vientiane people. Thus, the determination of a PT policy to increase ridership has three main parts: identification of user characteristics and preferences, acceptance of CA policy, and user acceptance and demand estimation of DRT.

To understand user characteristics and preferences, the primary data is collected using questionnaire survey. The survey is from JICA Person-Trip Survey Data (2019) and collected specifically for this study is the Government Official's survey (2022). To analyze the results descriptive statistics, factor analysis, and linear regression model is used. The expected result is PT perception and satisfaction of captive users and non-PT users among government officials. This will inform what kind of PT service characteristics are necessary for mode shift in the future.

CA policy modification is the next consideration. The policies that are acceptable to government officials are analyzed using multinomial logit (MNL) regression models. The expected result are proposed policy scenarios for changing fuel ticket to PT ticket. The purpose is to reallocate the funds of CA

to benefit not only government officials, but also support the PT for all commuters in Vientiane CBD.

The existing Lao government Guiding Connectivity Policy considers efficient and reliable PT routes and services. In Vientiane, paratransit is more popular than city bus and other formal PT. To create a seamless mass PT system, formal PT, paratransit, and ride hailing services (RHS) should be carefully integrated. DRT is an IT-based PT service that can complement the planned PT system, like the Vientiane BRT. The Vientiane commuters survey (2023) collected the primary data from regular people (non-government officials). Stated preference, choice mode and demand estimation using MNL determine the acceptable service scenarios with paratransit as DRT vehicles. The expected result is the acceptable DRT service scenario and demand estimates integration plan for Vientiane CBD. The private sector in Laos is active with IT-based PT, such as RHS that have electronic payment system and app-based booking. Policy makers need to clarify this result to formulate a guiding policy for IT-based PT with paratransit and private sector.

The results of the three parts will be combined and analyzed using SWOT analysis and evaluated based on the actual situation of Vientiane. This result will inform suitable policies for using CA to increase PT ridership among government officials. The expected outcome, eventually a formal mass PT services will be implemented and all commuters in Vientiane will have increased PT ridership.

3.3. Research Framework

This research framework shows the process from objectives to outputs. The first two objectives focus on government officials and contribute to goal #1. While objectives 3 and 4 consider all commuters in Vientiane. Currently, paratransit is more popular than city bus. To address this, DRT service plans can integrate paratransit to support PT and avoid competition. Considering the results and two main goals, this research will produce the policy recommendations and implementation strategies.

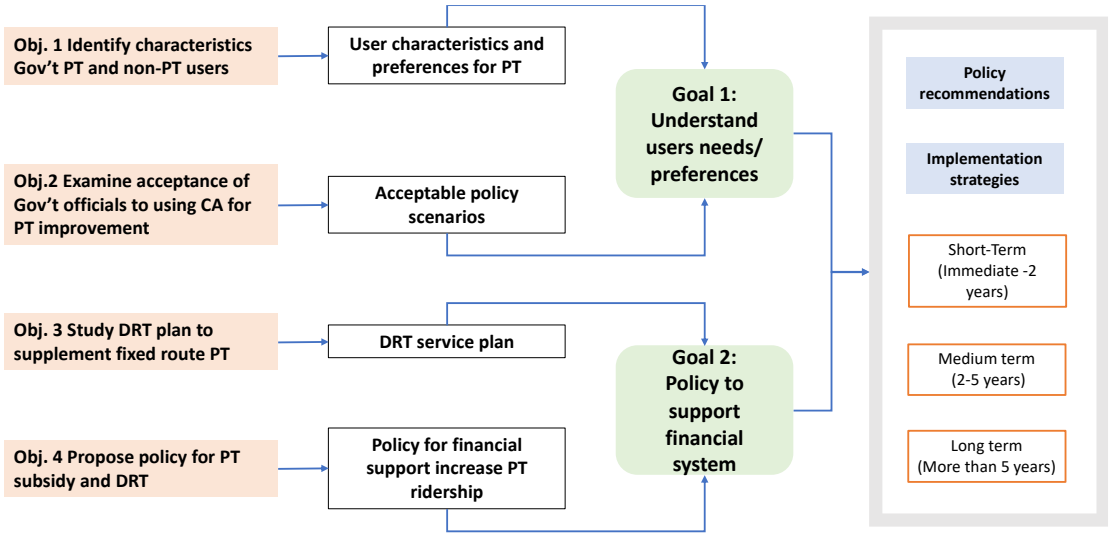


Figure 7. Research framework of the study

Chapter 4. PT User Characteristics and Preferences

4.1. Analysis of government officials' mode choice and receptiveness to PT

Laos government is improving PT services and with most government offices located along bus routes, there is an opportunity to promote PT ridership. Therefore, it is relevant to study the potential mode shift of government officials to PT in Vientiane and collect insights to improve the perceptions of PT in Laos PDR.

This chapter will answer two research questions: 1) determine which characteristics influence the mode choice of government officials, and 2) identify factors that will encourage a shift to PT. The study will analyze person-trip data containing a sample of 4,700 households collected in 2019 by The Project for Institutional Capacity Building for Sustainable Urban Transport System in Lao PDR (Vientiane Urban Transport Master Plan Project [VTMP]), a technical cooperation project funded by JICA. The results from a questionnaire survey to government officials conducted in 2022.

Factor analysis and linear regression analysis is used to explore the relationship among assets of variables. Factor analysis aims to identify latent factors that explain the correlations observed in the data. Linear regression analysis aims to estimate the parameters of the linear equation that best describes the relationship between the variables.

4.2. Study area

Vientiane consists of nine districts and has a population of approximately 969,000 people (in 2021) within an area of 3,920 km^2, resulting in a population density of 247 people/km^2. As of 2021, the total number of registered vehicles in Vientiane amounted to 1,044,866 vehicles. It increased annually at an average rate of 9%. Although the urban core of Vientiane is the target area of VTMP, for the current research, Vientiane's CBD has been selected as the study area. This is due to the prominent concentration of government office causing a significantly higher proportion of government officials commuting to work. Thus, trips are heavily clustered in the CBD. This contributes to congestion in the urban core during the morning and evening peak hours.

Table 1 Mode share in Vientiane (VTMP, JICA 2019)

Mode choice	Car	Motorcycle	Truck	Bus, Songteo	Tuk-Tuk, Jumbo	Bicycle	Walking	others
2007	10%	60.0%	0.0%	2.0%	2.0%	6.0%	19.0%	0.0%
2019	24%	63.0%	0.0%	1.0%	0.3%	2.0%	9.0%	0.0%

According to a JICA study in 2008, the mode share of PT was around 4%, a figure that decreased significantly to 1.4% in 2019, as shown in Table 1. Motorcycles are the dominant transport mode with a share of 63%. Moreover, car use more than doubled and replaced walking as the second main mode. Table 1 also shows that walking was reduced to 9% and bicycle use to 2%. Compared to PT modal share in other cities (Figure 8), Vientiane's 2011 PT

share of around 5% already stood out as a remarkably low share. This emphasizes the need to promote PT use in Vientiane.

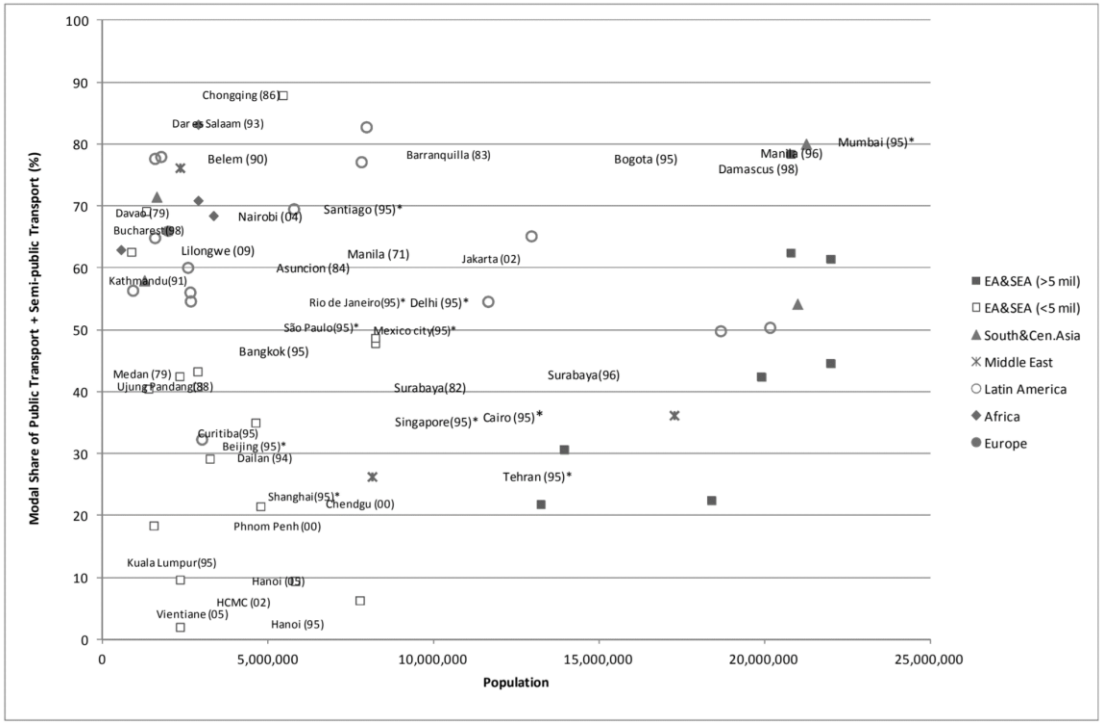


Figure 8 Modal share of PT in major cities around the world

(Source: The Research on Practical Approach for Urban Transport Planning, JICA, 2011)

4.3. Public transport in Vientiane

Vientiane registered 54,727 vehicles in 2019, where only 3,947 (7%) are urban PT. PT in Vientiane is composed of public buses operated by the VCSBE, in addition to individual paratransit operators. Paratransit modes include taxi, Songteo van, tuk-tuk, Jumbo, and motorbike taxi, as shown in Figure 9. VCSBE has been conducting the bus operation as an independent public entity without any operational subsidy from the government. As of 2023, VCSBE operates nine routes with 121 buses from the central part of the city area. This current bus network gives access to around 29% of the population in the target area

through bus stops along access roads within 500m to their home. Furthermore, Vientiane plans to introduce BRT, expected to operate in 2025 with a 12.9 km-route, consisting of 28 stations and serviced by a fleet of 55 buses, significantly boosting PT services.

Figure 9 Public transport services in Vientiane

4.4. Vientiane person-trip survey data

VTMP conducted a person-trip survey in 2019 to study the characteristics of traffic demand in Vientiane. The survey interviewed 4,700 households from villages within the project's target area, averaging a sample ratio of 3.27%. Five questionnaire forms were used in the survey: (1) household information, (2) household member information, (3) trip information of household members, (4) perception of PT, and (5) daily activity. This paper will analyze data from survey forms 1 to 4 to determine government official's preferences for PT.

The characteristics of government officials are shown in Table 2. Male respondents form most of the sample with a total of 4,407 officials (81.8%) and 982 (18.2%) female officials. In relation to the age of respondents, the median age is 52 years old with 64% older than 50 years old. The total monthly

household income, the 4,000,001-10,000,000 LAK range was found to account for the highest proportion (58.9%) of the sample. Government officials are low-income earners with an average salary of 2,000,000 LAK (excluding other allowances). Many of the households were found to own 2-3 motorcycles. Households that reported owning a car/ownership of one vehicle were found to be the highest proportion (44.5%).

Table 2 Characteristics of respondents (N=5,388)

Characteristics	Category	Frequency (N)	Percentage (%)
Gender	Male	4,407	81.8%
	Female	981	18.2%
Age	22-29	84	1.6%
	30-39	504	9.4%
	40-49	1,329	24.7%
	50-59	2,091	38.8%
	Upper 60	1,380	25.6%
Monthly total household income	Under 1,000,000 LAK	50	0.9%
	1,000,001-4,000,000 LAK	1,122	20.8%
	4,000,001-10,000,000 LAK	3,176	58.9%
	10,000,001-20,000,000 LAK	876	16.3%
	More than 20,000,001 LAK	164	3.1%
Motorcycle ownership	0 unit	116	2.2%
	1 unit	965	17.9%
	2 units	1,829	33.9%
	3 units	1,378	25.6%
	More than 4 units	1,100	20.4%
Car ownership	0 unit	1,377	25.6%
	1 unit	2,399	44.5%
	2 units	1,002	18.6%
	More than 3 units	610	11.3%
Motorcycle available	None	5,244	97.3%
	Available	144	2.7%
Car available	None	4,410	81.8%
	Available	978	18.2%
Motorcycle license	None	3,634	67.4%
	Available	1,754	32.6%
Car license	None	4,059	75.3%
	Available	1,329	24.7%

*1 USD = 17,800 LAK as of May 2023

It is important to consider that although some households own a car or a motorcycle, some household members cannot drive and need to be

accompanied by a driver. This is considered to influence the number of government officials that reported to not have availability to private vehicles, at 97.3% in the case of a motorcycle and 81.8% for car. Furthermore, the proportion of officials without a driving license was also found to be high, 67.4% for a motorcycle driving license and 75.3% in the case of a car driving license.

4.5. Survey to government officials

To understand the current mode choice and preferences of government officials towards PT, a questionnaire survey for government officials on mobility preferences related to public bus and possible future policy for promoting public bus use in Vientiane was conducted in February to March 2022. The target are government officials from the MPWT, Ministry of Education and Sports, Ministry of Defense, Ministry of Technology and Communication, National University of Laos, and Cabinet Office of Vientiane Capital. The questionnaire survey consisted of three sections: 1) demographics, 2) commuting mode (to capture the characteristics of users and non-users and their preferences), and 3) policy scenarios. Regarding the policy scenarios, three scenarios where three new alternatives for fuel ticket were presented under current public bus service conditions and after the introduction of BRT. Additionally, the same scenarios were presented under the alternative of conducting improvements to the bus service, as well as enforcing parking regulations.

Table 3 Characteristics of government respondents (N=1,490)

Characteristics	Category	Frequency (N)	Percentage (%)
Gender	Male	825	55%
	Female	668	45%
Age	Below 25	88	6%
	26-35	510	34%
	36-45	539	36%
	46-55	246	16%
	Over 55	126	8%
Position	Technical Official	907	61%
	Deputy Director	215	14%
	Director	111	7%
	Deputy Director General	50	3%
	Director General	38	3%
	Other	169	11%
Household Income	≤ 5,000,000 LAK	953	65.1%
	5,000,001-10,000,000 LAK	411	28.1%
	10,000,001-15,000,000 LAK	59	4.0%
	>15,000,001-20,000,000 LAK	42	2.9%
Mode share	Motorcycle	609	42.2%
	Car	810	56.1%
	Bus	16	1.1%
	Walking	5	0.3%
	Bicycle	1	0.1%
	Songteo	1	0.1%
	Van	1	0.1%
Situation of driving	Self-driving	1,369	93%
	Accompanied	94	6%
	Have a driver	9	1%

A total of 1,800 questionnaires were distributed, and 1,490 questionnaires were recollected, resulting in an 83% response rate. Regarding the characteristics of respondents as shown in Table 3, the majority consisted of male (male: 55.3%; female: 44.7%) and 26-45-year-old officials were the biggest proportion of respondents (69.5%). Moreover, many respondents reported being a technical official (60.9%), while higher positions such as deputy director (14.4%) and director (7.4%) were the minority of respondents. Regarding to household characteristics, household income equal or less than 5,000,000 LAK confirmed by most respondents (65%), was the second largest

group 5,000,001-10,000,000 LAK (28%). Mode share of car for the commute to work represents the highest proportion (56%), as well as commuting by motorbike (42.2 %). Mode share of PT (public bus) conformed 1.1% of respondents.

4.6. Characteristics influencing mode choice

This section analyzed data from Form 4 of the person trip survey forms, containing information related to: (1) household information, (2) household member details, and (3) trip information of household members. This data is analyzed to answer the research question regarding the characteristics influencing the modal choice of government officials. In addition, analyzing data from the commuting mode will capture the characteristics of users and non-users and their preferences in the second section of the government official's questionnaire survey.

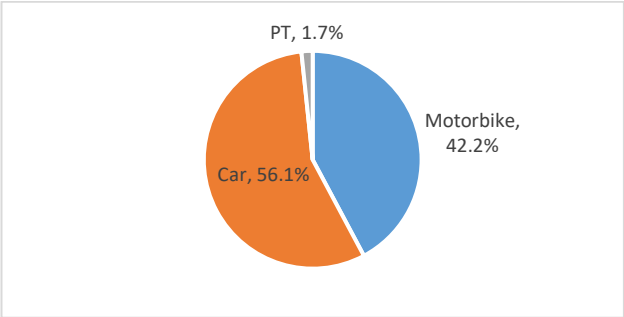


Figure 10 Mode share of government officials in Vientiane (2022)

As shown in Figure 10, modal share of car and motorcycle for the commute to work represents the highest proportion (56.1% and 42.2% respectively) of government officials. This is due to the low cost of motorcycles and the ease of access to parking space. In relation to the reason behind not using PT, previous studies have found that possible reasons include the

absence of public transport alternatives and the lack of access to existing public transport near the place where they live (Kingham, 2001). Thus, this may also be partially connected to the reasons behind officials who choose to commute by car (34.2 %). Accounting for the low cost of PT, it is considered that officials who have no other choice of transport or officials with middle to low household monthly income may be more attracted to select to use public transport, which had a modal share of 1.7%. This study follows previous research in considering the importance of improving PT service and upgrading its image to make it more attractive for high income people and car users (Tuan, 2015). As per the cross-tabulation analysis of modal choice of government officials currently using private vehicles and PT, Table 4 showcases that PT use concentrates (77.8%) on the middle to low-income categories, where the 1,000,001-4,000,000 LAK and 4,000,001-10,000,000 LAK income groups were found to be ones with the highest percentage of PT users, 34.9% and 42.9% respectively.

Table 4 Characteristics of mode choice

Characteristics	Mode choice	Motorbike (N=3,484)	Car (N=1,841)	PT (N=63)
Household total income	Under 1,000,000 LAK	1.4%	0.1%	0.0%
	1,000,001-4,000,000 LAK	23.8%	14.7%	34.9%
	4,000,001-10,000,000 LAK	60.3%	56.9%	42.9%
	10,000,001-20,000,000 LAK	12.7%	22.9%	17.5%
	More than 20,000,001 LAK	1.8%	5.3%	4.8%
Car Ownership	0 unit	37.3%	2.8%	39.7%
	1 unit	43.6%	46.4%	42.9%
	2 units	13.9%	27.5%	17.5%
	More than 3 units	5.2%	23.4%	0.0%
Motorbike Ownership	0 unit	0.7%	4.9%	0.0%
	1 unit	12.6%	27.6%	25.4%
	2 units	33.1%	35.3%	42.9%
	3 units	29.2%	19.0%	17.5%
	More than 4 units	24.4%	13.1%	14.3%

Commuting Allowance	No	81.7%	76.8%	96.8%
	Yes	18.3%	23.2%	3.2%
Motorbike License	No	52.8%	34.5%	44.4%
	Yes	47.2%	65.5%	55.6%
Car License	No	98.7%	96.4%	93.7%
	Yes	1.3%	3.6%	6.3%
Motorbike Availability	No	97.2%	97.8%	93.7%
	Yes	2.8%	2.2%	6.3%
Car Availability	No	28.8%	45.7%	34.9%
	Yes	71.2%	54.3%	65.1%
Trip purpose	No	47.7%	57.4%	38.1%
	Work	52.3%	42.6%	61.9%

The relative affordability of PT in comparison to other transport modes and the fact that users may not have any alternative for transport may potentially be reasons for ridership to concentrate on the middle to lower end of household income. In the particular case of a household not having alternative transport options, this may be due to the unavailability of private vehicles in their household or, even if the household owns a private vehicle, the government official may not be able to drive it. This can be observed from the high percentage of officials without a driving license, 93.7% in the case of a car driving license and 44% for motorcycles.

Therefore, there may not be another choice for their commute. More than half of PT users reported work commute as their trip purpose. The remaining less than 40% reported using PT for other private activities. Findings suggest that those who do not have access to this CA may be prone to choosing PT due to their financial situation. Figure 11 presents the main reasons reported for commuting by public bus. Most government officials selected the low cost

of public bus as the reason they chose PT for their commute (32.8% of respondents).

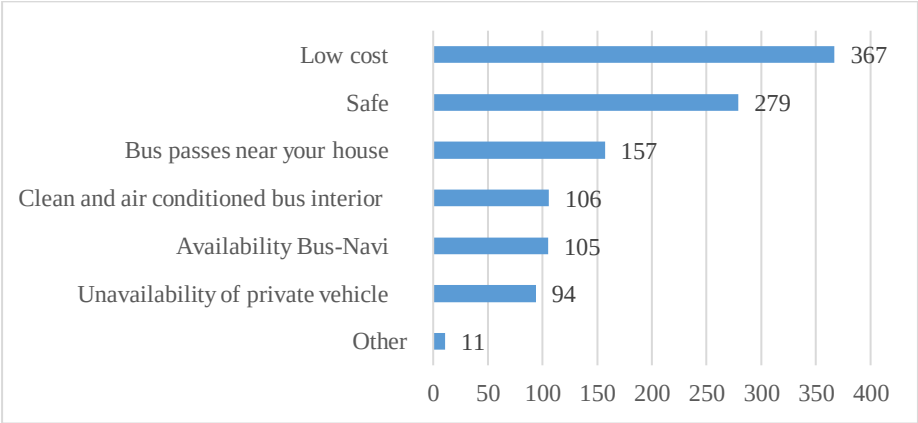


Figure 11. Main reason for commuting by bus

This reasoning follows the abovementioned results that show most households have a mid to low household income and thus may be more attracted to the savings brought by using PT. The second most reported reason (24.9%) was that they feel safer using PT than using private vehicles. This may be due to public awareness of the danger road accidents present. According to data from the Department of Transport from the MPWT, although the overall trend for accidents in the last 10 years has been to decrease, fatalities have not decreased accordingly and instead have remained at similar levels. The third most reported reason for using PT is easy access, in the form of bus passing near the respondent's house.

This highlights the importance of PT accessibility, especially the need to consider elements such as the effect of the weather and quality of facilities on pedestrian comfort and the overall network connectivity of PT. Therefore, under current conditions, it is considered that only government officials living near bus routes and who have no other transport alternatives choose PT for commuting.

4.7. Factors influencing mode shift to PT

This part of the results analyzes perception of PT to answer the research question of determining the main factors relevant to government officials in making a change in modal choice from private vehicles to PT. The study selected government officials who are non-users of PT within the data sample group to identify opinions related to PT and possible improvements that could motivate a change in their mode selection.

Table 5. Factor analysis for satisfaction of bus non-user government officials (N=1,763)

Component	Reliability	Service Time	Accessibility
Waiting time	-0.048	**0.842**	0.100
Operation hours	0.315	**0.783**	-0.082
Punctuality	0.030	**0.572**	**0.527**
Traveling time	0.625	0.270	0.208
Door to door	-0.008	0.113	0.761
Comfortable	**0.746**	-0.054	0.199
Bus stop facility	0.280	-0.058	**0.745**
Safety	**0.819**	0.080	-0.085
Eigen value	**2.498**	**1.374**	**1.192**
%of total variance	**31.228**	**17.176**	**14.894**
Total variance		**63.3%**	

Table 5 gives information on the satisfaction of non-users of PT among government officials, specifically of VCSBE's bus service. In the case of respondents with zero previous experience using public transport, respondents were asked for their opinion based on their perception of the bus service with the following scale: (1) very bad, (2) bad, (3) fair, (4) good and (5) very good.

The total sample consists of 1,763 collected questionnaires. All items of the survey were subject to factor analysis using maximum likelihood method in SPSS statistical software.

Bartlett's test of sphericity confirmed the possibility of using a factor analytic model on this dataset ($x^2 = 2381.375, p < 0.001$). Furthermore, sample adequacy was validated with a Kaiser-Meyer-Olkin (KMO) measure of 0.678. Correlations between factors obtained from SPSS are shown in Table 5. Results of factor analysis show that three dimensions appear in the satisfaction of non-users of PT.

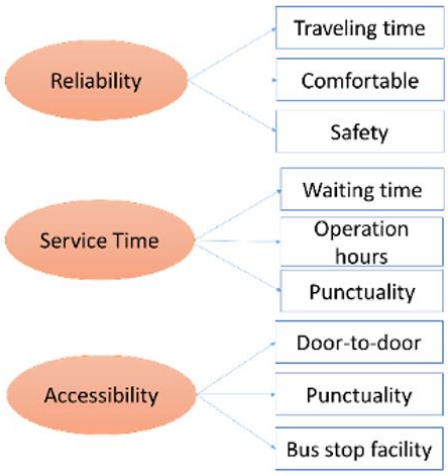


Figure 12. The path diagram of satisfaction

As shown in Figure 12, 8 variables resulting of all iterations, correlated to three components explaining 63.3% of the total variance. The first factor interpreted as reliability explains 31.2% of total variance. This factor consists of three items: traveling time, comfort, and safety. Most officials considered PT reliability as an important factor. Currently, buses in Vientiane commonly do not stop at designated bus stops and instead stop wherever users request the bus driver, thus traveling time is greatly affected and explains the reason for which

it appeared as an important factor in mode choice. Regarding comfort and safety, users may be concerned about the bus conditions since some buses have aged.

The second factor was identified as service time explains 17.2% of total variance, this in relation to bus waiting time, operation hours, and punctuality. Most non-users were found to be concerned with service time since they may be concerned of not being able to reliably know the arrival time of bus at each bus stop. In addition, the operation hours of the bus are limited from 6AM to 5PM. This operation hours directly affects people who may potentially want to use public bus after 5PM.

The third factor measures accessibly as reflected on the level of comfort of bus stop facilities and door-to-door bus accessibility and explaining 14.9% of total variance. Tropical weather conditions in Laos bring seasons of heavy rain during which people prefer to avoid walking for long distances. Therefore, the study considers that the availability of a door-to-door bus service that could enable access as close as possible to the front of the potential user's home would motivate more people to change their current mode selection. Moreover, linear regression analysis was used to look the effect of factors (waiting time, operation hours, punctuality, traveling time, safety, cost, door to door, comfortable and bus stop facility) on the overall satisfaction of government officials' non-users of PT.

Table 6 shows that regression coefficients for satisfaction model. From the analysis, the variables of punctuality, safety, cost, bus stop facility and bus comfort ("comfortable") were found to have a significant relationship ($p<0.001$)

with overall satisfaction. Waiting time, operation hour, traveling time, door to door did not have a significant effect on overall satisfaction in PT.

Table 6. Satisfaction coefficient regression model

Variable	B	Std. Error	t-Statistic	Prob.
(Constant)	0.404	0.112	3.605	0.000*
Waiting Time	0.023	0.021	1.102	0.271
Operation Hours	0.019	0.021	0.902	0.367
Punctuality	0.147	0.021	7.089	0.000*
Traveling Time	0.016	0.022	0.736	0.462
Safety	0.216	0.021	10.280	0.000*
Cost	0.083	0.019	4.303	0.000*
Door to Door	0.021	0.016	1.292	0.197
Comfortable	0.057	0.022	2.644	0.008*
Bus Stop Facility	0.346	0.018	18.840	0.000*
R^2	0.395	SE of regression		0.526
Adjusted R^2	0.393	Prob (F-statistic)		0.000

Dependent Variable: Overall Satisfaction
*P<0.05

The results of the questionnaire to government officials conducted in 2022 are shown in Table 7. The main factors that would make non-user government officials consider starting to use public buses are similar to the factors identified by the satisfaction survey on the bus service. The main factor stated is door-to-door access, with availability of tracking applications being the second most given factor and highlighting the importance of reliability.

Table 7. Factors non-PT users will consider to start using bus

		Factors							
Characteristics		Expansion of bus route	Door to Door service	Comfortable bus stops	Clean and comfor -table bus interior	Operation hours	Punctuclity	Good manners of bus driver and safe driving	Availibility of tracking application
		N=994	N=779	N=787	N=900	N=951	N=1,102	N=1,044	N=883
Position	Technical Official	65.00%	68.90%	64.90%	65.80%	65.10%	66.60%	61.80%	68.70%
	Deputy Director	17.00%	18.50%	17.50%	17.70%	17.20%	17.90%	14.30%	16.40%
	Director above	18.00%	12.60%	17.60%	16.50%	18.10%	15.50%	12.60%	13.90%
Age	Below 25	5.30%	4.90%	5.70%	6.10%	5.60%	5.40%	5.70%	5.70%
	26-35	32.50%	34.90%	33.00%	33.80%	32.70%	33.90%	33.30%	34.40%
	36-45	38.40%	38.50%	36.20%	35.60%	36.30%	38.60%	37.60%	37.40%
	46-55	16.30%	16.80%	18.30%	17.70%	17.90%	16.30%	16.90%	17.20%
	Over 55	7.50%	4.90%	6.80%	6.80%	7.50%	5.80%	6.50%	5.30%
Household income	Less than 285 USD	62.50%	64.40%	63.40%	62.20%	61.80%	62.60%	62.90%	61.70%
	286-570 USD	29.20%	28.10%	27.80%	29.00%	30.20%	30.30%	29.20%	29.90%
	More than 570 USD	8.30%	7.50%	8.80%	8.80%	8.00%	7.10%	7.90%	8.40%
Commuting mode	Motorbike	40.20%	41.00%	40.00%	38.40%	41.00%	40.70%	39.80%	41.60%
	Car	58.90%	58.40%	59.00%	58.60%	58.00%	58.30%	59.40%	57.50%
	Other	0.90%	0.60%	1.00%	3.00%	1.00%	1.00%	0.80%	0.90%
Gender	Male	55.60%	53.10%	52.70%	53.90%	54.70%	55.60%	53.10%	52.80%
	Female	44.40%	46.90%	47.30%	46.10%	45.30%	44.30%	46.90%	47.10%

The third reason is the punctuality of the bus, further emphasizing the value potential users place on a reliable service. Therefore, non-users considered door-to-door service by using tracking application for tacking the real time of bus to be a significant factor in considering changing to use the bus. Nonetheless, results showed that the high-ranking officials are not willing to consider using the bus, potentially due to concerns about safety and because a vehicle is provided for most high-ranking officials.

4.8. Findings and recommendations

The main objective of this chapter is to identify influencing modal choice for government officials in Vientiane. Findings revealed that most of government officials that are PT users have mid to low monthly household incomes (77.8%) and thus may be more budget conscious. This characteristic was also confirmed on the bus service satisfaction survey, with relative affordability of PT in comparison to other transport modes being the main reason for selecting the bus among current users. Moreover, the results found that the great majority of respondents who are currently using PT (96.8%) are not recipients of any form of CA. Apart from affordability, concerns over road safety were also found to be a characteristic of current PT users. Therefore, governmental officials with a focus on affordability and safety could be major targets for modal shift to PT. Other characteristics of current PT users highlight the need to improve PT's level of service. Not having a driving license, as well as belonging to households that do not own private vehicles or households where private vehicles are not available for use, were characteristics found to be common among a fraction of government officials using PT. Thus, using PT

due to not having access to other transport modes may emphasize a low level of service and potentially mean that this group of users may shift towards other modes, such as private vehicles, once they gain access to them. As for the second objective of identifying the factors that may encourage government officials to consider using PT, findings pointed out reliability in the dimensions of traveling time, comfort, and safety as a major factor in considering a modal shift to PT. Results from the regression analysis and the survey directed to government officials showcased that an improvement in the punctuality of the bus, driving safety, availability of different discount tickets, bus comfort, and bus stop facilities would increase satisfaction and potentially attract non-users from using private vehicles to PT.

With these findings considered, the study recommends in the short term, for the operator to focus on boosting reliability such as adhering to fixed bus schedules and stopping at designated bus stops and on the side of regulators, to prioritize the modification of the existing CA system to allow PT to be included as a commuting mode. In the mid to long term and accounting for more costly efforts, improvements to bus stop facilities and door-to-door accessibility are important. Moreover, the introduction and development of a real-time tracking application that can be linked to a DRT system for connecting with paratransit as a feeder service would further improve the overall reliability of PT. Finally, the introduction of BRT will be a key incentive for developing sustainable PT in Vientiane and can potentially spark political will, which should be used in favor of PT to push through the consideration of further subsidies and other strategies that support the improvement in Vientiane's PT quality. Additionally, launching targeted marketing campaigns and awareness programs that highlight the

benefits of PT such as cost savings, lower traffic congestion, and greater environmental sustainability will help change the perception of PT among government officials. Lastly, further studies can focus on potential policies among government officials to financially support PT to facilitate the operator's ability to improve its service and consequently increase ridership.

Chapter 5. Policy for Commuting Allowance

5.1. Potential of Using Commuting Allowance for Modal Shift to Public Transport of Government Officials

In Vientiane, the capital city of Lao PDR, PT ridership has been decreasing in recent years due to a low level of service, causing a negative perception of PT from the public. According to person-trip survey data from JICA's Project for Institutional Capacity Building for Sustainable Urban Transport System in Lao PDR (referred to as VTMP), PT ridership has decreased from 3.92% in 2007 to 1.23% in 2019. This has translated into a steady increase in the use of private vehicles, with MPWT estimating that car registration has had an average growth rate of 12% in recent years. These factors have resulted in aggravating traffic congestion during the morning and evening peak hours in Vientiane's CBD, which has the highest concentration of government-related workplaces. It is important to note that in Lao PDR, education and health workers, in addition to government office workers, are all considered government officials. Therefore, the high concentration of schools, colleges, hospitals, and government offices in the CBD causes a particularly high proportion of commuters to be government officials, with the number of officials commuting by private vehicles estimated to be 17% of trip makers.

The decline in PT passengers in addition to the lack of government subsidies has resulted in the public bus operator, VCSBE having serious financial problems. According to 2014-2018 data from operator's finances obtained by JICA's VTMP study, VCSBE has not been profitable in any year and while revenue increased in 2018, it is considered that the COVID-19

pandemic has effectively halted any positive trend since operations were forced to stop as part of infection prevention measures and no updates have been obtained since operations restarted. This dire state of the public bus operator has significantly impacted its ability to improve their service to meet the needs of passengers.

Therefore, the analysis of the factors influencing the modal choice of government officials, as well as the study of potential policies to financially support PT emerge as relevant areas of study. Such research can provide a valuable background that facilitates improvements in service quality by the operator, subsequently leading to an increase in ridership. Furthermore, the findings can inform policymakers by identifying opportunity areas to financially bolster PT services in Vientiane.

5.2. Vientiane CBD public transport

Vientiane, the capital of Lao PDR, consists of 9 districts and has a population of approximately 969,000 people (2021) within an area of 3,920 km^2, resulting in a population density of 247 people/km^2. As of 2021, according to data from MPWT, the number of registered vehicles in Vientiane amounted to 474,360 vehicles in 2011 and 1,106,263 in 2022, a figure that in recent years has doubled annually at an average rate of 12%. According to JICA's VTMP study in 2019, modal share of cars and motorcycles was of around 24% and 63% respectively, a significant increase from 9.68% and 59.81% in 2007. On the other hand, PT modal share (sum of "Buses, Sonteo" and "Tuk-tuk, Jambo") went from 3.92% in 2007 to 1.23% in 2019, indicating a strong trend towards motorization in Figure 13.

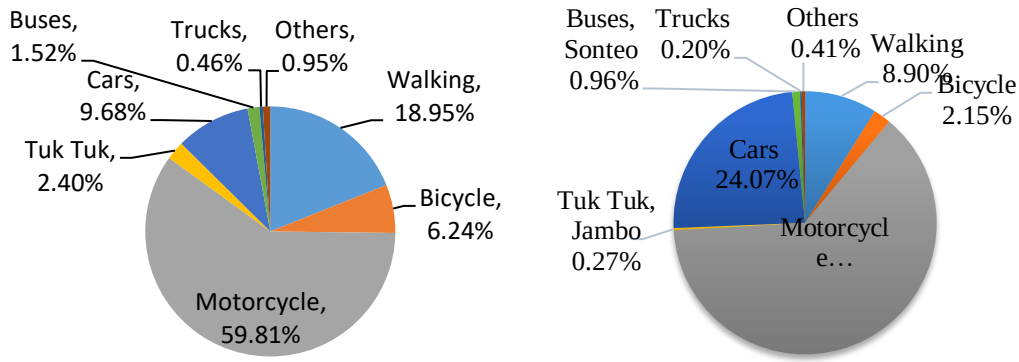


Figure 13. Mode share in 2007 and 2019 (Source: Vientiane Transport Master Plan Project JICA)

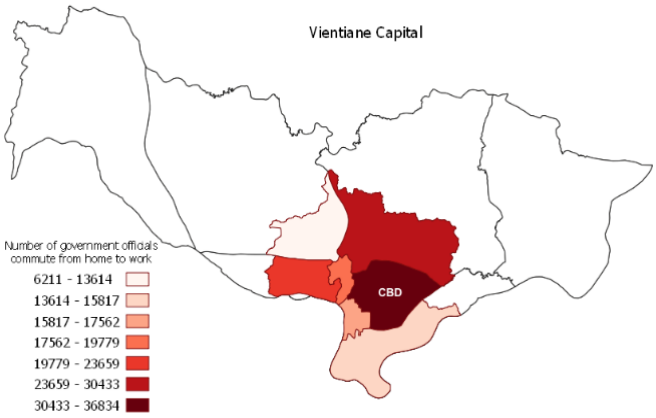


Figure 14. Number of trips by government officials in each district

In this study**,** Vientiane's CBD has been selected as the target area due to the prominent concentration of government officials. Offices of MPWT, Ministry of Education and Sports, Ministry of Defense, Ministry of Technology and Cabinet of Vientiane Capital are all located within the CDB. Moreover, the Faculty of Communication from the National University of Laos and prominent healthcare centers are also based within the CDB, thus resulting in the proportion of government officials commuting to work being significantly higher than other areas. Government officials' trips are approximately 17% heavily clustered in the CBD, as shown in Figure 14.

The main PT service within the CBD is currently provided by public buses operated by VCSBE, in addition to paratransit operators. Paratransit mode includes taxi, songteo, van, tuk-tuk, Jumbo, and motorbike taxi, as shown in Figure 15.

Figure 15. Paratansit and PT modes in Laos

Moreover, ride-hailing services, such as taxi and bike, are also popular among locals of middle-income class and above, foreign residents, and tourists. Under the ongoing Vientiane Sustainable Urban Transport Project supported by the Asian Development Bank (ADB), Vientiane is planning to introduce a BRT system in the main road of CBD in 2025 (as a current plan). The BRT system will consist of a total length of approximately 12.9 km, in addition to also considering non-motorized transport and parking management in the core area to improve mobility for sustainable transportation.

VCSBE established in 1976, operates city bus in Vientiane, intra province bus and international bus of Laos – Thailand. VCSBE has been conducting bus operations as an independent public entity without any operational subsidy from the government. As of 2023, VCSBE operates 18

routes including city bus 8 routes from the central part of the city area as shown in Table 8.

Table 8.City bus routes information and fare

Route No.	Route name	Distance (Km)	Fare (LAK*/person)
14	Central Bus terminal - Thaduea	29	12,000
23	Central Bus terminal - Thangon	25	10,000
29	Central Bus terminal - Dongdok	14	6,000
28	Central Bus terminal - Lao-China train station	15	15,000
25	Zang chieng market - Lao-China train station	25	20,000
47	Thai-Lao friendship bridge - Lao-China train station	21	20,000
31	Central Bus terminal - Phontong	13	6,000
8	Central Bus terminal - Northern bus terminal	15	7,000

*1 USD = 17,800 LAK as of 5/2023.

PT services in Vientiane suffer from a phenomenon commonly observed in other cities, a vicious cycle of financially stressed operators and poor-quality services for PT that eventually creates an image of PT as the mode of poor people (Morichi et at., 2013). This negative vicious cycle has further been accelerated by the COVID-19 pandemic, since ridership of public bus has not recovered to pre-pandemic levels, potentially due to people adopting other alternative modes since all bus routes were fully cancelled during some periods of the pandemic as part of infection prevention measures. Before pandemic VCSBE operated a total of 40 routes, of which 16 routes were urban bus services (referred as “City Bus”). In 2013, the number of passengers on City Bus routes totaled 4,600,646 passengers, this figure decreased by 24% in 2019 to 3,475,841 passengers and dropped to 682,174 passengers in 2022.

5.3. Commuting allowance for government officials

Currently, government officials have a CA given in the form of fuel tickets, as shown in Figure 16. All government officials in Lao PDR get a

monthly salary that includes certain allowances in cash, except CA, given in the form of fuel tickets. The amount given in fuel tickets depends on the position within the government, as shown in Table 9. This fuel ticket system has potentially encouraged government officials to commute by private vehicles, thus contributing to the negative impacts of traffic congestion, as well as air and noise pollution. However, due to the steady increase of fuel prices, the actual amount of fuel that government officials can get has decreased significantly.

Figure 16. Fuel ticket

For instance, as shown in Table 9, at the lowest and most common rank of government officials, technical officers, the allowance consists of 50,000 LAK/month. Thus, considering that prices for one liter of diesel and gasoline at stations from the state fuel company amounted to 19,420 LAK and 16,900 LAK (as of May 2023), respectively, the CA that most officials receive cannot fully cover the expenses of commuting by private vehicles.

Table 9.Commuting allowance amount by position (fuel ticket)

Position	Amount (LAK/month)
Vice Minister	700,000
Director General	500,000
Deputy Director General	400,000
Director	200,000
Deputy Director	150,000
Technical official	50,000

*1 USD = 17,800 LAK as of 5/2023.

A questionnaire survey targeting government officials was conducted during February-March 2022. The target group consisted of officials from the MPWT, Ministry of Education and Sports, Ministry of Defense, Ministry of Technology and Communication, National University of Laos, and the Cabinet of Vientiane Capital. The target institutions from which officials were surveyed consisted of governmental institutions that have direct access to bus service. Moreover, within the selected institutions all officials were targeted for the questionnaire survey. Officials from the target group were asked to participate in the questionnaire survey through the delivery of printed survey forms to their corresponding workplaces, with completed questionnaires being recollected afterwards. In total 1,800 questionnaires were distributed, and 1,490 questionnaires were successfully collected, representing a response rate of 83%. The contents of the questionnaire survey consisted of three sections: 1) demographics, 2) commuting mode (to capture the characteristics of users and non-users and their preferences), and 3) policy scenarios. Regarding the policy scenarios, three scenarios where three new alternatives for fuel tickets were presented under current public bus service conditions and after the introduction of the BRT system. Additionally, the same scenarios were presented under the

alternative of conducting improvements to the bus service, as well as enforcing parking regulations.

Table 10.Characteristics of respondents (N= 1,490)

Characteristics	Category	Frequency	Percentage
Gender	Male	825	55.3%
	Female	668	44.7%
Age	Below 25	88	5.8%
	26-35	510	33.8%
	36-45	539	35.7%
	46-55	246	16.3%
	Over 55	126	8.3%
Position	Technical Official	907	60.9%
	Deputy Director	215	14.4%
	Director	111	7.4%
	Deputy Director General	50	3.3%
	Director General	38	2.5%
	Other	169	11.3%
Individual Income	Equal or less than 2,000,000 kip	852	56.8%
	2,000,001-4,000,000 kip	597	39.8%
	4,000,001-6,000,000 kip	39	2.6%
	6,000,001-8,000,000 kip	3	0.2%
	8,000,001-10,000,000 kip	2	0.1%
	More than 10,000,001 kip	8	0.5%
Household Income	Equal or less than 5,000,000 kip	953	65.1%
	5,000,001-10,000,000 kip	411	28.1%
	10,000,001-15,000,000 kip	59	4.0%
	15,000,001-20,000,000 kip	11	0.8%
	20,000,001-25,000,000 kip	12	0.8%
	More than 25,000,001 kip	19	1.3%
Mode share	Motorbike	609	42.2%
	Car	810	56.1%
	Bus	16	1.1%
	Walking	5	0.3%
	Bicycle	1	0.1%
	Songteo	1	0.1%
	Van	1	0.1%
Situation of driving	Self-driving	1,369	93.0%
	Accompanied	94	6.4%
	Have a driver	9	0.6%

*1 USD = 17,800 LAK as of 5/2023.

Regarding the characteristics of respondents, as presented by Table 10, the majority consisted of male (male: 55.3%; female: 44.7%) and 26 to 45-year-

old officials were the biggest proportion of respondents (69.5%). Moreover, the majority of respondents reported being a technical officer (60.9%), while higher positions such as deputy director (14.4%) and director (7.4%) were the minority of respondents. Regarding household characteristics, household income equal or less than 5,000,000 LAK confirmed the majority of respondents (65.1%), with the second largest group (28.1%) being that of 5,000,001 to 10,000,000 LAK. Regarding individual income levels, most government officials reported an income equal or less than 2,000,000 LAK (56.7%), while officials reporting an individual income of 2,000,001-4,000,000 LAK was the second largest group (39.7%). Furthermore, regarding modal share, the use of private vehicles for commuting to work represented the highest proportion (56.1%), with motorbike coming in second (42.2 %), in stark contrast with PT (bus and songteo) which was reported to be used by 1.2% of respondents.

Furthermore, to evaluate the importance of key elements of the bus service under each policy scenario, respondents had to prioritize one bus service characteristic along with the policy scenario that best suited their preference. In order to examine potential policies for establishing a commuting allowance scheme that could potentially become a financial support for PT, respondents were asked for their preference regarding three different scenarios that were formulated based on an orthogonal experimental design. Additionally, to reduce the number of possible scenarios, the survey sample was divided into three survey groups, and each was presented with the same combinations of bus service elements and policy scenarios. Policy and service characteristics that would make them consider switching to public buses include: i) the alternative to choose between fuel tickets & bus tickets, along with ii) the

improvement of connectivity with PT's feeder system through an application, iii) greater network accessibility, iv) ticket discount for peak-hour trips, and v) availability of Wi-Fi on buses and bus stops.

This chapter aims to deepen understanding of the influence of sociodemographic characteristics and PT service characteristics of decision on commuting allowance policy choice. A multinomial logit (MNL) regression was used to develop the model in SPSS version 29. Three policy choices were evaluated: a) Policy 1 presents the alternative to choose between fuel ticket and bus ticket, b) Policy 2 shows the possibility for exchanging fuel ticket to half-priced bus ticket, and c) Policy 3 presents free public transport for persons that are not target of fuel tickets. Furthermore, sociodemographic and PT service variables were defined in the model as dummy variables.

5.4. Main factors for government officials to switch from private vehicles to PT

The study gathered information of both government officials who are current PT users and non-PT-users to identify opinions related to PT and possible improvements that could motivate a change in their modal choice. The respondents were asked for their opinion based on their perception of the bus service. The results in Figure 17 show that the main reason that non-users of PT would not like to commute by bus is that the bus doesn't pass near by their house. Other common answers include a lack of punctuality on the bus and the bus stop being located far from the respondent's house. These concerns are considered particularly important accounting for Laos's tropical weather conditions that result in seasons of heavy rain during which people may prefer

to avoid walking long distances and waiting for the bus outside for a long time. Therefore, these factors are potentially crucial in motivating more people to change their current mode selection. Government officials who reported to be non-PT-users were asked to rate different factors that would make them consider starting using PT.

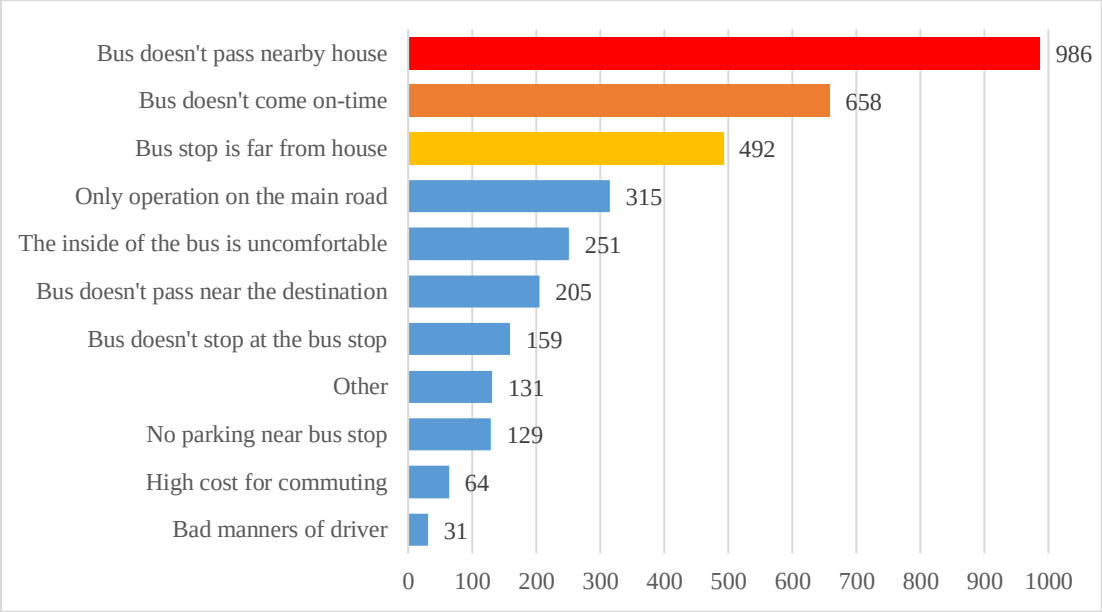


Figure 17. Reasons government officials do not want to commute by bus

Respondents were asked to rate the influence factors would have in their modal choice using the following scale: (1) “not at all”, (2) “slightly”, (3) “moderate”, (4) “very”, and (5) “extremely”. Factors that non-PT-users rated as promote modal shift. “very” and “extremely” are interpreted to be key improvement areas which could potentially. From the results presented in Figure 18, a major factor that non-PT-users rated to highly influence their modal choice is the driving of bus drivers.

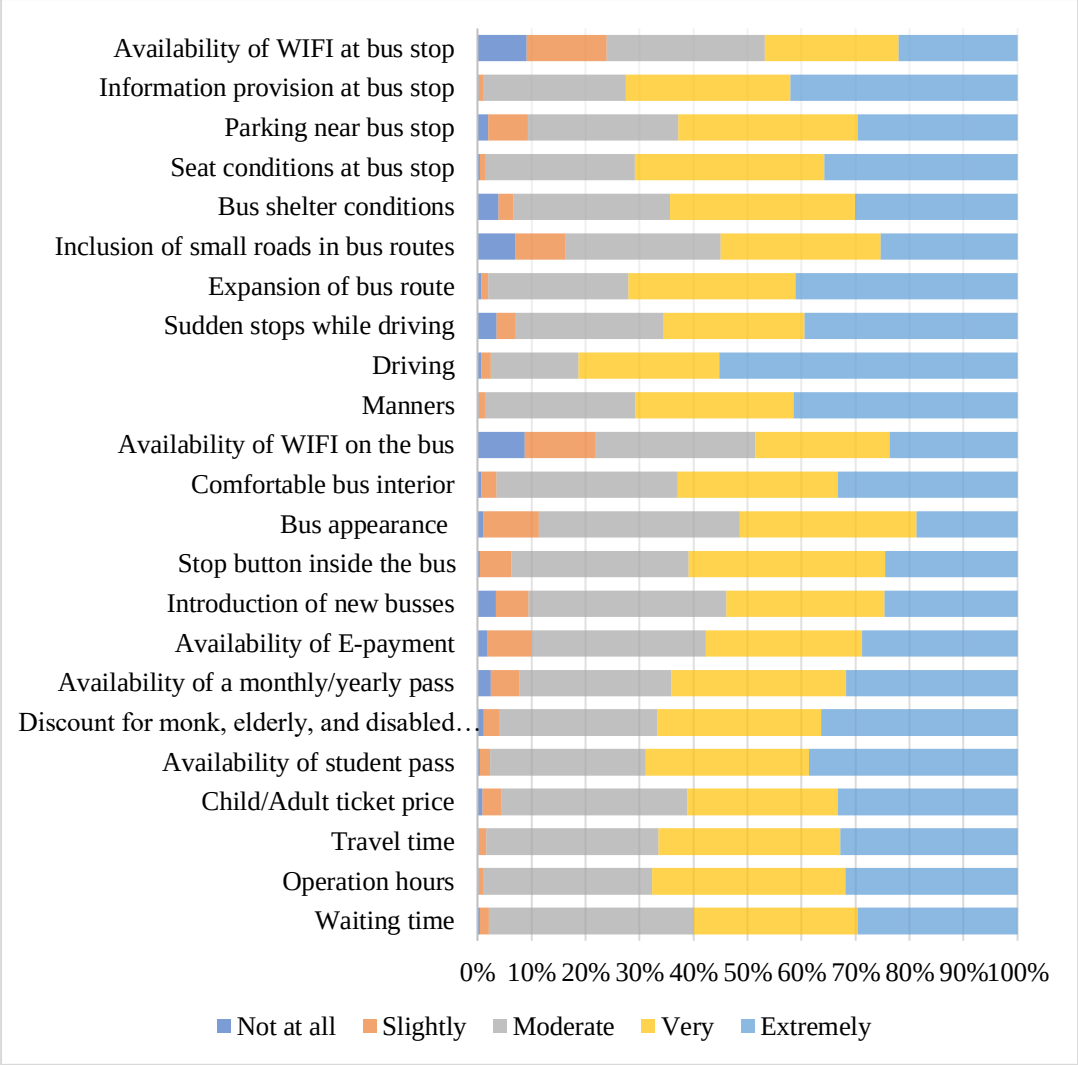


Figure 18. Factors that influence mode choice of non-PT users

This is considered to be due to the overall lack of driving manners, with some bus drivers suddenly breaking and buses commonly not stopping at designated stops, resulting in arbitrary stops based on users' requests. The second most stated factor is expansion of bus routes due to overall poor accessibility, while the third factor was information provision.

5.5. Policy scenarios for using the commuting allowance as PT subsidy

To examine potential policies for establishing a CA scheme that could potentially become a financial support for PT, respondents were asked for their preference regarding three different scenarios: the first scenario consisted of an alternative to choose between fuel tickets or PT tickets, a second scenario considered the possibility for exchanging fuel tickets to half-priced bus tickets, and the third scenario consisted in providing free PT for government officials that are not target of receiving fuel tickets. Stated preference related to the three policy scenarios are showcased in Figure 19. From the results, the majority of government officials agreed with the three potential CA policies.

However, it is important to note that the proportion of respondents extremely agreeing with the third policy scenario was higher than in other scenarios, thus highlighting particular interest in PT being free for government officials that are not target of receiving fuel tickets. Figure 19 also showcases a significant proportion of respondents remaining neutral in their preference of any policy scenario. This may be due to most government officials not having any prior experience using PT or as a result of a negative perception towards PT.

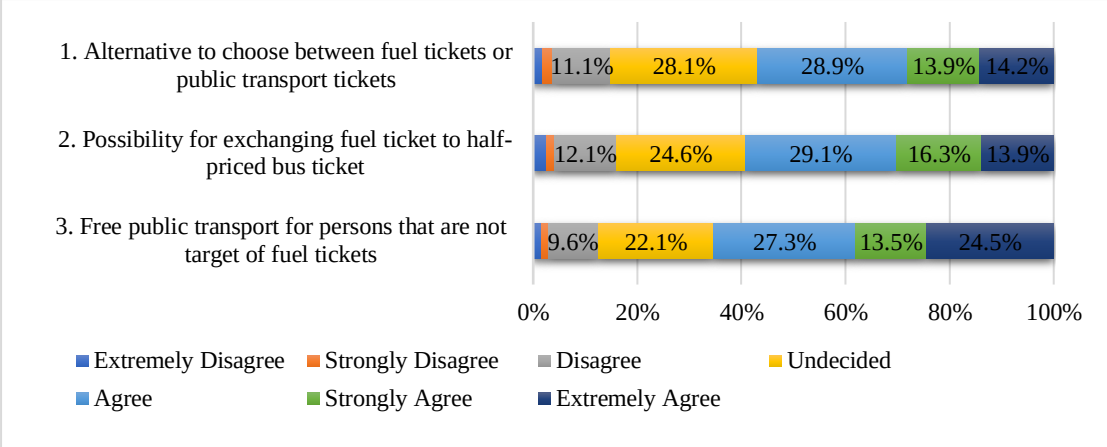


Figure 19. Stated preference results for each policy scenario (N=1440)

In relation to the multinomial logit regression model, the McFadden R^2 value for the resulting model was 0.443, higher than the acceptable value of 0.3 and thus representing a good fit. Model results are shown in Table 11, with Policy 3 being used as the reference category. The parameter estimates of sociodemographic characteristics indicated that individual low-income government officials are most likely to prefer Policy 3, the scenario presenting free public transport for persons that are currently not target of fuel tickets. This is considered to result from a higher importance being given to reducing commuting costs. However, taking a look at the overall trends for technical officers, the majority of officials were found to prefer Policy 1. This may be due to most of them already receiving some form of allowance and thus based their decision on an option that benefits them with the option of potentially changing their allowance to PT tickets.

Table 11. Multinomial Logit regression model of policy choice by independent variables

Independent Variables	Policy 1	Policy2
Individual Income (More than 6,000,000 LAK=0, less than 6,000,000 LAK=1)	-0.652(0.521) *	-0.296(0.744)
Household Income (More than 15,000,000 LAK=0, less than 15,000,000 LAK=1)	0.005(1.005)	-0.169(0.845)
Age (Upper 55=1, other=0)	0.404(1.502) *	0.291(1.337)
Sex (male=0, female=1)	0.095(0.908)	0.113(1.119)
Position (Technical official=1, other= 0)	0.894(2.444) ***	0.722(2.059) *
Mode (car=0, motorcycle=1)	0.178(1.195)	0.375(1.1455)
BRT (BRT=1, Current bus=0)	4.007(54.985) ***	5.035(153.727) ***
Connect with feeder by application (Connect by application =1, Current service=0)	-1.195(0.303) ***	1..442(4.229) ***
Operation time 5:00-22:00 (5:00-22:00=1, 6:00-17:00 & 6:00-20:00=0)	3.305(27.243) ***	6.089(440.916) ***
Access within 1 km (1km=1, 300m&500m=0)	3.579(35.850) ***	2.893(18.051) ***
Parking fee in CBD 10000LAK/Hour (10000 LAK/hour=1, not allow all day & not allow daytime=0)	-0.84(0.920)	0.300(1.350)
10% discount in peak hour (discount 10%=1, discount 20%&30%=0)	0.076(1.079)	-4.367(0.013) ***
WIFI available on bus and bus stop (available=1, none=0)	0.541(1.718)	-7.092(0.001) ***
Log likelihood (intercept) 2790.827		
Log likelihood (full model) 1495.388		
Chi square 1295.438		
Nagelkerke's R-squared 0.689		
McFadden's R-squared 0.443		
Cox-Snell's R-squared 0.604		

N=1,399
The reference category is policy 3

Considering the current commuting mode, the model showcased that government officials who use motorcycles for commuting are more likely to prefer Policy 2. This may represent a choice influenced by concerns with lowering their transportation costs for a proportion of their trips, while still aiming at having the current fuel ticket option. In the case of government officials with middle household income, respondents were found to prefer Policy 1, the alternative that gives officials the option to choose between fuel tickets or PT tickets. Moreover, when accounting for the age of respondents, officials over 55-year-olds were found to also prefer Policy 1. This could potentially stem from

middle income earners and older officials having a preference for the comfort of private vehicles and having a lower concern over commuting costs, a tendency that could be acerbated by the fact that a majority of high-ranking officials receive a private car from government. Finally, when accounting for gender, female officials were also found to prefer Policy 1. This could originate from different transportation needs in comparison to their male counterparts.

The parameter estimates of PT service demonstrated that in case of PT-related improvements respondents prefer Policy 2, indicating the interest to keep both transport allowance options (fuel tickets and PT tickets) while being able to access an improve PT-service at a fraction of the cost. Improvement to PT service such as introduction of BRT and an application to connect with paratransit, extension of operation times, better accessibility to the PT within less than 1km, provision of discounts of more than 10%, and enforcing parking were found to be relevant.

5.6. Policy implications

Based on the factors highlighted by the survey and the modelling results of government officials in Vientiane, a higher level of service is crucial to generate interest in a potential modal shift to PT. Government officials are willing to consider PT as an alternative to fuel ticket allowance, however, this is toward an improved version of the current PT system. It is the version that emphasizes safety, convenience, accessibility, and comfort. Otherwise, their current modal choice preference for private vehicles is most likely to prevail. Thus, the findings highlight the need to improve bus stop accessibility and expand the bust network through strategic infrastructure investments. At the

same time, driving behavior and manners needs to be improved in order for officials to shift to PT. On the other hand, low-income officials who are using PT at the current conditions wish to receive free PT benefits.

Accounting for the financial difficulties currently being faced by VCSBE, it is considered that in addition to the CA scheme, VSBE needs alternative sources of income to have the ability to invest in its operation and increase the feasibility of capitalizing on a potential modification of the CA scheme and generating a modal shift. In this context, the provision of a direct or indirect subsidy, as it is common in other countries, to maintain and improve the level of service or the creation of new services through adopting new business models, such as the use of technology to adopt a DRT model, are topics of relevance and worth exploring.

5.7. Findings and discussion

Currently, the level of service of PT in Vientiane is very low, causing a negative perception. Consequently, the number of passengers is decreasing year by year, contributing towards the worsening of traffic conditions and the financial situation of the public bus operator in Vientiane since it does not receive any subsidy. Within this context, this study aimed to identify the factors that influence the modal choice of government officials in Vientiane and study potential policies that could influence modal choice. Government officials in Vientiane, Lao PDR, receive fuel ticket allowance that can potentially become PT subsidy if officials will shift from using private car to bus and other PT modes. This concept, if successful, will address the problems of declining PT mode ridership and financially support PT service improvements. By

considering government official's perspective, it addresses a literature gap that was not yet studied until now. There are few studies on PT subsidy in Southeast Asian developing countries and this study also fills in this research gap.

Results from the model based on a multinomial logit regression, showcase the differences in the interest of government officials to potential policy changes to the current CA scheme. Officials not receiving fuel tickets were found to mostly be interested in being able to obtain free PT tickets as a CA (foreseen by Policy 3), while current receivers of fuel tickets were mainly interested in gaining the option of PT being covered by the allowance (Policy 1 and 2). Differences in the current modal choice for commuting, age, and gender played a role in defining the preference within the selection of fuel tickets or PT tickets as their allowance, as foreseen by Policy 1, or the ability to have both options with the caveat of PT tickets representing only a fraction of the PT fare as presented by Policy 2. Moreover, improvements of PT were found to be relevant for officials to be interested in Policy 2, translating into respondents potentially wanting to have a PT alternative at a discount price as part of their CA when a higher level-of-service is provided by PT. Overall results implied non-PT users will consider PT as an alternative only if service improvements are made. This highlights the importance to finance PT level of service improvement.

Findings of this study contribute to a better understanding on which bus service improvements and CA policies could have a greater impact on promoting a modal shift within government officials in Vientiane. Implications include the use of findings in assigning a priority to future bus improvements

and helping efforts to increase bus ridership, as a form of financially supporting PT and making feasible a sustained gradual improvement of the level of service. Moreover, alternatives such as direct or indirect subsidies, as well as other business models, such as the adoption of a DRT model, are considered topics worth exploring to increase the feasibility of capitalizing on a potential modification of the CA scheme for government workers and generating a modal shift. Further research is recommended to conduct a finance study on the feasibility of implementing the recommended policies.

Chapter 6. DRT System Acceptance and Demand Estimation

6.1. Policy Acceptance and Demand Estimation of Demand Responsive Transit (DRT) in a Least Developed Country: The Case of Paratransit in Vientiane, Lao PDR

In many developing countries, paratransit makes up the bulk of PT service, as is the case in the Lao PDR. In Thailand and Lao PDR, paratransit buses are called "Songteo" which means "two rows", referring to the two benches that run along the sides of the vehicle's rear cargo area. Songteo are generally medium-sized pickup trucks that have been converted to bus-like vehicles capable of carrying up to 10 or more passengers at a time. Fares are handled in cash and are paid to the driver, or fare handler if there is one. Other types of vehicles often used as paratransit in Vientiane include three-wheel TukTuks, and motorcycle taxis. In Vientiane, Songteos can be found in both urban and rural areas and are often used as a cheap and convenient mode of transportation for locals and sometimes tourists. They typically operate on fixed routes, like a conventional bus route, and will pick up and drop off passengers along the way, with unfixed fares are usually negotiated between the driver and passengers before the journey begins. While Songteos can be a convenient way to get around, they are often cramped and uncomfortable. Mostly due to a lack of other options, they are a popular and affordable way to travel between urban centers and inside cities in the Lao PDR and Thailand (Cervero, 2000). This type of paratransit is common in other Southeast Asian nations and is similar to the Jeepneys of the Philippines, Matatus of Kenya, or Marshrutkas in Russia, among others (Cervero, 2000).

Other forms of paratransit available in Lao PDR include Tuk-Tuks, which generally operate as point-to-point taxis, and Jambos which are larger TukTuks that can handle more passengers. Jumbos may be used as shared taxis, or as point-to-point taxis in the same ways as TukTuks. These vehicles are almost always three-wheeled vehicles powered by a 2-stroke motorcycle engine. As of 2021, there were about 512 Tuk-Tuks or Jambos, and 136 registered Songteos in Vientiane (MPWT, 2022). In some cases, Songteos in Vientiane is not scheduled efficiently, and sometimes directly competes with the existing city bus (fixed) routes, leading to an inefficient transport network (JICA, 2008). Since at least 2011 (ADB, 2023), a BRT system has been planned for Vientiane, originally proposed by JICA in their 2008 Master Plan for Vientiane (JICA, 2008). The first line in a greater network is anticipated to start construction in late 2023 and be ready for use in 2024 or 2025.

Based on its applications in other jurisdictions, the efficiency of the paratransit network could potentially be increased with a conversion to DRT, including other functions such as feeders into more traditional trunk routes (Anburuvel, et.al, 2022; Almedia Marins, 2023). To understand whether such a system could be accepted and therefore used in a developing country, 300 people in Vientiane, Lao PDR were surveyed in early 2023 and asked a series of questions including a stated preference survey approach, to determine if they would (a) accept such a system and (b) understand under what conditions they would use such a system. A (1) demand estimation model and consequently (2) applied the derived demand to an assignment-based network model were developed using the results.

This study contributes to the overall discourse related to DRT and PT by focusing on how to integrate DRT technologies with paratransit in developing nations, while also estimating what the demand potential for those types of services could be. Previous works on DRT have almost entirely focused on developed nations with existing robust public transport systems, and additionally, tend to focus on the specific technical aspects of DRT such as algorithms, rather than the potential passenger demand for the services.

6.2. Informal Public Transport in Southeast Asia

While there is no specific definition for paratransit, in general, paratransit in Southeast Asia consists of the following key traits, according to Cervero, 2000:

… [uses] a diverse spectrum of vehicles and services, encompassing shared minibuses [sic], tuk-tuks, motorbikes, and customized trucks [and functions] in tandem with, and at times independently of, formal public transit networks, informal PT is hailed for its adaptability and cost-effectiveness.

One of the noticeable attributes of informal PT (paratransit) in Southeast Asia is its role in bridging transportation gaps. Particularly in areas where conventional public transit is inadequate or inaccessible, informal services provide an essential lifeline, enhancing the connectivity of both urban and rural regions. This is especially pertinent in sprawling, geographically diverse countries like Indonesia, the Philippines, and even the Lao PDR, where the topography and urban sprawl have presented challenges to the establishment of comprehensive formal transit systems.

Despite the utility of informal PT, paratransit often does not provide a high-quality service and has numerous concerns (Cervero, 2000; Cervero, 1997; Hernandez, et.al., 2021; Kumarage, et.al., 2010). Chief among these is the issue of safety (Hernandez, et.al., 2021), encompassing concerns such as vehicle maintenance standards, driver training, and adherence to traffic regulations. Moreover, reliability remains a concern, as schedules can be erratic and contingent upon various factors, including weather conditions and local demand (Ndibatya and Booysen, 2020; Wongwiriya, et.al., 2010). The regulation of these services is another persistent challenge, as informal operators often operate on the fringes of the formal regulatory apparatus, evading taxation, oversight, etc. (Cervero, 2000).

Figure 20. Paratransit types in Lao PDR

Despite this, commuters in many developing nations rely on paratransit and even prefer it in some cases (Wongwiriya, et.al., 2010). Paratransit services in the Lao PDR consist of Songteo, Tuk-Tuk, and Jambo, depicted in Figure 20. Songteo is a modified pickup truck with a capacity of up to 10-15 passengers whereas TukTuk and Jambo appear to be three-wheel motorcycles with an attached cabin seating approximately 6-8 passengers. Since 2018, the Lao PDR Department of Transportation (DOT) noted an increase in Songteo registrations while the TukTuk and Jambo decreased (MPWT, 2022). This is

due to restrictions placed on new TukTuk and Jambo, which are now limited to servicing tourist areas. Around this same time, the DOT encouraged the consolidation of individual Songteo operators into associations, to organize their service routes, and to ensure these operate by the Transportation Law and regulations (JICA, 2021). More importantly, this policy is to delineate operations from overlapping with city bus routes. However, progress was delayed by the COVID-19 pandemic and post-COVID public transport services were being led by Songthaew, owing to its flexible routes and capacity to operate in areas without bus services. This further highlights the strength of paratransit in filling the transport supply gap. Conversely, it shows the weaknesses of the existing city bus system route operations and their lack of adequate service supply.

While there is significant information in the literature around DRT and its applications, including case studies, most studies are focused on developed nations. Further, many studies are focusing on simulations and algorithm development, with fewer focused on acceptance and demand estimated. In developing nations, transport users are used to a lack of conventional PT like buses and trains and have grown accustomed to the flexible nature of so-called paratransit/paratransit. There is reason to believe that DRT could be more widely accepted in these places. This study will attempt to partially fill this gap with a case study focused on the conversion of paratransit in Vientiane, Lao PDR a LDC.

6.3. Stated Preference (SP) Survey

A total of 300 people were surveyed based on the effective sample size, targeting Vientiane people by appropriately distributing 100 people for each travel purpose for car and motorcycle users and 100 people for each means of Paratransit users such as TukTuk, Jambo, and Songteo.

- Car users: 100
- Motorcycle users: 100
- TukTuk, Jambo, Songthaew (paratransit) users: 100

Stated Preference (SP) methodology is a discrete choice analysis used to quantitatively assess the impacts of traffic services or policy measures that are currently non-existent (Kroes and Sheldon, 2022; Hensher, 1994; Loo, 2002). This methodology involves estimating a respondent's utility function based on their choices related to various transportation attributes within a hypothetical market scenario. It allows for the quantitative evaluation of how transportation users would respond to policy variables, utilizing the estimated utility function. SP methodology is known for its flexibility and widespread use in transportation studies (Loo, 2002). SPs have been used extensively in transport studies, including for DRT (Kim, et,al., 2017; Frei, et.al., 2017; Bronsvoort, et.al., 2021; Lee, et.al., 2022) and BRT(Nkurunziza, et.al., 2012; Satiennam, et.al., 2016; Idris, 2014).

As previously discussed, this SP considered the alternative of using DRT as a feeder system in a BRT network versus the existing mods (car, motorcycle, or paratransit). In this SP, conventional SP variables are generally fare (cost), and time (waiting time, travel time, access, and egress time, etc.) Despite being

a flexible service, research has shown that traditional time and cost variables remain the most important (Bronsvoort, et.al., 2021). The questions and alternatives that were asked in the SP survey are summarized below. A total of six hypothetical travel scenarios were presented to respondents. In each, two alternative (binomial) choices were available (car/existing mode) or BRT and DRT, see below. In this case, the choice model estimates the number of users using BRT and DRT (with DRT acting as a feeder) or, in essence, PT demand.

- **Alternative 1**: Set all to Level +1, which is the standard value of each evaluation item
- **Alternative 2**: Same toll cost (COST) (Level +1), but increased travel time (Total Vehicle Travel Time [TVTT], IVTT and dispatch interval (Level -1)
- **Alternative 3**: Same IVTT (Level +1), but high toll, TVTT, and the long interval between buses (Level -1)

A fractional factorial design was used to reduce the number of hypothetical alternatives in the SP survey, and it was reduced to three alternatives to easily understand the survey contents and minimize response time.

Table 12. SP Service Level and Values

Category		Cost	Total Travel Time	In-Vehicle Travel Time	Bus Frequency
Car					
1	(1) Car	27,500 kip	15 min	10 min	-
	(2) BRT + DRT	11,500 kip	35 min	20 min	15 min
2	(1) Car	27,500 kip	25 min	20 min	-
	(2) BRT + DRT	11,500 kip	50 min	25 min	15 min
3	(1) Car	31,500 kip	25 min	20 min	-
	(2) BRT + DRT	13,000 kip	50 min	20 min	25 min
Motorcycle					
4	(1) Motorcycle	16,500 kip	20 min	15 min	-
	(2) BRT + DRT	11,500 kip	35 min	20 min	15 min
5	(1) Motorcycle	16,500 kip	30 min	25 min	-
	(2) BRT + DRT	11,500 kip	50 min	25 min	15 min
6	(1) Motorcycle	18,500 kip	30 min	15 min	-
	(2) BRT+DRT	13,000 kip	50min	20min	25min

The survey was conducted in January 2023 firstly with a small pilot survey, and later the full survey was conducted for one month from February 2023 through a local company located in the Lao PDR. The main contents of the survey are as follows:

1. Respondent's attributes and PT usage information
2. Characteristics of use using each means (purpose of travel, frequency of use, hopes for improving public transportation)
3. DRT service requirements (necessity, desired route section, departure point, destination)
4. BRT service requirements (possibility of substituting BRT use, purpose of travel using BRT)
5. Transfer investigation on appropriate travel time and fares for BRT and DRT switching, etc.

The total number of effective respondents was 300, with male (49%) and female (51%) respondents being evenly distributed. Among the survey subjects for cars, males accounted for 64%, while motorcycles accounted for 65% of females. Paratransit users are 48% male and 52% female, see Table 13 below.

Table 13. Gender distribution of SP survey respondents

Category	**Total**		**Car**		**Motorcycle**		**Paratransit**	
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Male	147	49%	64	64%	35	35%	48	48%
Female	153	51%	36	36%	65	65%	52	52%
Total	*300*	*100%*	*100*	*100%*	*100*	*100%*	*100*	*100%*

As for the age group of survey respondents, those in their 20s who are usually active on the road account for 48%, followed by those in their 30s with 19%. As for the distribution by age group of car and motorcycle users, those in their 20s accounted for the most at 51% and 54%, respectively, followed by

those in their 30s with 20% for passenger cars and 25% for motorcycles in their teens. In the case of Paratransit users, those in their 20s accounted for the most with 39%, followed by those in their 30s with 26%, and those in their 40s with 16%, refer to Table 14 below.

Table 14. Age distribution of SP survey respondents

	Total		Car		Motorcycle		Paratransit	
	No.	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
<20	30	10%	5	5%	25	25%	0	0%
20-29	144	48%	51	51%	54	54%	39	39%
30-39	57	19%	20	20%	11	11%	26	26%
40-49	38	13%	15	15%	7	7%	16	16%
50-59	14	5%	5	5%	2	2%	7	7%
60-69	14	5%	3	3%	1	1%	10	10%
>69	3	1%	1	1%	0	0%	2	2%
Total	*300*	*100%*	*100*	*100%*	*100*	*100%*	*100*	*100%*

Respondent's occupations were students at 41%, followed by professionals/engineers at 18%. Professionals/engineers account for 25% of car users, followed by students at 23%, motorcycle users with students at 68%, and self-employed at 11%. Among paratransit users, students account for the most at 32%, and 18% are professionals/engineers, excluding other job classifications.

6.4. Choice Model

The collected data from the SP is used to estimate the parameters of a choice model. The most commonly used model for this purpose is the random utility model, which assumes that individuals choose the alternative with the greatest utility. Other advanced models include the nested logit, mixed logit, and hybrid choice models, which capture more complex decision patterns.

This case developed a binary logit transfer choice model. That is, this model is used to calculate the probability, based on certain input parameters and alternative specific constants, that a motorcycle or car user would switch to using PT (DRT & BRT). While several models were developed, the final model chosen utilized two parameters: time and cost. Time is defined as the difference between the total travel time from origin to destination using BRT & DRT (in minutes) and using either car or motorcycle. The cost variable is defined similarly, being the difference between the total travel cost from origin to destination of BRT & DRT (in kip) and using a car or motorcycle (cost being defined as the operation costs including fuel and maintenance, since toll roads rarely exist in the Lao PDR). NLOGIT 6's Discrete Choice software (LIMDEP) was used for analysis using a standard binary transfer logit model function. In addition to estimating the coefficient of the utility function. Model fit parameters were examined including log likelihood, R2, and adjusted R2. The following equation describes the binary logit transfer choice model developed:

$$U_m = \beta_1 \times M_{Dummy} + \beta_2 \times (COST_m - COST_{BRT+DRT}) + \beta_3 \times (TVTT_m - TVTT_{BRT+DRT}) \quad (1)$$

Where:

- M_{Dummy} = Constant
- $Cost_m$ = travel cost of car or motorcycle
- $Cost_{BRT+DRT}$ = travel cost of the BRT and DRT mode
- $TVTT_m$ = Total travel time of car or motorcycle
- $TVTT_{BRT+DRT}$ = Total travel time of the BRT and DRT mode
- β_1, β_2, β_3 = parameters for each variable

Based on the above-described utility equations, probabilities can be calculated using the following equation:

$$P_{i,n} = \frac{e^{\lambda V_{i,n}}}{\sum_{j \in A_n} e^{\lambda V_{i,n}}} = \frac{1}{\sum_{j \in A_n} e^{\lambda (V_{j,n} - V_{i,n})}} \quad (i \in A_n) \tag{2}$$

$$V_{i,n} = \theta' X_{i\,n} = \sum_{k=1}^{k} \theta_k \, X_{i\,n\,k} \quad (i \in A_n) \tag{3}$$

Where:

- A_n= a set of individual n choices
- P_{in} = Probability that individual n chooses option *i* (i =1, 2..., I_n)
- V_{in} =The fixed term for the utility that individual n will receive from option *i*
- λ = Parameter representing the variance of the utility term

Demand can be estimated by applying the above-described choice model to a base demand. Base demand in this case came from the 2021-year Origin-Destination (OD) survey completed by the JICA team (JICA, 2021) and used with permission for this study. According to this survey, there was a daily base demand of approximately 400,000 trips for cars (30% of all daily trips), and 840,000 trips for motorcycles (63% of all daily trips).

6.5. Assignment Model (Network Model)

An existing regional transport network model for the Vientiane Region built using the Emme software package (INRO Emme,2023), was used to calculate OD travel times, assign the transport demand, and perform matrix calculations where needed. The road and transit networks from this model are shown below in Figure 21. In this model, the future proposed BRT network was coded, however base demand was based on the 2021 OD demand matrix, with no growth or other forecasting applied. Therefore, the demand estimation results represent present-day base demand with hypothetical modifications to the network including the planned BRT lines and the addition of DRT as part of

this study. This way, results are subject to fewer errors from future demand estimations based on growth or trip generation/distribution models.

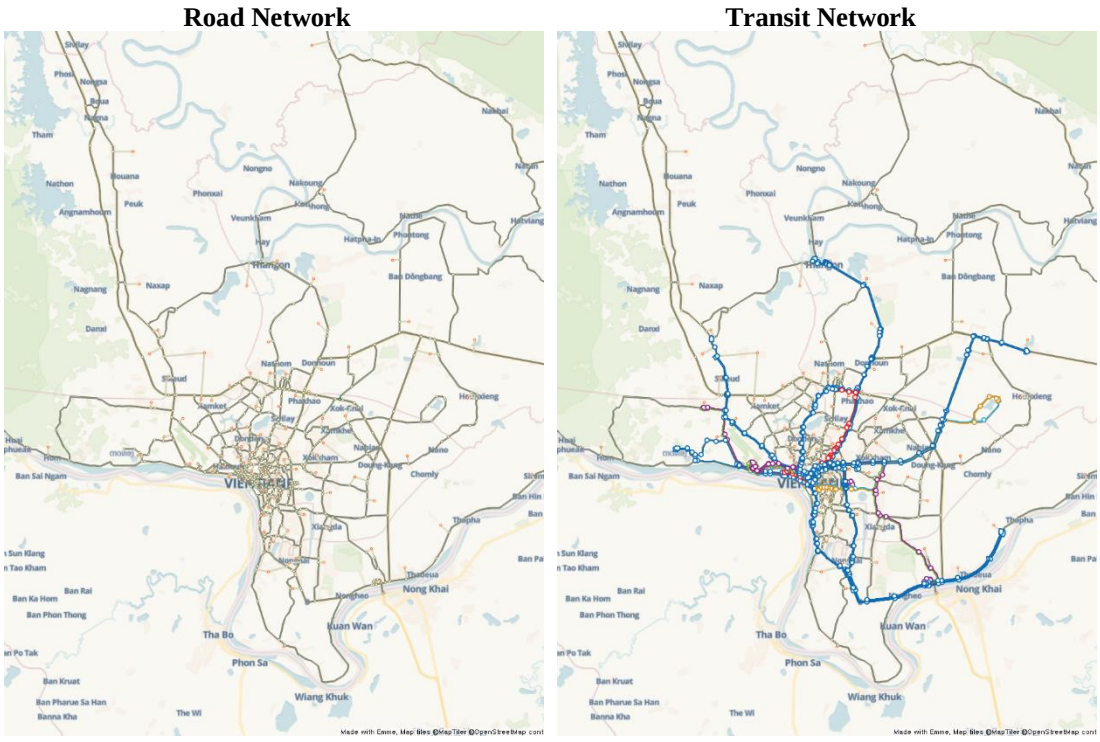
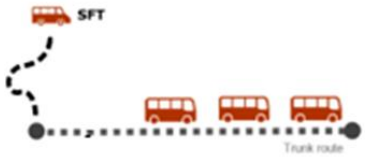
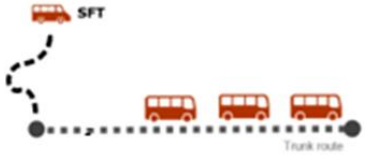


Figure 21. Transit and Road Network, O/D Model

The network model calculated the OD costs and travel times, before being fed into the choice model. The overall model is coded in Python language using Inro (Emme) libraries. Further, the resultant demand matrix is assigned to the network allowing for a split between PT modes (BRT and DRT) to be estimated. The model iterates 6 times between mode choice and assignment, overall effects of iteration are minor as the transfer of demand to PT modes is relatively small.

Three scenarios were analyzed and coded into the choice and network models; they are described as follows in Table 15 with the operation areas shown in Figure 22.

Table 15. DRT Operations Scenarios Overview

Scenario			Image
Scenario 1a	Description	DRT vehicles allow for first-mile/last-mile trips that must begin or end at a BRT Station. DRT does not compete with BRT but acts as a feeder. In this scenario, there are 15 designated pick-up/drop-off areas that DRT services must use.	
	Service area	Large, covering ~3000 sq. km.	
	Operation	Many-to-few	
Scenario 1b	Description	DRT vehicles allow for first-mile/last-mile trips that must begin or end at a BRT Station. DRT does not compete with BRT but acts as a feeder. In this scenario, there are 15 designated pick-up/drop-off areas that DRT services must use.	
	Service area	The overall area served by DRT is relatively compact, covering 120 sq. km. no more than 5 km from the BRT stops.	
	Operation	Many-to-few	
Scenario 2	Description	DRT may compete with BRT for short trips within the city center. The inner area is generally bounded by the ring roads.	
	Service area	The overall area served by DRT is relatively compact, covering 50 sq. km.	
	Operation	Many-to-many	

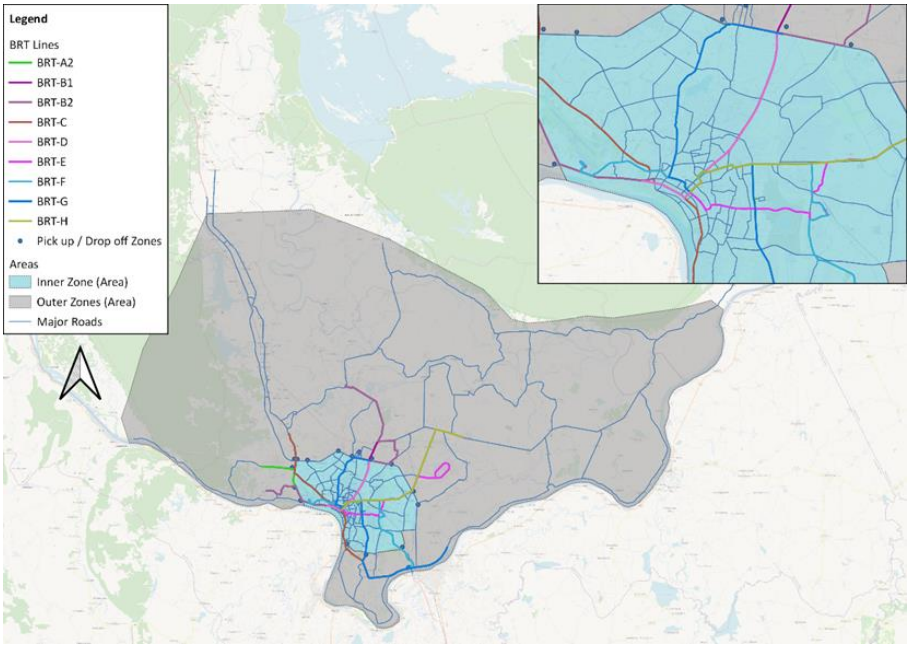


Figure 22. DRT Scenario Service Areas

The assignment determined which portion of the demand resulting from the choice modeling uses the BRT network, on which lines, and where they used DRT. DRT mode is coded as an access (auxiliary) transit mode in the network model, meaning it can be easily used as a feeder, but does not have a specific route. The BRT bus speeds are a function of the automobile speeds, as are DRT. Neither BRT nor DRT are capacity-constrained in this model (meaning that capacity is matched to demand).

6.6. Results of the survey, choice model, and demand estimation

The results discussed in this section are from the (1) opinion survey, (2) stated preference survey, and (3) subsequent modeling and demand estimation.

6.6.1. Opinion Survey: Acceptance of and Intention to use DRT

Despite being a new technology, respondents were generally in favor of both implementing and using DRT. Motorcycle users expressed the most positive opinions towards DRT with 95% saying it was necessary and 91% saying they would use it. Further, 76% of car users and 69% of paratransit users indicated they would use DRT. Overall, 84% of respondents expressed a positive opinion of DRT in Vientiane, while 79% indicated they would use it (Figures 23 and 24).

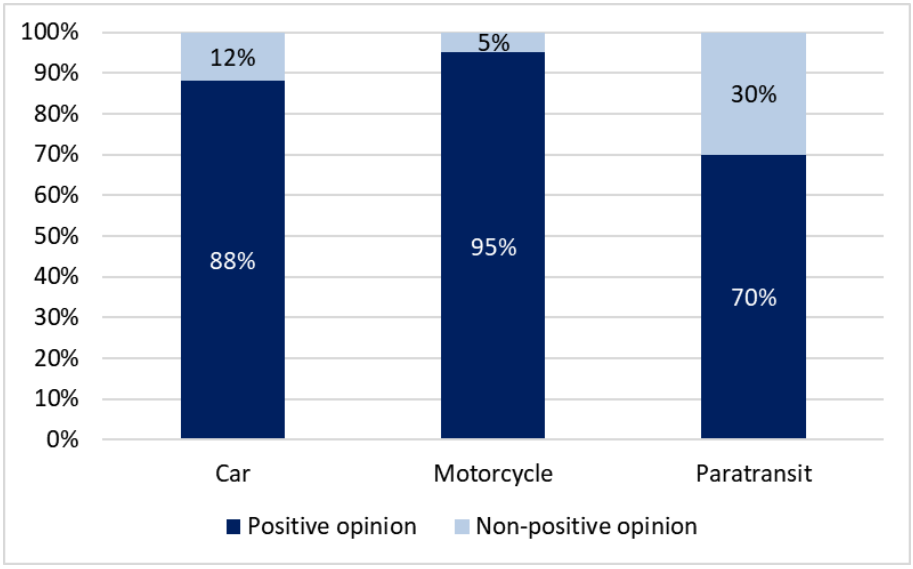


Figure 23. Positive Opinion of a DRT System

The group of transport users with the overall lowest positive opinions about DRT were paratransit users, this may be because as frequent users of flexible transport, they have become accustomed to the current system and may perceive any changes to it as a threat, or potential disadvantage.

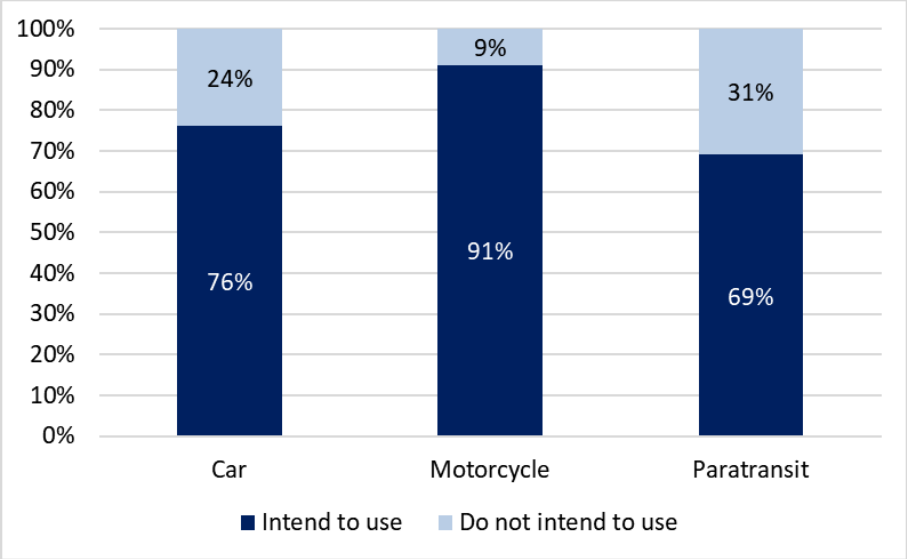


Figure 24. Intention of Using a BRT System in Combination with DRT

Respondents were also asked what types of routes would be best for DRT, and what types of trips they would use it for. For types of routes, responses were mixed, but the highest portion (34%) indicated that they would be best used as local area circulators. A total of 10% of respondents indicated they thought it would work best for getting to and from bus terminals or railway stations (transport hubs). A further 36% of respondents said that they would use the DRT to commute, followed by going to school at 32% and for business travel at 12%.

6.6.2. Choice Model and Demand Estimation

The type of model developed in a “demand transfer” or “capture” model, is based on differences in price and travel time of the comparison mode (car or motorcycle) and the desired transfer mode, in this case BRT + DRT. As a result of analysis using the proposed attribute values as described above, two reasonably well-fitted models with R squared (R^2) of 0.24-0.29 were found, as

follows in Table 16. This result is similar to a recent SP survey and subsequent model undertaken in the Vientiane region (Vongpraseuth, et.al., 2022).

Table 16. DRT Operation Scenarios Overview

Variable (Coefficient)	Car Users		Motorcycle Users	
	Estimate	T-Statistic	Estimate	T-Statistic
M_{Dum}	-4.24	-6.34e-07	23.37	1.17e-05
$Cost_m$ (1,000 kip)	-0.433	-7.07	-0.358	-6.51
$Time_m$ (mins)	-0.591	-1.77e-06	1.4	1.01e-05
R^2	0.294		0.242	
Number of Cases	198		184	

To finally estimate demand, the above-described choice model was applied to the 2021 OD base demand, and times/costs were calculated with the network model, and finally assigned to the network using the network model. Results are presented in Table 17 below for comparison with the Base Case (2021 OD demand, no BRT network) and Business-as-usual scenario (2021 OD demand, BRT network) scenarios. All results are rounded to the nearest 1,000.

Table 17. Demand Estimations - BRT + DRT (Daily)

Scenario	BRT + DRT (Daily Trips)	BRT (Boardings)	DRT/ Paratransit (Boardings)	Transfers DRT-BRT	Mode Share (Public Transport)
Base case (no BRT or DRT)	40,000*	31,000**	9,000***	-	3%
BRT only	80,000	71,000	9,000***	-	6%
1a: (BRT + DRT)	89,000	64,000	14,000	16%	7%
1b: (BRT + DRT)	85,000	79,000	10,000	12%	7%
2: (BRT + DRT)	131,000	64,000	74,000	5%	10%

* Total bus and paratransit demand

** Bus demand

*** Paratransit demand

Demand estimates indicate that, if implemented based on current measured demand levels, the mode share for BRT+DRT (PT) could increase to as high as 10%, which is more than three times the existing level based on the 2021 JICA OD survey, which estimates the total PT (including formalized and paratransit) at around 3%.

Scenario 1a and 1b presented DRT operation scenarios that only allowed the DRT vehicles to be used as first-mile/last-mile feeders into the more conventional BRT network (many-to-few). In Scenario 1a, the area covered by DRT was large and covered all potential demand within the Vientiane metropolitan region, whereas in Scenario 1b, the area was significantly reduced. While this reduced overall demand by 5,000 (around 5%) and reduced the mode share overall by 1pp, the total vehicle kilometers would be significantly reduced, perhaps increasing the overall efficiency of the system. Drawbacks include that fewer people would be served, and potentially more vulnerable people would have poorer access to PT.

In Scenario 2, DRT is confined to the denser urban core of Vientiane (many-to-many). In this scenario, an estimated 131,000 people would use the combined DRT & and BRT transit service every day. Of that, about 56% would use DRT over BRT. Generally, BRT would be used for longer-distance trips, while DRT would be used for shorter-distance trips within the city center. In this scenario, the overall ridership is highest, as is the mode share for PT, which could be as high as 10%.

6.7. Discussion of DRT

This chapter measured the effects of a hypothetical improved PT network in the City of Vientiane, Lao PDR which consisted of a series of planned BRT lines and DRT under three different DRT operation scenarios. These improvements to the PT network could increase the mode share and use of PT, and additionally, may be generally accepted and used by the public. Primarily, this study found that the integration of DRT and BRT systems in Vientiane appears to be a feasible approach to addressing public transportation challenges. While DRT offers flexibility and accessibility, BRT provides a high-capacity, dedicated transit corridor. The coexistence of these systems can potentially optimize the overall transit network, accommodating both scheduled and on-demand passenger needs.

Despite the advantages of DRT, there is an important financial variable to consider, specifically the profitability of the operators which are run as private businesses. Converting paratransit vehicles into DRT requires investing in technology that powers it. The acquisition of these devices and payment for the related services could be a financial barrier for governments and private entities that currently operate paratransit. While the cost of the hardware that is required to convert the existing trucks to DRT is relatively low as it can be done with a tablet or smartphone, the software and server payments may be relatively high. As of today, each vehicle is individually owned and operated, and therefore profitability is a must. In examining the financial sustainability of DRT, Scenario 2 stands out as the most promising. It envisions DRT as the dominant transit mode within the central Vientiane area and potentially offers a path to profitability for operators due to a denser passenger potential. Scenarios 1 and

1b, while offering excellent convenience and a much-improved experience for DRT users, would likely not supply enough customers per unit of revenue operation, and thus limit profit-making opportunities. Scenario 2, however, would require a large investment in additional vehicles, to meet demand. If not, then the projected mode shares would not be achieved. Government intervention and/or investment may be required to convince and ensure that the litany of private paratransit operators use the DRT systems. Further, previous research has shown that many DRT schemes offering lots of flexibility (i.e. many-to-many operations) have failed in the past, as they could have high operation costs and subsidies (Enoch, et.al., 2006; Currie & Fournier, 2020). Whether this is still the case in developing nations, which are already used to operating paratransit systems with high levels of flexibility, is unclear.

A major component of this case study includes a massive investment in additional BRT lines, which are planned to be implemented over the next decade. The investment into BRT as described in this study was based on the JICA-developed Transportation Master Plan for Vientiane, for 2035 (JICA, 2023). The cost of this system would be quite significant for a relatively small economy like the Lao PDR to take on. The DRT portion requires lower capital investment, predominantly relying on existing road networks and in some cases existing vehicles. This study, however, assumed that the BRT network was implemented as planned, and therefore for DRT to be successful, it is also necessary to have a high-quality fixed-route PT system.

The introduction of a DRT system in combination with planned BRT has the potential to increase PT mode share, by up to 10% of trips. While this may

not be exceptionally high by European or East Asian standards, considering the current state of PT in Vientiane, it would be quite an achievement. By offering responsive, point-to-point services, DRT can cater to a broader range of passengers, attracting those who may not find traditional transit options convenient or accessible. Expanding the PT user base aligns with the broader sustainability goals of the Lao PDR and could help alleviate traffic congestion.

It is worth noting that the success of DRT systems largely depends on digital literacy. Many residents, especially in developing regions, may lack the necessary digital skills to effectively use and benefit from the technology, particularly since DRT often relies on smartphone apps for booking and tracking services. This raises concerns about equity and accessibility in adopting DRT. As a form of ridesharing, DRT it has been found that government regulation is key to ensuring equity (Icasiano & Taeihagh, 2021). Despite this obvious concern, our research shows that Vientiane residents expect to use (accept) the service if it is available. According to similar research from Sri Lanka (Anburuvel, et.al, 2022), DRT users in developing nations would be willing to pay more and wait longer (up to 11.65 minutes) for DRT services compared to conventional services. Therefore, DRT may be a good option for Vientiane in the short term (2024 – 2027) in addition to, or possibly even instead of, non-BRT fixed feeder routes.

On limitations of this survey, the primary data source for this study was an opinion and SP survey with a relatively small sample (300 people) which may not be representative of the population at large, particularly with the age distribution. Vientiane tends to have a young population, but many users of

paratransit are older and may have different trip purposes than the sampled population. Effort was made to obtain an accurate representation of the Vientiane population in this exploratory study which found that there is a good chance that the population of Vientiane could be well-served by a DRT-conversion of paratransit services. However, since digital literacy was not considered specifically, the demand potential is a relative maximum and has an inherent assumption that all passengers will have access to a smartphone. This is almost certainly not the case. This research did not address operational costs and potential revenues.

6.8. Conclusions about DRT

This case study evaluated the acceptance of DRT and estimated the demand potential of a hypothetical future PT network with BRT trunk lines and DRT in Vientiane, the capital of the Lao PDR, a developing country. This case study envisioned that the DRT could be a partial or full conversion of the existing paratransit (consisting of Songteo, and potentially TukTuk, and motorcycle taxi modes) semi-formalized and complementary to the planned BRT network.

There is a significant gap in the literature regarding DRT in the developing world (Anburuvel, et.al, 2022), and especially in the Lao PDR and in estimating demand potential for DRT. This paper addressed this gap by studying the implementation of DRT in Vientiane. Using the results from an opinion and Stated Preference (SP) survey of 300 residents in Vientiane, Lao PDR, and built a multinomial logit model and made use of an existing regional network assignment model. Our findings indicated that there is a strong

potential for a future BRT and DRT combined network in Vientiane. Results from our opinion survey indicated a potential for the DRT concept to have a high level of acceptance from users, as most respondents indicated they would be willing to use it in combination with BRT in the future.

DRT relies on smartphone technology, and according to data from the Lao Statistics Agency (LAOSIS), the Lao PDR smartphone penetration rate is around 60% (higher in urban areas), and the number is increasing every year. Nonetheless, the use of DRT which requires a smartphone may marginalize many trip makers, especially those who cannot afford or use smartphones, the elderly, or those with low digital literacy.

Based on the results from this case study, Lao PDR has a unique opportunity to implement DRT and re-imagine/re-organize the paratransit as a network to its conventional PT network, in anticipation of the planned BRT system. Due to a surveyed positive acceptance, the DRT application could be implemented in the city as a pilot study. Future research and projects can verify the potential profitability of DRT vehicles, which will be critical if they are to be sustainably operated.

Chapter 7. Discussion

Three empirical studies were conducted to determine the features of a PT system improvement policy for Vientiane. In this chapter, relevant findings are consolidated and analyzed using SWOT analysis. The first purpose is to determine the suitable PT policy and decide the best use of the CA funding for government officials. The second purpose is to craft future PT policy actions (ex. subsidy) that will guide development of self-funding PT, and finance capacity in Lao, PDR.

7.1. Summary of main findings

The characteristics of government officials that are current PT users are members of low-income households. Findings showed PT users do not receive CA, and do not own a motorcycle or private car. Those who receive CA are non-PT users and own a motorcycle or car. However, the fuel ticket from the CA can no longer pay for the amount of fuel necessary for work trips. This implies the CA fuel ticket policy is no longer effective based on the original purpose. Moreover, non-PT users value the reliability, service time, and accessibility in their mode choice. This explains their behavior why they would keep using the private mode, even at an additional cost.

Regarding the acceptable CA policy, government officials who currently receive fuel tickets still prefer the private mode with fuel ticket access, despite additional cost. However, government officials will consider the choice of PT ticket as CA, only when the PT service is efficient and improved. Particularly, the bus service should have good bus driver behavior and accessibility. The

main policy point is that current PT users wish to have free PT, even if they are not qualified for CA in the first place. Existing fuel ticket users may consider PT ticket as an alternative, only when the PT system has been improved.

Regarding DRT service scenarios, Vientiane people are generally in favor of both implementing and using the DRT. A model scenario where DRT can compete with BRT and operate everywhere, can increase mode share by 10% compared to BAU scenario.

7.2. Policy results and analysis

The study has two main goals that are relevant to Vientiane's situation. First, it aims to understand what PT users need and like. This is important for Vientiane as the city grows and traffic gets heavier. The idea is to teach people about the benefits of using buses and to make those buses work better, for example, by starting a BRT or DRT system. These improvements could make it easier for everyone, including government officials to use the PT in the city.

Second, the study focuses on funding the PT system through new policies. In the short term, Vientiane could use grants, loans, and help from private companies to pay for this. In the medium and longer term, the study suggests using subsidy from CA to support finance for bus services. This means the CA that government officials get to help with their travel costs could be used to improve PT for everyone. This could also encourage government officials to use the bus regularly. Overall, this approach is about finding a steady way to finance better PT services for the city's future (Fig.25).

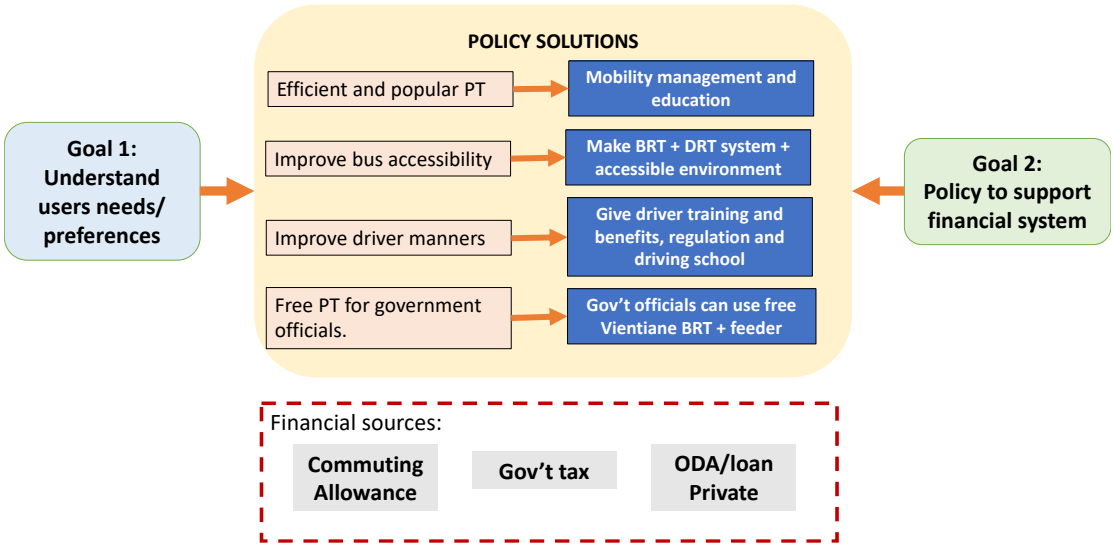


Figure 25. Policy solutions based on 2 main goals

7.3. Commuting allowance budget

In Vientiane, government officials' CA total $2.7 million yearly. Higher-ranking officials like the Vice Minister, who account for 39% of this budget, prefer not to use PT. For their safety, it's advised to maintain their allowances. However, other staff such as Division Directors and Technical Officers represent 61% of the budget and agreed to use improved PT, totaling around $1.66 million per year that could subsidize this service. A SWOT analysis of survey data was used to pinpoint strategies to boost PT ridership with this funding potential. Considering the main research findings, three main points were considered in the proposed budget for rearranging the CA is shown in Table 18.

Table 18. Proposed rearrangement of CA budget

Rearrangement of CA	%	in USD
City bus operations subsidy (operation cost)	65	1,080,411.43
Bus stop improvement, signages and timetables	15	249,325.71
City bus driver/staff education, training, and benefits	10	166,217.14
Contingency (choice of PT ticket or Fuel ticket)	10	166,217.14
Total	**100**	**1,662,171.43**

The first is to improve bus operations and bus stop infrastructure. Government officials are willing to use improved PT services. Improving bus operations and bus stop infrastructure is necessary in the immediate phase. Some Vientiane City bus operations have been canceled due to low ridership and vehicles have degraded. To address this, 80% of the budget is allotted for subsidizing operation costs to restart the canceled services. Moreover, bus stops and facilities will be improved and can provide passenger information on signages and timetables. Second, is driving education and the manners of bus drivers. This is the main reason why respondents do not want to use the bus. 10% of the budget is allotted for bus driver training and staff education. Driver benefits for good service (ex. no crash) will be provided. Third, government officials want an option to keep the fuel ticket or use the PT ticket. Hence, the final 10% is allotted for those who want to use fuel tickets. This also means Lao State Fuel company can maintain 50% of the original budget allocation of the CA.

Furthermore, rearranging the CA budget can shift 20,864 (83%) gov't officials to PT. While 4,313 (17%) high-ranking officials can keep their CA for fuel tickets. This policy can give PT tickets to all government officials and

prevent private vehicle use in the future. More importantly, this change will also benefit regular commuters in Vientiane CBD. The improved PT system is not limited to government officials.

7.4. Policy applicability analysis using SWOT

The strength, weakness, opportunities, and threat (SWOT) analysis conducted identified internal and external factors while highlighting the need for strategic interventions in Vientiane's PT system (Table 19).

Table 19. SWOT Analysis

	Strengths (S)	Weakness (W)
INTERNAL	- High demand for PT among low-income HH. - Potential to rearrange CA to encourage PT use among government officials.	- Public perception of PT as unreliable and inaccessible. - Insufficient CA leading to extra personal costs for fuel
	Opportunity (O)	**Threats (T)**
EXTERNAL	- Enhance infrastructure for better bus access and network coverage. - Financial incentives to improve PT services and operations. - Adopt DRT as an innovation commuting solution.	- Government officials' reluctance to use PT without significant improvements. - Driving manner prevent switching to PT

Internal strengths include the existing demand from low-income households and the existence of a CA system which in turn can potentially be redesigned to motivate government officials to shift to PT. Internal weaknesses include perceived issues with the reliability, service time, and accessibility of the current PT service. Additionally, the current CA system has the weakness of not being comprehensive enough to fully cover the commuting expenses of government officials resulting in officials having to cover additional costs on their own.

External opportunities for improvement are identified in infrastructure investment for better bus stop accessibility and expansion of the network, a positive attitude towards DRT, and the potential for financial incentives. External threats such as resistance from officials, the limitations of the current paratransit system, and driving habits that difficult the shift to using PT must be addressed.

Table 20. Strategic Interventions

	STRENGTHS (S)	WEAKNESS (W)
OPPORTUNITY (O)	**1. Redesigning the CA:** • Transition from fuel ticket allowances to PT option for government officials. • Consider to subsidize low-income officials' commuting costs to encourage PT use. **2. Infrastructure Investment:** • Improve bus stops and expand the bus network	**1. Testing DRT Systems** • Pilot DRT systems in selected areas to address the first and last mile connectivity **2. Parking Management** • Parking fee system and restriction parking • Consider Park & Ride facilities **3. Private Vehicle Restriction** • Implement a permit system/restrictions • Low emission zone.
THREATS (T)	**1. Integration of DRT Systems** • Fully integrate DRT systems as feeder services into the main PT routes **2. Continuous Improvement** • Regularly review and refine PT policies, including financial incentives	**1. Driver Behavior Improvement:** • Develop training programs. • Provide the incentive for better driving manner. **2. Promotion and Awareness Campaign** **3. Stakeholder Engagement**

Combining elements of the SWOT analysis, strategic policy interventions can be formulated. The SO strategy includes (1) redesigning the CA, meaning transitioning from a fuel ticket allowance system to one that provide a PT option for government officials. This policy would provide subsidies specifically targeting low-income officials to make PT use cost-effective. Therefore, CA funds would be reallocated to financially support PT infrastructure and service improvements. The second element of the SO strategy would be (2) Infrastructure investment that improves bus stops and expands the bus network. Hence, both components of SO strategy would work

in conjunction to encourage PT use among government officials, while aligning incentives with broader transport objectives.

Managing the internal weakness using external opportunities is the WO strategy. Components of this strategy include the (1) testing of a DRT system through a pilot program in selected areas design to address first and last mile connectivity. The deployment of a DRT system is expected to complement existing public buses and paratransit, supporting efforts to enhance accessibility and reliability of PT. Additionally, a (2) parking management component including measures such as the establishment of a parking fee system with strict parking restrictions and the introduction of Park & Ride facilities can be considered as push measures to incentive the use of PT. Lastly, on the policy side, (3) private vehicle registration policies can be used to encourage non-motorized transport through the introduction of a permit system, vehicle ownership restrictions, and establishment of low emission zones.

The ST strategy uses internal strengths to address external threats. The first component is expected to be the (1) integration of a DRT system as a feeder service to the main PT routes. Therefore, this would consider the integration of DRT as a means to boost the efficiency and revenue of the overall PT system. Moreover, a second component is considered in the form of (2) continuous improvement through regular reviews and refinements of PT policies, including financial incentives, in order to mitigate external threats. For instance, continuous restructuring of the CA system can be envisioned so that it functions as an indirect subsidy that fosters PT system enhancements tailored to government officials' needs.

Lastly, WT strategic interventions include (1) improving driver behavior through training programs and incentives for better driving manners. This foresees the implementation of training and incentive programs aimed at improving driving behavior among PT operators. Additionally, (2) promotion and awareness campaigns are recommended to improve the perception of the PT system. Campaigns to promote PT and elevate its public perception, combating existing prejudices and fostering proper driving manners are all considered within this component. Finally, (3) stakeholder engagement with government officials and potential users is regarded to be key to gain support for PT enhancements.

By integrating these strategic elements, Vientiane can effectively address its PT challenges, promoting a shift to more sustainable transportation practices among government officials and the general people.

7.5. Proposed Policies to Increase PT ridership

Redesigning the CA system to endorse PT use among officials, particularly aiding low-income ones, is key. Significant investment in PT infrastructure will enhance access and bus network expansion. Financial incentives and subsidies should boost PT service enhancements, while a formalized DRT system, complemented by regulated parking and private vehicle use in CBD, will solve last-mile challenges and advance informal transport methods. Continual revisions of PT policies are necessary to keep pace with technological developments, evolving user requirements, and environmental sustainability commitments.

Table 21. Implementation strategies

Short-Term (Immediate -2 years)	Medium term (2-5 years)	Long term (More than 5 years)
1. Driver Behavior Improvement: • Develop training programs. • incentive for better driving manner. **2.Promotion and Awareness Campaign:** • improve the perception of the current PT system. **3. Stakeholder Engagement:** • Engage with government officials and potential users to gain support for PT enhancements. **4. Parking Management:** • Parking fee system • Restriction parking in CBD area • Consider Park & Ride facilities	**1. Redesigning the CA:** • Fuel ticket to PT option for government officials. • Subsidize low-income officials' commuting. **2. Infrastructure Investment:** • Improve bus stops and expand the bus network based on assessments from the short term **3. Pilot DRT Systems:** • Pilot DRT systems in selected areas to address the first and last mile connectivity and wider implementation **4. Private Vehicle Restriction:** • Implement a permit system/restrictions • Low emission zone.	**1. Integration of DRT Systems :** • Fully integrate DRT systems as feeder services into the main PT routes. **2. Continuous Improvement:** • Regularly review and refine PT policies, including financial incentives. **3.Sustainable Financial Models:** • Develop and implement sustainable financial models and subsidies to support PT. **4. Long-term Behavior Change** • Awareness campaigns and establish a culture of PT use.

To transition towards a sustainable PT system in Vientiane, a phased strategy over different time horizons is proposed. In the short term, the focus is on improving driver behavior, initiating training programs, and developing incentives to foster better driving manners. Concurrently, awareness campaigns are to be launched to enhance the current perception of PT and encourage wider usage. Stakeholder engagement, particularly with government officials and users, will also be initiated to gain support for the improvements in PT services. Additionally, parking management strategies should be explored. This could include implementing a parking fee system, imposing parking restrictions in the CBD area, and considering Park & Ride facilities. These measures can help to discourage private vehicle use and promote a shift towards PT.

In the medium term, the fuel ticket allowances will be replaced with a PT option for government officials, and subsidies for low-income officials will be considered to encourage PT use. Investments will be made in crucial infrastructure, such as the expansion of bus networks and bus stop upgrades, based on the knowledge gained during the short-term phase. Testing and implementing DRT systems will address first and last-mile connectivity issues, and restrictions on private vehicle use during peak hours are advised to be

implemented. Furthermore, private vehicle restriction strategies should be implemented. This could include implementing a permit system, introducing vehicle ownership restrictions, and establishing low-emission zones**.**

Over a period extending beyond five years, the fully integrated DRT system will improve the extent and flexibility of PT services. Policies and financial incentives will undergo continuous revisions to ensure the long-term sustainability of the PT system's improvements. Lastly, extensive and ongoing awareness campaigns will aim to cultivate a lasting behavioral shift toward PT use across all social segments.

Vientiane's pursuit of a sustainable PT system requires a balanced approach that acknowledges potential risks and implements proactive mitigation strategies. Addressing social equity concerns through targeted subsidies and inclusive engagement is paramount. Maintaining political will needs transparent governance and continuous communication with stakeholders. Economically-viable measures, diversification of funding sources, piloting initiatives, and adopting dynamic pricing models will ensure long-term viability. By proactively navigating these complexities and prioritizing social inclusion, Vientiane can achieve its vision of a sustainable and efficient transport system, fostering a more equitable and environmentally responsible future.

7.6. Discussion

In this study examining the rearrangement of CA among government officials in Vientiane, Lao PDR, findings indicate a significant correlation between the current fuel ticket allowance system and the high reliance on

personal vehicles. This dependence contributes notably to urban traffic congestion and motorization, thereby need an exploration of transformative policies aimed at promoting PT usage. The key aspect of this transition rests on replacing fuel ticket allowances with a PT option to incentivize government officials to adopt a more sustainable mode of transport.

The fuel ticket allowance, as it currently operates, promotes the use of personal vehicles. The research findings suggest that government CA, which do not cover the full costs of fuel, lead to a preference for personal vehicle use among officials who can afford the additional expenses. This practice not only exacerbates traffic congestion but also undermines efforts to enhance the use of PT. By shifting the CA system from subsidizing personal vehicle use to supporting PT through PT option, policy can actively guide commuter behavior towards a more sustainable path.

When considering the transition to PT option, it is vital to recognize that simply introducing PT options without addressing the quality and reliability of PT services may not yield the desired modal shift. The study found that the non-PT user group highly values these attributes in their mode choice, which must be improved to match the benefits of private vehicle use. This indicates that a policy that offers PT option must go hand-in-hand with measures aimed at improving the PT system. These improvements include improvement of bus stops, expanding the bus network, increasing the frequency of services, and ensuring that the system is user-friendly and accessible to government officials.

The introduction of a PT option aligns with the study's recommendations for policy interventions aimed at enhancing PT ridership. The study argues for

a comprehensive approach that includes driver behavior improvement programs and promotion campaigns to challenge and change the current perceptions of PT. Furthermore, it suggests that the city bus service requires financial subsidies to upgrade and expand their services, which may be facilitated in part by reallocating funds from fuel allowances to PT system development.

Additionally, the findings emphasize the importance of integrating DRT system to complement established fixed-route services. The potential integration of DRT could provide the flexibility and personalization that government officials currently associate with private vehicle use, thereby addressing the concerns around reliability and service.

The study's SWOT analysis underlines the broader implications of the proposed policy changes, highlighting an opportunity to redesign the CA system in a way that incentivizes the use of PT among government officials. By doing so, it can address the strength identified in the research, demand from low-income households that already use PT due to the non-availability of private vehicles and turn it into a city-wide strategy that also impacts the behavior of higher-income officials.

Weaknesses, such as the perception of a lack of reliability, service time, and accessibility, are critical issues that this policy shift intends to address. With the implementation of PT options, it is expected that there will be an inherent demand for the PT system to improve, as its usage by government officials will be more closely studied. This provides a unique opening to elevate the quality of PT, making it a more viable and attractive option for all users.

Opportunities are explored within the research for infrastructure improvements to increase bus stop accessibility and network expansion. These opportunities could be pursued more aggressively with the transition to PT passes, as there would be a direct incentive for the government to invest in the facilities that will be more frequently used by government officials. Additionally, the financial incentives that PT options bring could pave the way for innovative solutions and technologies that may further enhance the effectiveness and attractiveness of PT as the preferred mode of commuting.

However, the threat of resistance from government officials to switch to PT unless substantial improvements are made remains a significant barrier. The study advocates for strategic interventions, including driver training incentives and promotion campaigns aimed at improving the public image and perception of the PT system. Moreover, these interventions can potentially mitigate some of the hesitation or resistance to change while highlighting the societal and environmental benefits of using PT.

In conclusion, the transition from fuel ticket allowances to PT options represents a strategic policy intervention with the potential to create sustainable change in the commuting habits of government officials. This change would not only encourage a shift towards PT use but would also necessitate concurrent enhancements in the PT service itself. The study underscores that for the policy to succeed, there must be a synchronized effort involving infrastructure upgrades, the introduction of complementary transport services such as DRT, and a change in the PT behavior, influenced by governmental leadership. The feasibility of such an allowance policy could not only impact Vientiane but also

serve as an example for other cities in Southeast Asia, suggesting a model for urban transport sustainability that aligns with broader environmental and economic goals.

Chapter 8. Conclusions and Recommendations

This research shows the core findings and implications drawn from the study focused on promoting PT use among government officials in Vientiane, Lao PDR. Through an in-depth analysis, the study's primary objective was to assess the feasibility of transitioning from a fuel ticket (CA) system to one that encourages PT ridership.

The research indicates that the current fuel ticket (CA) system encourages government officials to favor personal vehicle use. This preference contributes to increased traffic congestion, higher rates of motorization, and deterrence from PT due to the lack of economic incentives. Therefore, a substantial opportunity exists for policy reform that aligns with sustainable transportation objectives by shifting to the inclusion of a PT option as part of the CA system. This has the potential to substantially increase PT usage among government officials, placing greater emphasis on PT use and thereby signaling institutional commitment to sustainable mobility practices.

Findings from the study show that there is a demand for PT from low-income households, which currently do not own private vehicles. By reallocating resources toward improving PT services and providing a PT alternative in the CA system, the study recommends capitalizing on this demand to incentivize a broader cross-section of government officials to transition to PT. Such a reallocation would not only provide immediate support for those already using PT but would also set a precedent for a wider modal shift within the urban commuter population. However, for the proposed shift towards using PT to be successful, it is crucial that there are simultaneous

enhancements to the PT system itself. These improvements should focus on enhancing the reliability, service time, and accessibility of PT services, which are currently perceived as lacking by non-PT users. Additionally, integrating innovative solutions such as DRT has the potential to bridge the gaps in the existing system, providing a more tailored and convenient service that could attract more PT users.

An obstacle the policy must navigate is resistance to change, especially if substantial improvements to PT services are not felt immediately. This research emphasizes the need for well-structured strategic interventions, including awareness campaigns, promoting changes to driver behavior, and incentivizing PT use. These strategies, coupled with investments in PT infrastructure and subsidies for PT operation costs, can engender a positive shift in PT perception and usage.

This study's recommendations support the transition from fuel allowances to the provision of a PT option and highlight the need for improved PT service reliability and infrastructure. These could be further supported by inclusive policy design involving key stakeholders, incentives for PT use, and pilot programs to test innovative solutions like DRT.

For further study, it is imperative to construct a sustainable framework for this system transition. Future research should focus on the creation and assessment of financial models that can effectively subsidize PT systems in the long term. This would involve exploring a mix of funding sources, such as government subsidies, public-private partnerships (PPP), and user fees, to develop a robust financial strategy that ensures the consistent quality and

expansion of PT services, representative of a truly sustainable urban mobility solution. Lastly, future research could further examine the effectiveness of these reimbursement policies in achieving their intended objectives, such as reducing traffic congestion or promoting eco-friendly commuting.

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Appendixes

- Questionnaire Survey for Government Officials Version 1
- Questionnaire Survey for Government Officials Version 2
- Questionnaire Survey for Government Officials Version 3
- Vientiane SP survey (Car)
- Vientiane SP survey (Motor)
- Vientiane SP survey (Transit)
- Household Information Survey 1
- Household Information Survey 2
- Household Information Survey 3
- Household Information Survey 4
- Household Information Survey 5

Questionnaire Survey for Government Officials
Mobility Preferences related to Public Bus and Possible Future Policy for Promoting Public Bus Use in Vientiane (Version1)

This questionnaire survey is part of a PhD research study and will be used as reference for improving public transportation in Vientiane. In addition, the results will be utilized for the formulation of recommendations for policy making within Vientiane's Urban Transport Master Plan under the project for Capacity Development for Sustainable Urban Transport System in Laos supported by JICA and with the aim of promoting people's modal shift from private vehicles to public bus as part of countermeasures to solve traffic congestion, as well as the efforts to develop a sustainable and environmentally friendly urban transportation system.

We sincerely appreciate your cooperation and time to answer this questionnaire.

Questionnaire takes approximately 5 minutes to complete.

Thank you very much for your kind cooperation.

Please mark ✓ for your answer in the ☐

1. Age ☐Below 25 ☐26-35 ☐36-45 ☐46-55 ☐Over 55
2. Sex ☐M ☐F
3. Position
   ☐Technical Official ☐Deputy Director ☐Director ☐Deputy Director General
   ☐Director General ☐Deputy Head of Cabinet ☐Head of Cabinet ☐Other
4. Home address: Unit....., Village……, District……..
5. Workplace: ……..
6. Individual monthly income
   ☐Equal or less than 2,000,000 kip ☐2,000,001-4,000,000 kip ☐4,000,001-6,000,000 kip
   ☐6,000,001-8,000,000 kip ☐8,000,001-10,000,000 kip ☐More than 10,000,001 kip
7. Household monthly income
   ☐Equal or less than 5,000,000 kip ☐5,000,001-10,000,000 kip ☐10,000,001-15,000,000 kip
   ☐15,000,001-20,000,000 kip ☐20,000,001-25,000,000 kip ☐More than 25,000,001 kip
8. Describe your usual routine in a weekday (start from home; end back at home). Describe the purpose for each trip using the numbers located into the box.

Leave home→☐→☐→☐→☐→☐→☐→☐→☐→☐→ Back home

1	Send kids to school	4	Send wife/husband to work	7	Work	10	Shopping	13	Others
2	Lunch	5	Exercise/gym	8	Drinking	11	Leisure	14	Breakfast
3	School after work	6	Visit cousin/friend	9	Hospital	12	Pick-up kids from school		

Example usual routine trips in a weekday:

Home→School (leave kids)→Work→Lunch (outside workplace)→Work→School (pick-up kids)→Home

Leave home→[1]→[7]→[2]→[7]→[12]→☐→☐→☐→☐→ Back home

9. Commuting mode (multiple answers) (before Covid-19 outbreak)

☐ Motorbike
☐ Car

Respondents who choose these options please continue to answer next question (Q. 10)

☐ Bus

Respondents who choose these options please skip to answer questions no. 15-19

☐ Walking
☐ Bicycle
☐ Tuktuk/Jumpbo
☐ Songteo
☐ Taxi
☐ Van
☐ Others

Respondents who choose these options please answer questions no. 14, 17-19

10. For those who chose commuting by motorbike and/or car:
Describe how do you commute: self-driving, accompanied, or do you have diver?
☐Self-driving ☐Accompanied ☐Have a driver

11. For respondents who chose commuting by motorbike and/or car:
Main difficulty in commuting? (up to 3 answers)
☐Unavailable of Car/bike ☐Send/pick-up kids to/from school ☐Send family before going to work ☐High cost ☐Traffic congestion ☐Not enough parking space at the office
☐ Other (……..)

12. For respondents who chose commuting by motorbike and/or car:
Where do you park when you cannot find parking space in the office area? (up to 3 answers)
☐Parking near the office ☐Roadside ☐Along the road of parking lot and leaving a note with the phone number ☐In the temple ☐In front of a house, restaurant or shop
☐Other (……..)

13. Main reason for not commuting by public bus?
Please consider each of the following 11 factors and evaluate how much do they affect your decision of not commuting by public bus.
*If there is any other factor that affects your decision, please describe it in "Other" and indicate the degree to which it affects your decision.

For each factor, mark the column that best describes the degree to which the factor affects your decision.

Factors	Not at all	Slightly	Moderate	Very	Extremely
1) Bus doesn't pass nearby your house					
2) Bus stop is far from your house					
3) Bus doesn't come on-time					
4) The inside of the bus is uncomfortable					
5) Bad manners of driver					
6) Bus doesn't stop at the bus stop					
7) No parking near bus stop					
8) Only operation on the main road					
9) High cost for commuting					
10) Bus doesn't pass near the destination					
11) Long waiting time for bus to pass					
Other (……..)					

14. Which factors do you think are important for you to consider starting to use public bus? Please consider each of the following 8 factors and evaluate how much would they affect your decision to start using public bus.
*If there is any other factor that affects your decision, please describe it in "Other" and indicate the degree to which it affects your decision.

For each factor, mark the column that best describes the degree to which the factor affects your decision.

Factors	Not at all	Slightly	Moderate	Very	Extremely
1) Expansion of bus route					
2) Door to door service					
3) Comfortable bus stops					
4) Clean and comfortable bus interior					
5) Operation hours					
6) Punctuality					
7) Good manners of bus driver and safe driving					
8) Availability of tracking application					
Other (……..)					

(After answering this question please move to questions no. 17-19)

15. For respondents who chose commuting by bus:
Main reason for commuting by public bus? (up to 3 answers)
☐Low cost ☐Safe ☐Availability of Bus-Navi ☐Clean and air conditioned bus interior
☐Bus passes near your house ☐Unavailability of private vehicle ☐Other (……..)

16. For respondents who chose commuting by bus:
Indicate the aspects related to public bus service that should be improved.
For each factor, mark the column that best describes the importance for the factor to be improved.

	Factor	Not at all	Slightly	Moderate	Very	Extremely
Time	Waiting time					
	Operation hours					
	Travel time					
Cost	Child/Adult ticket price					
	Availability of student pass					
	Discount for monk, elderly, and disabled people					
	Availability of a monthly/yearly pass					
Bus	Availability of E-payment					
	Introduction of new busses					
	Stop button inside the bus					
	Bus appearance					
	Comfortable bus interior					
Driver	Manners					
	Driving					
	Sudden stops while driving					
Bus route	Expansion of bus route					
	Inclusion of small roads in bus routes					
Bus stop	Bus shelter conditions					
	Seat conditions					
	Parking near bus stop					
	Information provision					

(After answering this question please continue to question no. 17-19)

17. Policies for promoting the use of public bus within government officials
For each policy, mark the column that best describes your opinion.

Commuting Allowance Policy	Extremely Disagree	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Extremely Agree
Alternative to choose between fuel tickets or public transport tickets							
Possibility for exchanging fuel ticket to half-priced bus ticket							
Free public transport for persons that are not target of fuel tickets							

18. Which policy would make you consider switching from using a private vehicle to public bus? Consider the following conditions (Choose 1 policy):
For each policy, evaluate the service characteristics and indicate the one that would make you consider using public bus.

Service Characteristics / Commuting Allowance Policies	Public Bus Service	Connect with Feeder System	Operation Time	Access to Bus Route	Parking Enforcement in CBD	Price of Bus Ticket for peak-hour	Availability of WIFI on bus & bus stop	Mark ✓ for 1 policy
Policy 1: Alternative to choose between fuel ticket and bus ticket	Current bus service	Current service	6:00-17:00	Access within 1 km	Not allowed to park along the roadside all day	10% discount	NA	
	BRT	Connect by App	6:00-17:00	Access within 500 m	10000kip/hr for parking along the roadside	30% discount	Available	
Policy 2: Possibility for exchanging fuel ticket to half-priced bus ticket	Current bus service	Connect by App	6:00-20:00	Access within 500 m	Not allowed to park along the roadside all day	10% discount	NA	
	BRT	Connect by App	6:00-20:00	Access within 300 m	Not allowed to park along the main roadside at daytime	10% discount	Available	
Policy 3: Free public transport for persons that are not target of fuel tickets	Current bus service	Connect by App	5:00-22:00	Access within 1 km	10000kip/hr for parking along the roadside	10% discount	Available	
	BRT	Current service	6:00-17:00	Access within 300 m	10000kip/hr for parking along the roadside	20% discount	NA	

- Current bus service routes: before Coivd-19 outbreak, bus operated along the main road (Routes map in Fig 1 in Page 5) the bus frequency from central bus station is 15 minutes (operation time is 6:00-17:00). However, the bus didn't stop at the bus stop, so that bus was delayed and unpunctually.
- Bus Rapid Transit (BRT) will be introduced in Vientiane in the near future. The BRT has a dedicated lane through which buses will pass every 5 to 10 minutes. BRT routes will extend from Dongdok to Chaofangoum Park, passing through Patuxay and Morning Market/Central Bus Station (for details check Fig 2 in Page 5).

19. Other comments and suggestions:

Fig 1. Current bus service route

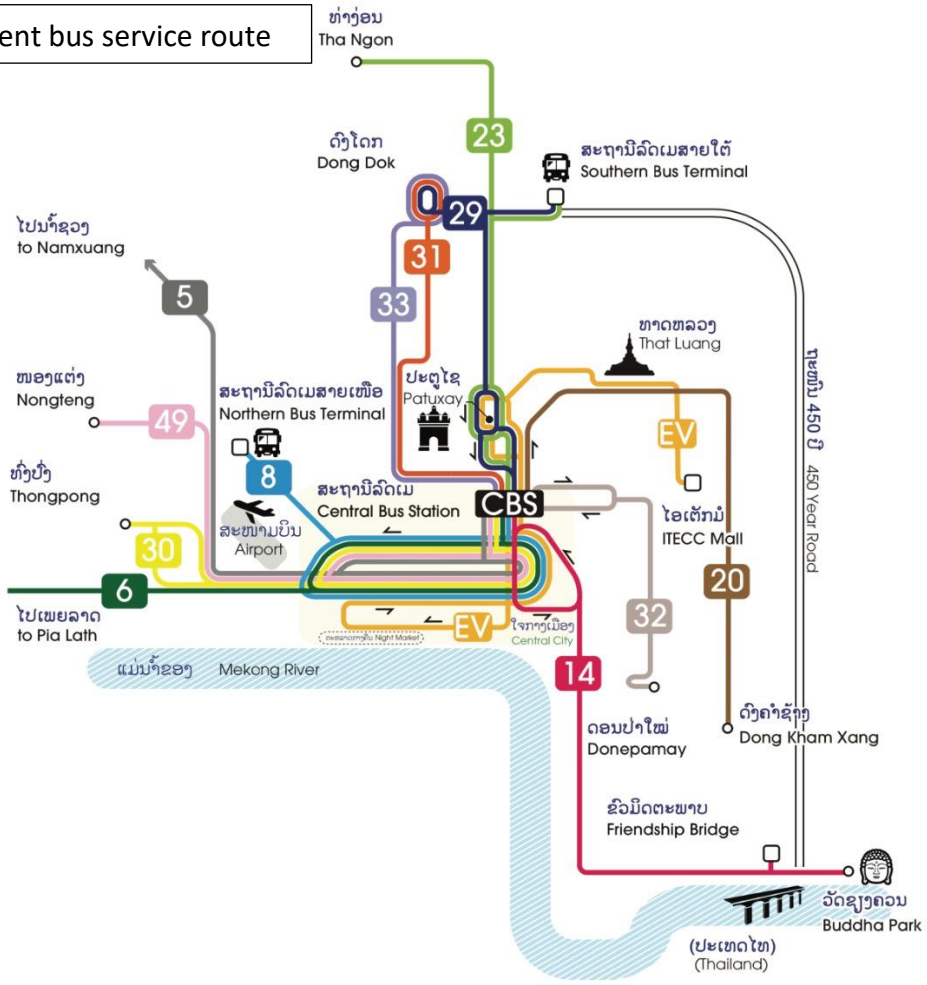
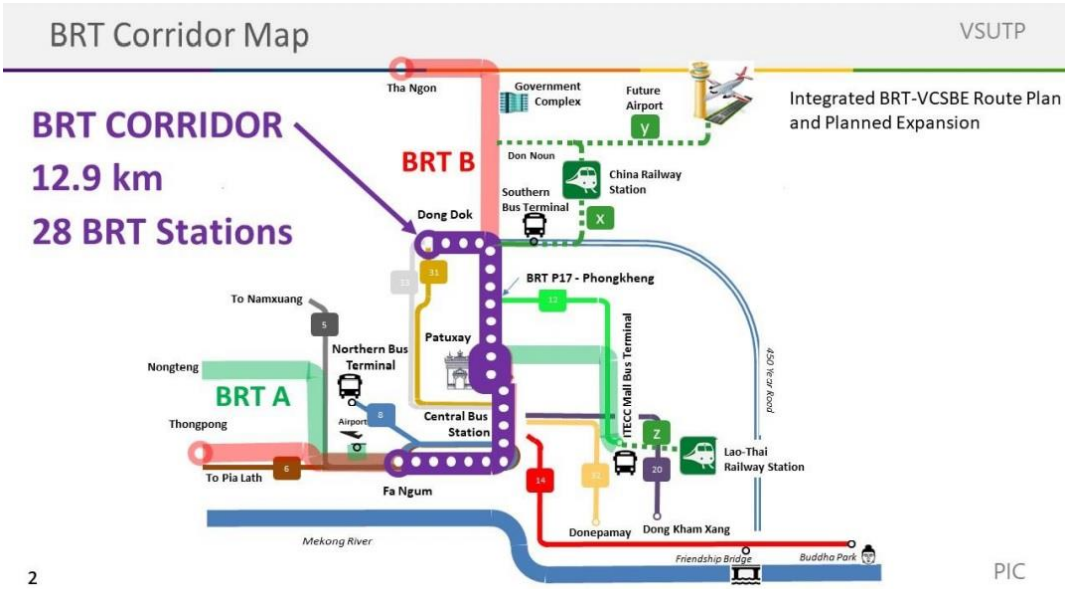


Fig 2. BRT route plan



Questionnaire Survey for Government Officials
Mobility Preferences related to Public Bus and Possible Future Policy for Promoting Public Bus Use in Vientiane (Version2)

This questionnaire survey is part of a PhD research study and will be used as reference for improving public transportation in Vientiane. In addition, the results will be utilized for the formulation of recommendations for policy making within Vientiane's Urban Transport Master Plan under the project for Capacity Development for Sustainable Urban Transport System in Laos supported by JICA and with the aim of promoting people's modal shift from private vehicles to public bus as part of countermeasures to solve traffic congestion, as well as the efforts to develop a sustainable and environmentally friendly urban transportation system.

We sincerely appreciate your cooperation and time to answer this questionnaire.

Questionnaire takes approximately 5 minutes to complete.

Thank you very much for your kind cooperation.

Please mark ✓ for your answer in the ☐

1. Age ☐Below 25 ☐26-35 ☐36-45 ☐46-55 ☐Over 55
2. Sex ☐M ☐F
3. Position
   ☐Technical Official ☐Deputy Director ☐Director ☐Deputy Director General
   ☐Director General ☐Deputy Head of Cabinet ☐Head of Cabinet ☐Other
4. Home address: Unit....., Village……, District……..
5. Workplace: ……..
6. Individual monthly income
   ☐Equal or less than 2,000,000 kip ☐2,000,001-4,000,000 kip ☐4,000,001-6,000,000 kip
   ☐6,000,001-8,000,000 kip ☐8,000,001-10,000,000 kip ☐More than 10,000,001 kip
7. Household monthly income
   ☐Equal or less than 5,000,000 kip ☐5,000,001-10,000,000 kip ☐10,000,001-15,000,000 kip
   ☐15,000,001-20,000,000 kip ☐20,000,001-25,000,000 kip ☐More than 25,000,001 kip
8. Describe your usual routine in a weekday (start from home; end back at home). Describe the purpose for each trip using the numbers located into the box.

Leave home→☐→☐→☐→☐→☐→☐→☐→☐→☐→ Back home

1	Send kids to school	4	Send wife/husband to work	7	Work	10	Shopping	13	Others
2	Lunch	5	Exercise/gym	8	Drinking	11	Leisure	14	Breakfast
3	School after work	6	Visit cousin/friend	9	Hospital	12	Pick-up kids from school		

Example usual routine trips in a weekday:

Home→School (leave kids)→Work→Lunch (outside workplace)→Work→School (pick-up kids)→Home

Leave home→[1]→[7]→[2]→[7]→[12]→☐→☐→☐→☐→ Back home

9. Commuting mode (multiple answers) (before Covid-19 outbreak)

☐ Motorbike
☐ Car

Respondents who choose these options please continue to answer next question (Q. 10)

☐ Bus

Respondents who choose these options please skip to answer questions no. 15-19

☐ Walking
☐ Bicycle
☐ Tuktuk/Jumpbo
☐ Songteo
☐ Taxi
☐ Van
☐ Others

Respondents who choose these options please answer questions no. 14, 17-19

10. For those who chose commuting by motorbike and/or car:
Describe how do you commute: self-driving, accompanied, or do you have diver?
☐Self-driving ☐Accompanied ☐Have a driver

11. For respondents who chose commuting by motorbike and/or car:
Main difficulty in commuting? (up to 3 answers)
☐Unavailable of Car/bike ☐Send/pick-up kids to/from school ☐Send family before going to work ☐High cost ☐Traffic congestion ☐Not enough parking space at the office
☐ Other (……..)

12. For respondents who chose commuting by motorbike and/or car:
Where do you park when you cannot find parking space in the office area? (up to 3 answers)
☐Parking near the office ☐Roadside ☐Along the road of parking lot and leaving a note with the phone number ☐In the temple ☐In front of a house, restaurant or shop
☐Other (……..)

13. Main reason for not commuting by public bus?
Please consider each of the following 11 factors and evaluate how much do they affect your decision of not commuting by public bus.
*If there is any other factor that affects your decision, please describe it in "Other" and indicate the degree to which it affects your decision.

For each factor, mark the column that best describes the degree to which the factor affects your decision.

Factors	Not at all	Slightly	Moderate	Very	Extremely
1) Bus doesn't pass nearby your house					
2) Bus stop is far from your house					
3) Bus doesn't come on-time					
4) The inside of the bus is uncomfortable					
5) Bad manners of driver					
6) Bus doesn't stop at the bus stop					
7) No parking near bus stop					
8) Only operation on the main road					
9) High cost for commuting					
10) Bus doesn't pass near the destination					
11) Long waiting time for bus to pass					
Other (……..)					

14. Which factors do you think are important for you to consider starting to use public bus? Please consider each of the following 8 factors and evaluate how much would they affect your decision to start using public bus.
*If there is any other factor that affects your decision, please describe it in "Other" and indicate the degree to which it affects your decision.

For each factor, mark the column that best describes the degree to which the factor affects your decision.

Factors	Not at all	Slightly	Moderate	Very	Extremely
1) Expansion of bus route					
2) Door to door service					
3) Comfortable bus stops					
4) Clean and comfortable bus interior					
5) Operation hours					
6) Punctuality					
7) Good manners of bus driver and safe driving					
8) Availability of tracking application					
Other (……..)					

(After answering this question please move to questions no. 17-19)

15. For respondents who chose commuting by bus:
Main reason for commuting by public bus? (up to 3 answers)
☐Low cost ☐Safe ☐Availibility of Bus-Navi ☐Clean and air conditioned bus interior
☐Bus passes near your house ☐Unavailability of private vehicle ☐Other (……..)

16. For respondents who chose commuting by bus:
Indicate the aspects related to public bus service that should be improved.
For each factor, mark the column that best describes the importance for the factor to be improved.

	Factor	Not at all	Slightly	Moderate	Very	Extremely
Time	Waiting time					
	Operation hours					
	Travel time					
Cost	Child/Adult ticket price					
	Availability of student pass					
	Discount for monk, elderly, and disabled people					
	Availability of a monthly/yearly pass					
Bus	Availability of E-payment					
	Introduction of new busses					
	Stop button inside the bus					
	Bus appearance					
	Comfortable bus interior					
Driver	Manners					
	Driving					
	Sudden stops while driving					
Bus route	Expansion of bus route					
	Inclusion of small roads in bus routes					
Bus stop	Bus shelter conditions					
	Seat conditions					
	Parking near bus stop					
	Information provision					

(After answering this question please continue to question no. 17-19)

17. Policies for promoting the use of public bus within government officials
    For each policy, mark the column that best describes your opinion.

Commuting Allowance Policy	Extremely Disagree	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Extremely Agree
Alternative to choose between fuel tickets or public transport tickets							
Possibility for exchanging fuel ticket to half-priced bus ticket							
Free public transport for persons that are not target of fuel tickets							

18. Which policy would make you consider switching from using a private vehicle to public bus? Consider the following conditions (Choose 1 policy):
    For each policy, evaluate the service characteristics and indicate the one that would make you consider using public bus.

Service Characteristics / Commuting Allowance Policies	Public Bus Service	Connect with Feeder System	Operation Time	Access to Bus Route	Parking Enforcement in CBD	Price of Bus Ticket for peak-hour	Availability of WIFI on bus & bus stop	Mark ✓ for 1 policy
Policy 1: Alternative to choose between fuel ticket and bus ticket	Current bus service	Connect by App	5:00-22:00	Access within 500 m	Not allowed to park along the main roadside at daytime	20% discount	Available	
Policy 2: Possibility for exchanging fuel ticket to half-priced bus ticket	Current bus service	Current service	5:00-22:00	Access within 300 m	10000kip/hr for parking along the roadside	30% discount	Available	
	BRT	Connect by App	6:00-20:00	Access within 300 m	Not allowed to park along the main roadside at daytime	10% discount	Available	
Policy 3: Free public transport for persons that are not target of fuel tickets	Current bus service	Connect by App	6:00-20:00	Access within 500 m	Not allowed to park along the main roadside at daytime	20% discount	Available	
	BRT	Current service	6:00-17:00	Access within 1 km	Not allowed to park along the main roadside at daytime	30% discount	Available	
	BRT	Current service	5:00-22:00	Access within 1 km	Not allowed to park along the roadside all day	20% discount	NA	

- Current bus service routes: before Coivd-19 outbreak, bus operated along the main road (Routes map in Fig 1 in Page 5) the bus frequency from central bus station is 15 minutes (operation time is 6:00-17:00). However, the bus didn't stop at the bus stop, so that bus was delayed and unpunctually.
- Bus Rapid Transit (BRT) will be introduced in Vientiane in the near future. The BRT has a dedicated lane through which buses will pass every 5 to 10 minutes. BRT routes will extend from Dongdok to Chaofangoum Park, passing through Patuxay and Morning Market/Central Bus Station (for details check Fig 2 in Page 5).

19. Other comments and suggestions:

Fig 1. Current bus service route

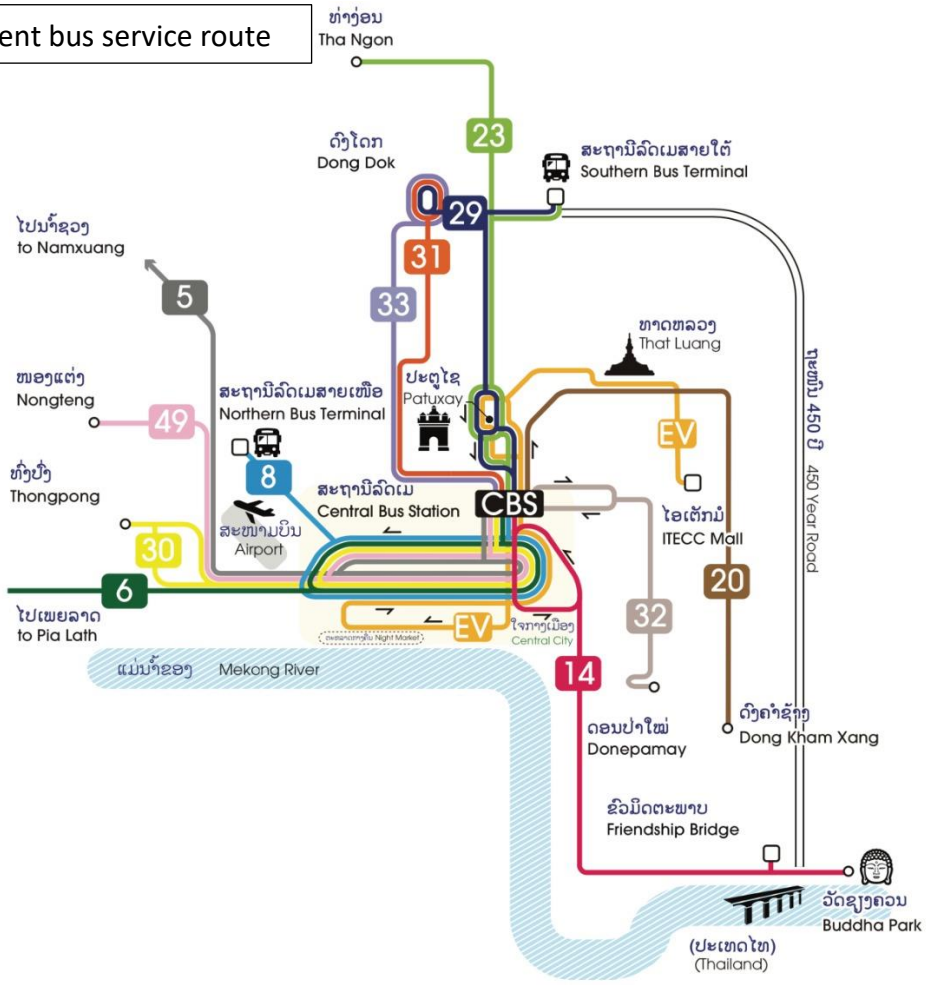
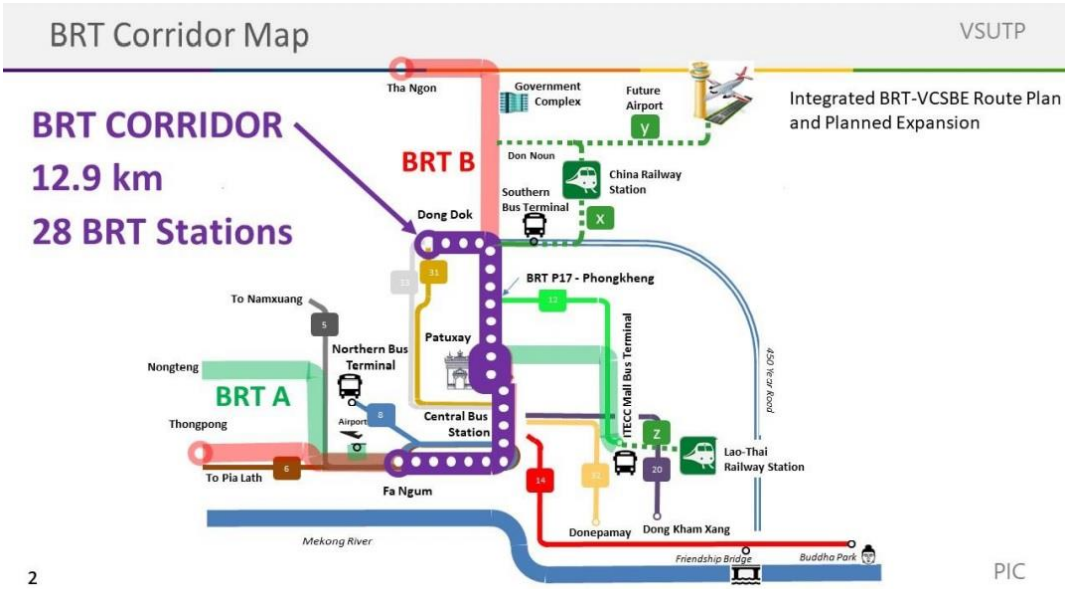


Fig 2. BRT route plan



Questionnaire Survey for Government Officials
Mobility Preferences related to Public Bus and Possible Future Policy for Promoting Public Bus Use in Vientiane (Version 3)

This questionnaire survey is part of a PhD research study and will be used as reference for improving public transportation in Vientiane. In addition, the results will be utilized for the formulation of recommendations for policy making within Vientiane's Urban Transport Master Plan under the project for Capacity Development for Sustainable Urban Transport System in Laos supported by JICA and with the aim of promoting people's modal shift from private vehicles to public bus as part of countermeasures to solve traffic congestion, as well as the efforts to develop a sustainable and environmentally friendly urban transportation system.

We sincerely appreciate your cooperation and time to answer this questionnaire.

Questionnaire takes approximately 5 minutes to complete.

Thank you very much for your kind cooperation.

Please mark ✓ for your answer in the ☐

1. Age ☐Below 25 ☐26-35 ☐36-45 ☐46-55 ☐Over 55
2. Sex ☐M ☐F
3. Position
   ☐Technical Official ☐Deputy Director ☐Director ☐Deputy Director General
   ☐Director General ☐Deputy Head of Cabinet ☐Head of Cabinet ☐Other
4. Home address: Unit....., Village……, District……..
5. Workplace: ……..
6. Individual monthly income
   ☐Equal or less than 2,000,000 kip ☐2,000,001-4,000,000 kip ☐4,000,001-6,000,000 kip
   ☐6,000,001-8,000,000 kip ☐8,000,001-10,000,000 kip ☐More than 10,000,001 kip
7. Household monthly income
   ☐Equal or less than 5,000,000 kip ☐5,000,001-10,000,000 kip ☐10,000,001-15,000,000 kip
   ☐15,000,001-20,000,000 kip ☐20,000,001-25,000,000 kip ☐More than 25,000,001 kip
8. Describe your usual routine in a weekday (start from home; end back at home). Describe the purpose for each trip using the numbers located into the box.

Leave home→☐→☐→☐→☐→☐→☐→☐→☐→☐→ Back home

1	Send kids to school	4	Send wife/husband to work	7	Work	10	Shopping	13	Others
2	Lunch	5	Exercise/gym	8	Drinking	11	Leisure	14	Breakfast
3	School after work	6	Visit cousin/friend	9	Hospital	12	Pick-up kids from school		

Example usual routine trips in a weekday:

Home→School (leave kids)→Work→Lunch (outside workplace)→Work→School (pick-up kids)→Home

Leave home→[1]→[7]→[2]→[7]→[12]→☐→☐→☐→☐→ Back home

9. Commuting mode (multiple answers) (before Covid-19 outbreak)

☐ Motorbike
☐ Car

Respondents who choose these options please continue to answer next question (Q. 10)

☐ Bus

Respondents who choose these options please skip to answer questions no. 15-19

☐ Walking
☐ Bicycle
☐ Tuktuk/Jumpbo
☐ Songteo
☐ Taxi
☐ Van
☐ Others

Respondents who choose these options please answer questions no. 14, 17-19

10. For those who chose commuting by motorbike and/or car:
Describe how do you commute: self-driving, accompanied, or do you have diver?
☐Self-driving ☐Accompanied ☐Have a driver

11. For respondents who chose commuting by motorbike and/or car:
Main difficulty in commuting? (up to 3 answers)
☐Unavailable of Car/bike ☐Send/pick-up kids to/from school ☐Send family before going to work ☐High cost ☐Traffic congestion ☐Not enough parking space at the office
☐ Other (……..)

12. For respondents who chose commuting by motorbike and/or car:
Where do you park when you cannot find parking space in the office area? (up to 3 answers)
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Please consider each of the following 11 factors and evaluate how much do they affect your decision of not commuting by public bus.
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For each factor, mark the column that best describes the degree to which the factor affects your decision.

Factors	Not at all	Slightly	Moderate	Very	Extremely
1) Bus doesn't pass nearby your house					
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7) No parking near bus stop					
8) Only operation on the main road					
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11) Long waiting time for bus to pass					
Other (……..)					

14. Which factors do you think are important for you to consider starting to use public bus? Please consider each of the following 8 factors and evaluate how much would they affect your decision to start using public bus.
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4) Clean and comfortable bus interior					
5) Operation hours					
6) Punctuality					
7) Good manners of bus driver and safe driving					
8) Availability of tracking application					
Other (……..)					

(After answering this question please move to questions no. 17-19)

15. For respondents who chose commuting by bus:
Main reason for commuting by public bus? (3 answers)
☐Low cost ☐Safe ☐Availability of Bus-Navi ☐Clean and air conditioned bus interior
☐Bus passes near your house ☐Unavailability of private vehicle ☐Other (……..)

16. For respondents who chose commuting by bus:
Indicate the aspects related to public bus service that should be improved.
For each factor, mark the column that best describes the importance for the factor to be improved.

	Factor	Not at all	Slightly	Moderate	Very	Extremely
Time	Waiting time					
	Operation hours					
	Travel time					
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	Availability of student pass					
	Discount for monk, elderly, and disabled people					
	Availability of a monthly/yearly pass					
Bus	Availability of E-payment					
	Introduction of new busses					
	Stop button inside the bus					
	Bus appearance					
	Comfortable bus interior					
Driver	Manners					
	Driving					
	Sudden stops while driving					
Bus route	Expansion of bus route					
	Inclusion of small roads in bus routes					
Bus stop	Bus shelter conditions					
	Seat conditions					
	Parking near bus stop					
	Information provision					

(After answering this question please continue to question no. 17-19)

17. Policies for promoting the use of public bus within government officials
    For each policy, mark the column that best describes your opinion.

Commuting Allowance Policy	Extremely Disagree	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree	Extremely Agree
Alternative to choose between fuel tickets or public transport tickets							
Possibility for exchanging fuel ticket to half-priced bus ticket							
Free public transport for persons that are not target of fuel tickets							

18. Which policy would make you consider switching from using a private vehicle to public bus? Consider the following conditions (Choose 1 policy):
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Policy 1: Alternative to choose between fuel ticket and bus ticket	Current bus service	Connect by App	6:00-20:00	Access within 300 m	Not allowed to park along the roadside all day	30% discount	Available	
Policy 2: Possibility for exchanging fuel ticket to half-priced bus ticket	Current bus service	Current service	6:00-20:00	Access within 500 m	Not allowed to park along the roadside all day	20% discount	Available	
	Current bus service	Connect by App	6:00-17:00	Access within 1 km	Not allowed to park along the main roadside at daytime	30% discount	Available	
Policy 3: Free public transport for persons that are not target of fuel tickets	BRT	Current service	5:00-22:00	Access within 500 m	Not allowed to park along the roadside all day	10% discount	Available	
	BRT	Connect by App	6:00-20:00	Access within 1 km	10000kip/hr for parking along the roadside	20% discount	Available	
	BRT	Connect by App	5:00-22:00	Access within 500 m	Not allowed to park along the main roadside at daytime	30% discount	NA	

- Current bus service routes: before Coivd-19 outbreak, bus operated along the main road (Routes map in Fig 1 in Page 5) the bus frequency from central bus station is 15 minutes (operation time is 6:00-17:00). However, the bus didn't stop at the bus stop, so that bus was delayed and unpunctually.
- Bus Rapid Transit (BRT) will be introduced in Vientiane in the near future. The BRT has a dedicated lane through which buses will pass every 5 to 10 minutes. BRT routes will extend from Dongdok to Chaofangoum Park, passing through Patuxay and Morning Market/Central Bus Station (for details check Fig 2 in Page 5).

19. Other comments and suggestions:

Fig 1. Current bus service route

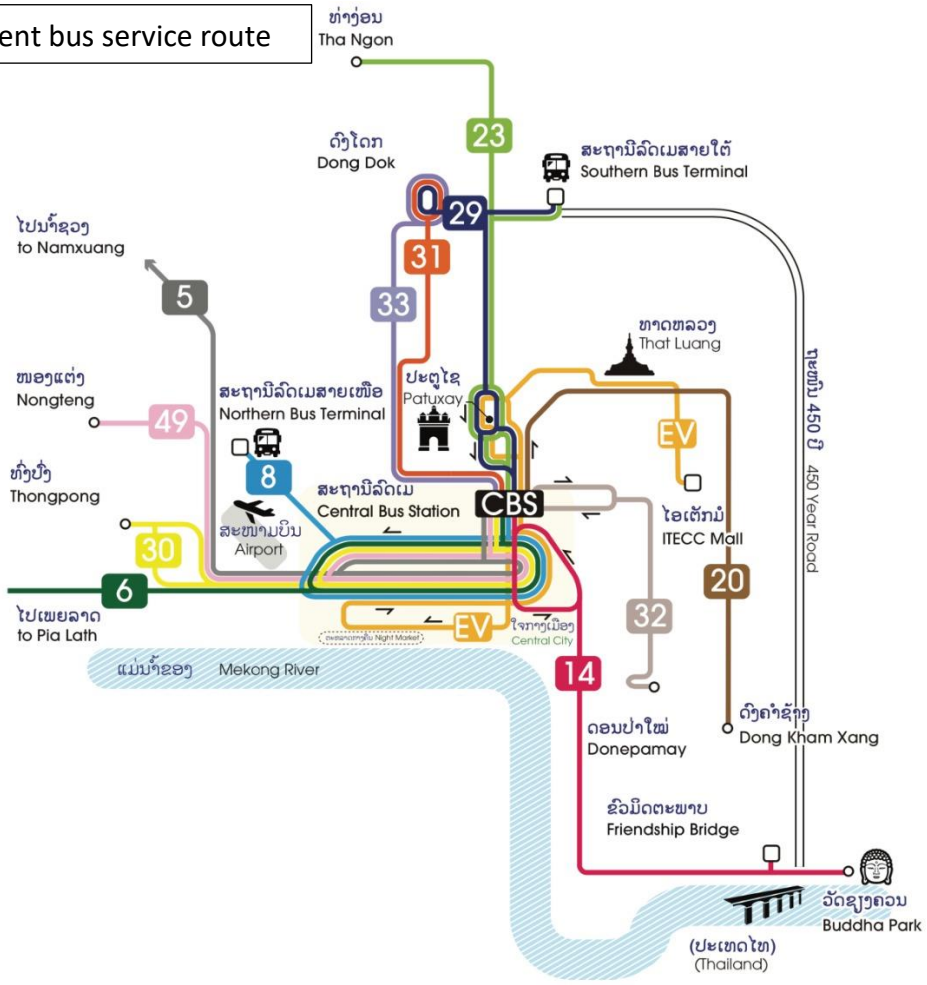
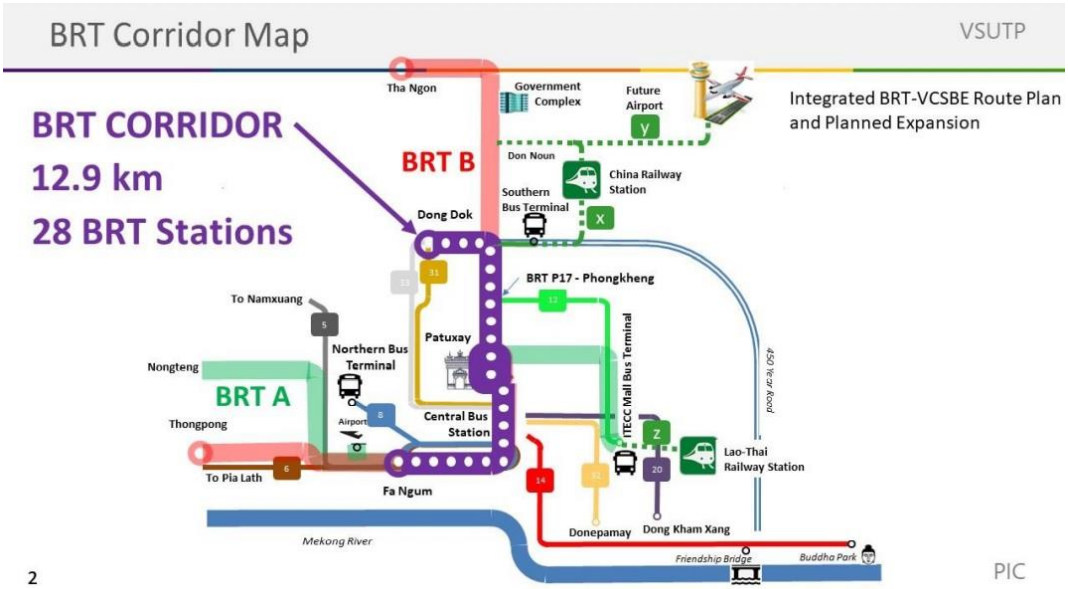


Fig 2. BRT route plan



Car	Place		Source	

Stated Preference (SP) Survey on Public Transportation in Vientiane

Korea National University of Transportation (KNUT) and Youngin ITS undertaking planning activities related to the public transport system in Vientiane, to improve public transportation services and reduce greenhouse gases in Vientiane. This survey is sponsored by the Department of Transport, Ministry of Public Works and Transport (Lao PDR), and it will be used for research purposes only.

The survey will take about 15 minutes. Your answers will remain confidential. We would appreciate it if you could take a time to answer it. We ask for your cooperation.

2023. 1.

Lao PDR Governing Body

Implementors

Ⅰ. Personal Attributes (Private Car Users)

Q.1 Information

Residence	District : _____	Sex	□ Male □ Female
Age	□ 10-19 □ 20-29 □ 30-39 □ 40-49 □ 50-59 □ 60-69 □ ≥70		
Occupation	□ Professional/Technical □ Services □ Self Employed □ Student □ Housewife □ Others( )		

Q.2 In the last week, what was the purpose for trips you made using a private car?

- ☐ ① Commuting
- ☐ ② Using it for work
- ☐ ③ Going to school/university
- ☐ ④ Shopping
- ☐ ⑤ Leisure/entertainment/visiting
- ☐ ⑥ Other

Q.3 How many days in the past week have you used a private car?

- ☐ ① More than 5 days
- ☐ ② 4 Days
- ☐ ③ 3 Days
- ☐ ④ 2 Days
- ☐ ⑤ 1 Day
- ☐ ⑥ Did not user

Q.4 What do you think is the most important thing to improve in the Vientiane publi c transport service?

- ☐ ① Service from early morning to late evening by adjusting the operating hours
- ☐ ② Replacement of old tuk-tuk, jumbo, and songthaew vehicles and introduction of a fully bus-based public transportation system

☐ ③ Expanded operating area by expanding bus routes

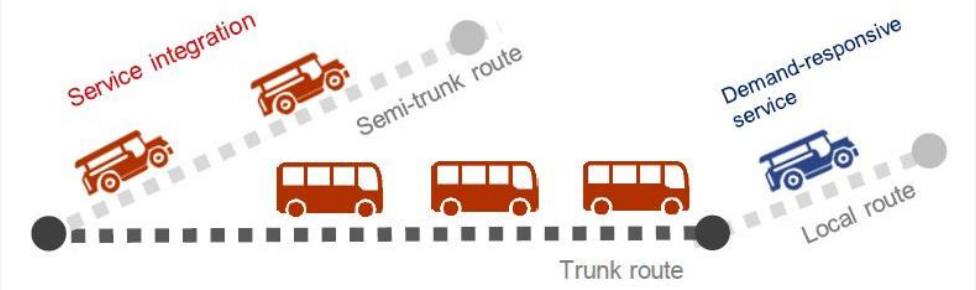
☐ ④ Improvements to operations and spacing (headways)

☐ ⑤ Introduction of real-time bus location services and other enhancements to bus stops

☐ ⑥ Other _____

Ⅱ. Preferences for DRT and BRT Systems

Demand Responsive Transport (DRT) refers to a concept of public transportation service that flexibly transports passengers, potentially using songthaew vehicles on the local areas without a fixed route or operation schedule (interval, time of operation). Users can "call" the vehicle using a SmartPhone app and get a pick-up and ride to their destination. DRT is similar to ride-hailing services like LOCA but uses shared vehicles (like songthaew).



Q5. How do you feel about introducing a more accessible Demand Responsive Transport (DRT) to complement your current city bus routes?

☐ ① Yes ☐ ② No

Q5-1 Where would be the best place to implement DRT?

☐ ① Local area circulator ☐ ② To schools/university

☐ ③ Commuting routes ☐ ④ To bus terminals or railway stations

☐ ⑤ To shopping malls/markets ☐ ⑥ Other

Q5-2 If you are not in favour of DRT, what type of service do you think would work better?

☐ ① Improvements to tuk-tuks/jumbos services.

☐ ② Improvements to car-based-taxi or ride-hailing services (RHS).

☐ ③ Improve existing songthaew services.

☐ ④ Improvements to the bus system.

Q6. Where would you likely use a DRT service?

① Origin area : ② Destination area :

Q.7 If DRT is operated in conjunction with the BRT to be introduced in Vientiane, are you currently willing to use it instead of using a private car?

☐ ① Yes ☐ ② No

Q7.1 If using DRT in conjunction with BRT, what would be the main purpose of the trip?

☐ ① Commuting to work ☐ ② Work-related

□ ③ Going to school/university □ ④ Shopping

□ ⑤ Leisure/Entertainment/Dining/Visit □ ⑥ Other

Ⅲ. Mode Choice Stated Preference (SP) Survey

Q.8 If DRT is operated in conjunction with the BRT to be introduced in Vientiane, Please compare the following time and costs scenarios of BRT+DRT compared to private car and select (✓) which mode you would use, in that situation.

		Travel cost	Total travel time	In-vehicle travel time	The interval between buses		Mode Choice	
1	① Car	27,500 kip	15 min	10 min	-	⇨	Car	□
	② BRT+DRT	11,500 kip	35 min	20 min	15 min		BRT+DRT	□

		Travel cost	Total travel time	In-vehicle travel time	The interval between buses		Mode Choice	
2	① Car	27,500 kip	25 min	20 min	-	⇨	Car	□
	② BRT+DRT	11,500 kip	50 min	25 min	15 min		BRT+DRT	□

		Travel cost	Total travel time	In-vehicle travel time	The interval between buses		Mode Choice	
3	① Car	31,500 kip	25 min	20 min	-	⇨	Car	□
	② BRT+DRT	13,000 kip	50 min	20 min	25 min		BRT+DRT	□

Ⅳ. BRT+DRT Mode Choice Transfer Price (TP) Survey

Q.9 If DRT is operated in conjunction with the BRT to be introduced in Vientiane, select (✓) how much you would be willing to pay to use BRT+DRT, compared to a trip by car?

Transportation	Car	BRT+DRT	BRT+DRT Maximum Bus fares
Travel cost Transport and parking cost, BRT fares	27,500 kip	➜ ?	□ 5,000 kip □ 7,500 kip
Total travel time Total travel time from origin to destination	20 min	40 min	□ 10,000 kip
In-vehicle travel time Travel time in the vehicle	15 min	25 min	□ 12,500 kip □ 15,000 kip
Out-of-vehicle time Acess time, Walking and waiting time	5 min	15 min	□ Maximum kip □ No, I would not choice

Q.10 DRT is operated in conjunction with the BRT to be introduced in Vientiane, select (✓) how long you would be willing to use BRT+DRT, compared to a trip by car?

Transportation	Car	BRT+DRT	BRT+DRT Total travel time
Travel cost Transport and parking cost, BRT fares	27,500 kip	11,500 kip	□ <30 mins □ 30-35 min
Total travel time Total travel time from origin to destination	20 min	➜ ?	□ 35-40 min
In-vehicle travel time Travel time in the vehicle	15min	25 min	□ 50-45min □ 50-50 min □ >50 mins
Out-of-vehicle time Acess time, Walking and waiting time	5 min	- min	□ Maximum 0 hr 0 min □ Would not choos

Thank you very much for carefully filling in this survey.

Motorcycle	Place		Source	

Stated Preference(SP) Survey on Public Transportation in Vientiane

Korea National University of Transportation (KNUT) and Youngin ITS undertaking planning activities related to the public transport system in Vientiane, to improve public transportation services and reduce greenhouse gases in Vientiane. This survey is sponsored by the Department of Transport, Ministry of Public Works and Transport (Lao PDR), and it will be used for research purposes only.

The survey will take about 15 minutes. Your answers will remain confidential. We would appreciate it if you could take a time to answer it. We ask for your cooperation.

2023. 1.

Lao PDR Governing Body

Implementors

Ⅰ. Personal Attributes for Motorcycle Users

Q.1 Information

Residence	District : _____	Sex	□ Male □ Female
Age	□ 10-19 □ 20-29 □ 30-39 □ 40-49 □ 50-59 □ 60-69 □ ≥70		
Occupation	□ Professional/Technical □ Services □ Self Employed □ Student □ Housewife □ Others( )		

Q.2 In the last week, what was the purpose for trips you made using a motorcycle?

- ☐ ① Commuting
- ☐ ② Using it for work
- ☐ ③ Going to school/university
- ☐ ④ Shopping
- ☐ ⑤ Leisure/entertainment/visiting
- ☐ ⑥ Other

Q.3 How many days in the past week have you used a motorcycle?

- ☐ ① More than 5 days
- ☐ ② 4 Days
- ☐ ③ 3 Days
- ☐ ④ 2 Days
- ☐ ⑤ 1 Day
- ☐ ⑥ Did not user

Q.4 What do you think is the most important thing to improve in the Vientiane public transport service?

- ☐ ① Service from early morning to late evening by adjusting the operating hours
- ☐ ② Replacement of old tuk-tuk, jumbo, and songthaew vehicles and introduction of a fully bus-based public transportation system

☐ ③ Expanded operating area by expanding bus routes

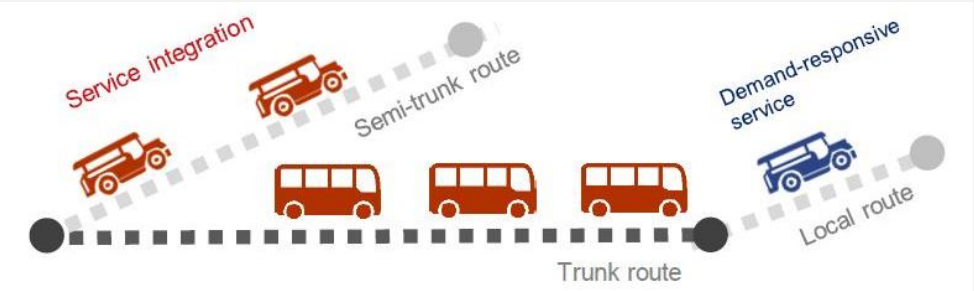
☐ ④ Improvements to operations and spacing (headways)

☐ ⑤ Introduction of real-time bus location services and other enhancements to bus stops

☐ ⑥ Other _____

Ⅱ. Preferences for DRT and BRT Systems

Demand Responsive Transport (DRT) refers to a concept of public transportation service that flexibly transports passengers, potentially using songthaew vehicles on the local area s without a fixed route or operation schedule (interval, time of operation). Users can “cal l” the vehicle using a SmartPhone app and get a pick-up and ride to their destination. DRT is similar to ride-hailing services like LOCA but uses shared vehicles (like songthae w).



Q5. How do you feel about introducing a more accessible Demand Responsive Transp ort (DRT) to complement your current city bus routes?

☐ ① Yes ☐ ② No

Q5-1 Where would be the best place to implement DRT?

☐ ① Local area circulator ☐ ② To schools/university

☐ ③ Commuting routes ☐ ④ To bus terminals or railway stations

☐ ⑤ To shopping malls/markets ☐ ⑥ Other

Q5-2 If you are not in favour of DRT, what type of service do you think would work better?

☐ ① Improvements to tuk-tuks/jumbos services.

☐ ② Improvements to car-based-taxi or ride-hailing services (RHS).

☐ ③ Improve existing songthaew services.

☐ ④ Improvements to the bus system.

Q6. Where would you likely use a DRT service?

① Origin area : ② Destination area :

Q.7 If DRT is operated in conjunction with the BRT to be introduced in Vientiane, are you currently willing to use it instead of using a motorcycle?

☐ ① Yes ☐ ② No

Q7.1 If using DRT in conjunction with BRT, what would be the main purpose of the trip?

☐ ① Commuting to work ☐ ② Work-related

□ ③ Going to school/university □ ④ Shopping

□ ⑤ Leisure/Entertainment/Dining/Visit □ ⑥ Other

Ⅲ. Mode Choice Stated Preference (SP) Survey

Q.8 If DRT is operated in conjunction with the BRT to be introduced in Vientiane, Please compare the following time and costs scenarios of BRT+DRT compared to motorcycle and select (✓) which mode you would use, in that situation.

		Travel cost	Total travel time	In-vehicle travel time	The interval between buses		Mode Choice	
1	① Motorcycle	16,500 kip	20 min	15 min	-	⇨	Motorcycle	□
	② BRT+DRT	11,500 kip	35 min	20 min	15 min		BRT+DRT	□

		Travel cost	Total travel time	In-vehicle travel time	The interval between buses		Mode Choice	
2	① Motorcycle	16,500 kip	30 min	25 min	-	⇨	Motorcycle	□
	② BRT+DRT	11,500 kip	50 min	25 min	15 min		BRT+DRT	□

		Travel cost	Total travel time	In-vehicle travel time	The interval between buses		Mode Choice	
3	① Motorcycle	18,500 kip	30 min	15 min	-	⇨	Motorcycle	□
	② BRT+DRT	13,000 kip	50 min	20 min	25 min		BRT+DRT	□

Ⅳ. BRT+DRT Mode Choice Transfer Price (TP) Survey

Q.9 If DRT is operated in conjunction with the BRT to be introduced in Vientiane, select (✓) how much you would be willing to pay to use BRT+DRT, compared to a trip by motorcycle.

Transportation	Motorcycle	BRT+DRT	BRT+DRT Maximum Bus fares
Travel cost Transport and parking cost, BRT fares	18,500 kip	→ ?	□ 5,000 kip □ 7,500 kip
Total travel time Total travel time from origin to destination	25 min	40 min	□ 10,000 kip
In-vehicle travel time Travel time in the vehicle	20 min	25 min	□ 12,500 kip □ 15,000 kip
Out-of-vehicle time Acess time, Walking and waiting time	5 min	15 min	□ Maximum _____kip □ No, I would not choice

Q.10 If DRT is operated in conjunction with the BRT to be introduced in Vientiane, select (✓) how long you would be willing to use BRT+DRT, compared to a trip by car.

Transportation	Motorcycle	BRT+DRT	BRT+DRT Total travel time
Travel cost Transport and parking cost, BRT fares	18,500 kip	11,500 kip	□ <30 mins □ 30-35 min
Total travel time Total travel time from origin to destination	25 min	➜ ?	□ 35-40 min
In-vehicle travel time Travel time in the vehicle	20 min	30 min	□ 50-45min □ 50-50 min □ >50 mins
Out-of-vehicle time Acess time, Walking and waiting time	5 min	- min	□ Maximum 0 hr 0 min □ Would not choose

Thank you very much for carefully filling in this survey.

Paratransit	Place		Source	

Stated Preference (SP) Survey on Public Transportation in Vientiane

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The survey will take about 15 minutes. Your answers will remain confidential. We would appreciate it if you could take a time to answer it. We ask for your cooperation.

2023. 1.

Lao PDR Governing Body

Implementors

Ⅰ. Personal Attributes (Public Transport Users)

Q.1 Information

Residence	District : _____	Sex	□ Male □ Female
Age	□ 10-19 □ 20-29 □ 30-39 □ 40-49 □ 50-59 □ 60-69 □ ≥70		
Occupation	□ Professional/Technical □ Services □ Self Employed □ Student □ Housewife □ Others( )		

Q.2 In the last week, what was the purpose for trips you made using a public transport?

- ☐ ① Commuting
- ☐ ② Using it for work
- ☐ ③ Going to school/university
- ☐ ④ Shopping
- ☐ ⑤ Leisure/entertainment/visiting
- ☐ ⑥ Other

Q.3 How many days have you used a tuk-tuk/jumbo or songthaew in the past week?

- ☐ ① More than 5 days
- ☐ ② 4 Days
- ☐ ③ 3 Days
- ☐ ④ 2 Days
- ☐ ⑤ 1 Day
- ☐ ⑥ Did not user

Q.4 What do you think is the most important thing to improve in the Vientiane publi c transport service?

- ☐ ① Service from early morning to late evening by adjusting the operating hours
- ☐ ② Replacement of old tuk-tuk, jumbo, and songthaew vehicles and introduction of a fully bus-based public transportation system

☐ ③ Expanded operating area by expanding bus routes

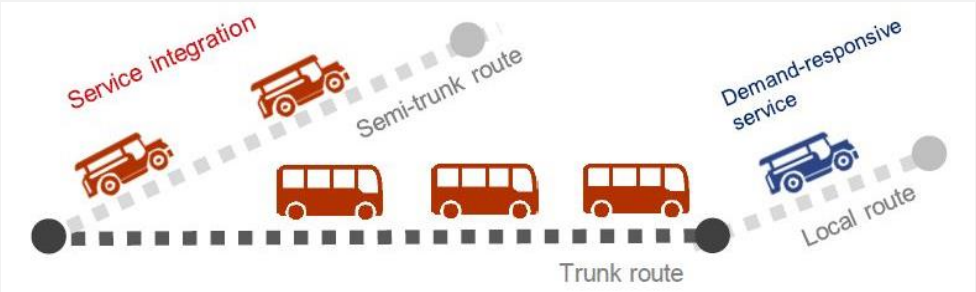
☐ ④ Improvements to operations and spacing (headways)

☐ ⑤ Introduction of real-time bus location services and other enhancements to bus stops

☐ ⑥ Other _____

Ⅱ. Preferences for DRT and BRT Systems

Demand Responsive Transport (DRT) refers to a concept of public transportation service that flexibly transports passengers, potentially using songthaew vehicles on the local areas without a fixed route or operation schedule (interval, time of operation). Users can "call" the vehicle using a SmartPhone app and get a pick-up and ride to their destination. DRT is similar to ride-hailing services like LOCA but uses shared vehicles (like songthaew).



Q5. How do you feel about introducing a more accessible Demand Responsive Transport (DRT) to complement your current city bus routes?

☐ ① Yes ☐ ② No

Q5-1 Where would be the best place to implement DRT?

☐ ① Local area circulator ☐ ② To schools/university

☐ ③ Commuting routes ☐ ④ To bus terminals or railway stations

☐ ⑤ To shopping malls/markets ☐ ⑥ Other

Q5-2 If you are not in favour of DRT, what type of service do you think would work better?

☐ ① Improvements to tuk-tuks/jumbos services.

☐ ② Improvements to car-based-taxi or ride-hailing services (RHS).

☐ ③ Improve existing songthaew services.

☐ ④ Improvements to the bus system.

Q.6 Where would you likely use a DRT service?

① Origin area : ② Destination area :

Q.7 If DRT is operated in conjunction with the newly introduced Bus Rapid Transit (BRT) in Vientiane, are you currently willing to use it instead of tuk-tuk/jumbo or songthaew?

☐ ① Yes ☐ ② No

□ ① 0 ~ 5,000 kip

□ ② 5,000 ~ 7,500 kip

□ ③ 7,500 ~ 10,000 kip

□ ④ 10,000 ~ 12,500 kip

□ ⑤ 12,500 ~ 15,000 kip

□ ⑥ Maximum ____ kip

Thank you very much for carefully filling in this survey.

Form 1. Household Information

1. Address of Residence

District	
Village	
No./Street	
Name of Building	
Landmark	
Village Code	
Traffic Zone	
Household No.	

2. Name of Surveyors, Supervisor

Interviewer 1	
Interviewer 2	
Supervisor	
Editor	
Coding	

1st Visit	dd mm		Coding	dd mm
2nd Visit	dd mm		Data inpu	dd mm
3rd Visit	dd mm			

3. Number of Household Members

	Male	Female	Total
5 years old and less			
6 years old and more			
Household Helper			
Total			

Name of Contact Person of Household	
Phone Number	

4. Monthly Total Household Income

(1-15)

[1] Under 299,999 Kip
[2] 300,000-599,999 Kip
[3] 600,000-999,999 Kip
[4] 1,000,000-1,999,999 Kip
[5] 2,000,000-3,999,999 Kip
[6] 4,000,000-5,999,999 Kip
[7] 6,000,000-7,999,999 Kip
[8] 8,000,000-9,999,999 Kip
[9] 10,000,000-14,999,999 Kip
[10] 15,000,000 - 19,999,999 Kip
[11] 20,000,000 - 24,999,999 Kip
[12] 25,000,000 - 29,999,999 Kip
[13] 30,000,000 - 34,999,999 Kip
[14] 35,000,000 - 39,999,999 Kip
[15] 40,000,000 Kip Over

5. Number of Vehicles Own/Available by Household membe

	Bicycle	Motorcycl	Car/Pick-	Van	Truck	Others
Owned by Household						
Other available vehicle (Company						

Usual parking place of your car at residence (1-4)

[1] On-street near residence
[2] Sidewalk of street near residence
[3] Set back in front of residence
[4] Parking space in residence (out of street)

6. Ownership of House and land of Residence

House	(1-2)	[1] Own [2] Rented
Land	(1-2)	

If [2] Rented → _____ Kip/month

7. Length of Staying in Present Address

_____ Years

Cooperation for Daily Activity Survey
If "Yes", check box ☐

Form 2. Household Member Information (6 Years Old and More Only)

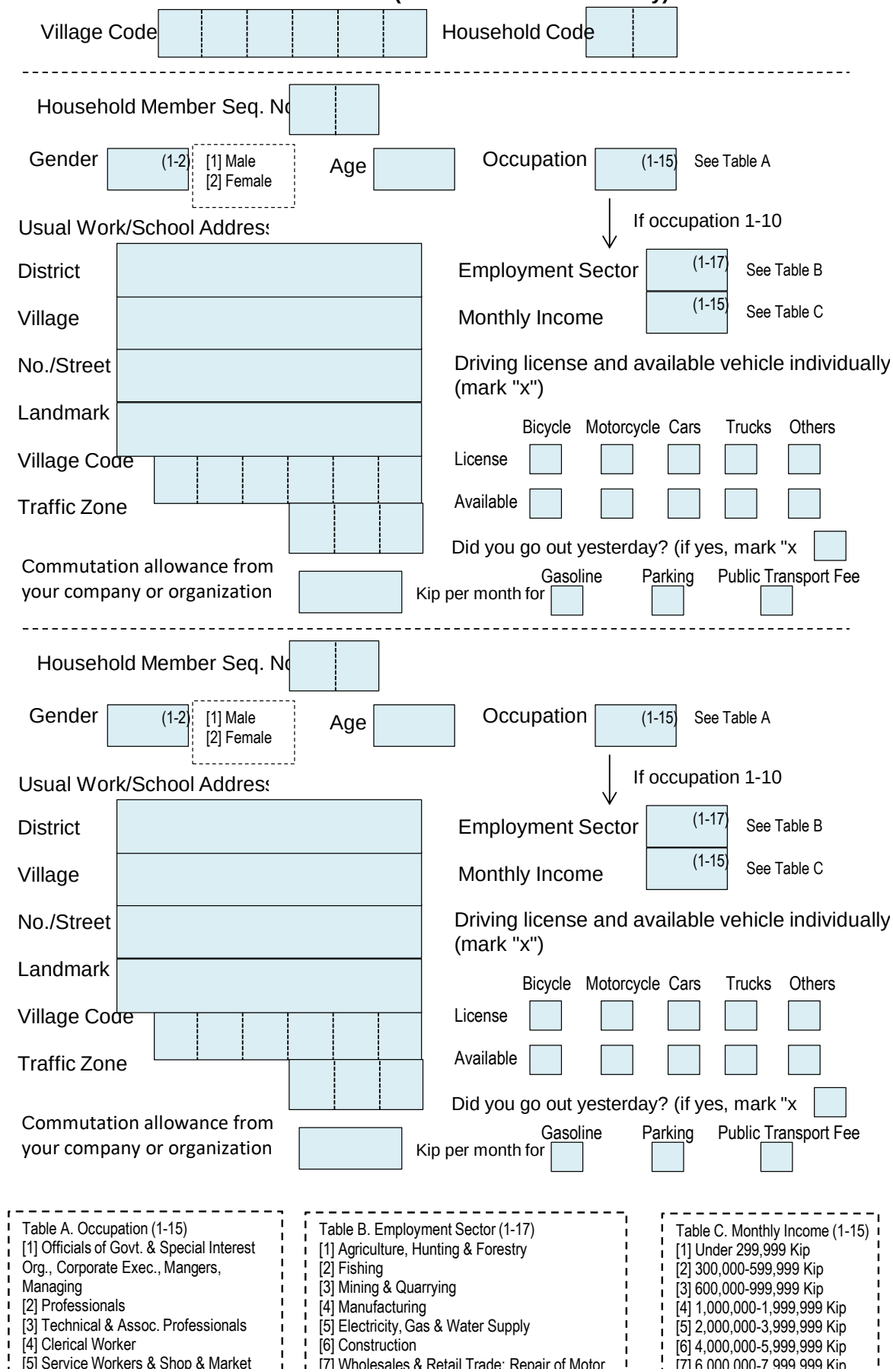


Table A. Occupation (1-15)
[1] Officials of Govt. & Special Interest Org., Corporate Exec., Mangers, Managing
[2] Professionals
[3] Technical & Assoc. Professionals
[4] Clerical Worker
[5] Service Workers & Shop & Market

Table B. Employment Sector (1-17)
[1] Agriculture, Hunting & Forestry
[2] Fishing
[3] Mining & Quarrying
[4] Manufacturing
[5] Electricity, Gas & Water Supply
[6] Construction
[7] Wholesales & Retail Trade; Repair of Motor

Table C. Monthly Income (1-15)
[1] Under 299,999 Kip
[2] 300,000-599,999 Kip
[3] 600,000-999,999 Kip
[4] 1,000,000-1,999,999 Kip
[5] 2,000,000-3,999,999 Kip
[6] 4,000,000-5,999,999 Kip
[7] 6,000,000-7,999,999 Kip

[5] Service Workers & Shop & Market Workers
[6] Farmers, Forestry Workers & Fisherman
[7] Traders & Related Workers
[8] Plant & Machine Operators & Assemblers
[9] Laborers & Unskilled Workers
[10] Teacher & School Workers
[11] Student (Elem.)
[12] Student (H.S. & Univ.)
[13] Housewife
[14] Jobless

[7] Wholesales & Retail Trade, Repair of Motor Vehicles Motorcycles, Personal & Household Goods
[8] Hotels & Restaurants
[9] Transport, Storage & Comm.
[10] Financial Intermediation
[11] Real Estate, Renting & Business Activities
[12] Public Adm. & Defense
[13] Education
[14] Health & Social Work
[15] Other Community, Social & Personal Service
[16] Private Households

[7] 6,000,000-7,999,999 Kip
[8] 8,000,000-9,999,999 Kip
[9] 10,000,000-14,999,999 Kip
[10] 15,000,000 - 19,999,999 Kip
[11] 20,000,000 - 24,999,999 Kip
[12] 25,000,000 - 29,999,999 Kip
[13] 30,000,000 - 34,999,999 Kip
[14] 35,000,000 - 39,999,999 Kip
[15] 40,000,000 Kip Over

Form 3. Daily Trip Information (6 Years Old and More Only)

Village Code | Household Code | Household Member Seq. No | Trip Info. Sheet No.

Table A. Place of Trip
[1] Residence (Home)
[2] Usual Work Place / School (student only)
[3] Commercial Institution
[4] Office / Bank
[5] Factory / warehouses
[6] School / Universities Educational
[7] Recreational Place, Park
[8] Medical and Welfare
[9] Religious and Social
[10] Wholesale and Retail Shop
[11] Restaurant / Entertainment
[12] Others

Origin (Fisrst sheet only)

Place of Trip (1-12) See Table A

If 3-12, detail address is required.

District
Village
No./Street
Landmark
Village Code
Traffic Zone

Destination (Origin of next trip)

Place of Ttip (1-12) See Table A

If 3-12, detail address is required.

District
Village
No./Street
Landmark
Village Code
Traffic Zone

Trip Purpose (1-9) See Table B

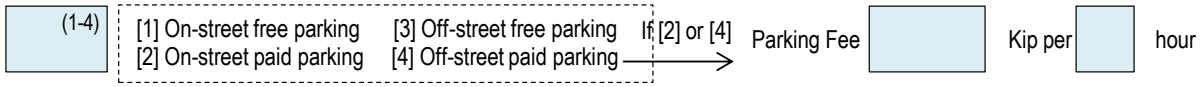
Table B. Trip Purpose
[1] To Home
[2] To Work
[3] To School
[4] Send off/pick up
[5] Personal Business
[6] Firm Business
[7] Social
[8] Shopping/eating
[9] Other private purpose

Dep. #1 (hh:mm)	Arr. #1 (hh:mm)	Dep. #2 (hh:mm)	Arr. #2 (hh:mm)	Dep. #3 (hh:mm)	Arr. #3 (hh:mm)	Dep. #4 (hh:mm)	Arr. #4 (hh:mm)	Dep. #5 (hh:mm)	Arr. #5 (hh:mm)	Dep. #6 (hh:mm)	Arr. #6 (hh:mm)
:	:	:	:	:	:	:	:	:	:	:	:
Transfer Point											
Zone											
Transport Mode (1-13)		(1-13)		(1-13)		(1-13)		(1-13)		(1-13)	

Table C. Transport Mode
[1] Walking
[2] Bicycle
[3] Motorcycle
[4] Tuk tuk, Jambo
[5] Passenger Cars, Pick-up, 4WD, Taxi
[6] Van
[7] 2 Axles Rigid Truck
[8] 3 Axles and more Rigid Truck
[9] Trailers
[10] Sonteo
[11] Regular Bus, Inter-city Bus
[12] Other Bus
[13] Other Vehicle

If you drive, check box						
Fare of Public Transport		Kip/person				
Num of acompanies		If only you, "0"				

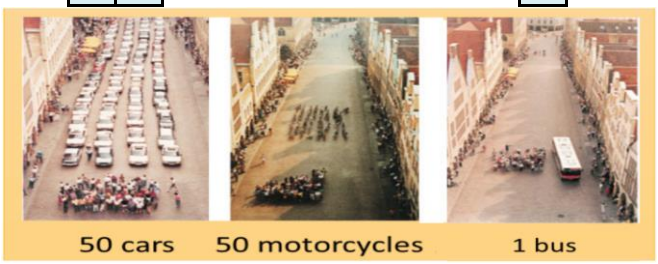
If you drive motorcycle or car, where are you park it at destination?


(1-4)
[1] On-street free parking
[2] On-street paid parking
[3] Off-street free parking
[4] Off-street paid parking
If [2] or [4]
Parking Fee
Kip per
hour

Form-4. Assessment Survey to Public Transport Serivce (6 Years Old and more only)

Village code ☐☐☐☐☐☐ Household Code ☐☐ Household Member Seq. ☐

The congestion in Vientiane is getting severer year by year, private vehicles occupy the road much more than other type as shown in the picture on the right. On the other hand, 50 cars and 50 motorbikes on the road are occupied most of road capacity, if together ride on bus contributes to mitigate the traffic congestion and reduce number of



Q1. Are there any trip which can be replaced to bus or sonteo in your whole trips?

1. Yes→→→→→→→→
2. Maybe yes but I'm not
3. No

Could you tell us which trip it is?

Q2. How often do you use "Bus" and "Songteo" ? Please select the number you match.

a. Bus ☐
b. Songteo ☐

[1] No experience
[2] Do not use or almost do not use
[3] Once or Twice a month
[4] Once or twice a week
[5] 3 to 5 times a week
[6] Almost everyday

If answer [1] or [2] skip Q3. and answer Q4., If answer [3] - [6], go to Q3. and skip Q4.

Q3. Those who on "Q2, answer [3] to [6] on bus option". Why do you use the Bus?

Please put a ✓ mark the answer box you match.If your answer is "Others", please write the detail about it.

a. I have no choice ☐
b. There is an A/C ☐
c. Safer than other modes ☐
d. Other ☐

Reason: ex) I want to drink beer, I don't want to wear helmet, I don't like driving

Q4. Those who on "Q2, answer [1] or [2] On bus option".

If these cases below will be happened, do you use the Bus? Please select the number from the table.

Case1: If the Bus service hours are extended (From 6AM-8PM to 6AM-10PM), ☐
Case2: If the Bus is operated every 15 minutes, ☐
Case3: If the Bus fare is free ☐
Case4: If the Bus operates in front of your house ☐
Case5: If the Bus arriving time become on time ☐

[1] Yes, I would start using the Bus.
[2] No, I wouldn't use the Bus.

Q5. How would you feel about "Bus" and "Songteo" service? Please select the number from the table.

If you have no experience, please imagine the situation and select the number from the table.

	Bus/Songteo		Bus/Songteo
a. Waiting time	☐☐	f. Cost	☐☐
b. Operation hours	☐☐	g. Door-to-door	☐☐
c. Punctuallity	☐☐	h. Comfortable	☐☐
d. Traveling time	☐☐	i. Bus stop faclity	☐☐
e. Safety	☐☐	j. Overall satisfaction	☐☐

[1] Very bad
[2] Bad
[3] Fair
[4] Good
[5] Very good

Q6. Have you ever changed your main transport mode "from Bus or Songteo to Car or Motorcycle"?

Yes ☐
No ☐

If you answer "YES", please put a ✓ mark the answer box you match as your first reason.

If your answer is "Others", please write the detail about it.

a. I bought a private car. ☐
b. I bought a motorcycle. ☐
c. Others ☐

Reason: ex) ・My wallet was stolen, I was molested, and I waited so long time.

Q7. If following cases with improved bus service (on time operation, expanding service hour to 10PM, and expanding bus routes) will be happened, do you use the Bus? Please select the number from the table.

Case1: If illegal parking are strict controlled on the City Center ☐
Case2: If you have to pay 1 million KIP when you did drinking and driving ☐
Case3: If car and motorcycle parking lots are provided near the Bus stop ☐
Case4: If A/c Installed at Bus stops ☐

[1] Yes, I would start using the Bus.
[2] No, I wouldn't use the Bus.

Case5: If you have to pay 1 million KIP when you ride a motorcycle without helmet ☐ (Only motorcycle user)

Case6: If you have to pay 1 million KIP when you ride a motorcycle with 3 people or more ☐ (Only motorcycle user)

Q8.Can you join the further survey and interview for the bus use campaign after this survey?

a. Yes

b. No

Q9. Do you have any other ideas that would make you consider riding the Bus? This is a free-answer question.

Form-5. Daily Activity Survey (6 Years Old and more only)

Village Code | | | | | | | Household Code | | | Household Member Seq. | |

Activity Date (dd/mm) dd mm

Activity at Home (1-6)
[1] Sleep
[2] Preparation
[3] Eat / drink
[4] TV / Radio/ Internet etc.
[5] Cooking, Cleaning, washing
[6] Others at Home

Main Transport Mode (1-13)
[1] Walking
[2] Bicycle
[3] Motorcycle
[4] Tuk tuk, Jambo.
[5] Passenger Cars, pick-up, 4WD, Taxi
[6] Van
[7] 2 Axles Rigid Truck
[8] 3 Axles and more Truck
[9] Tailers
[10] Sonteo
[11] Regula Bus, Inter-city bus
[12] Other bus
[13] Other vehicle

Activity at Other Place
[7] Working at Usual Place
[8] Working (personal business)
[9] Working (firm business)
[10] School/Institute (to study)
[11] Send off/pick up person
[12] Social (visit friend/family etc)
[13] Private (shopping, eat, drink)
[14] Hospital
[15] Other private activity

Time	Activity															
	Act. at Home (1-6)	Moving		Activity at Other Place (and address)												
		Transport Mode (1-13)	Public Transport/Parking Fee (Kip.)	type of act. (7-15)	Province	District	Village	Landmark	Village Code (Coding staff use)							
AM 3:00 - 3:15																
AM 3:15 3:30																
AM 3:30 3:45																
AM 3:45 4:00																
AM 4:00 4:15																
AM 4:15 4:30																
AM 4:30 4:45																
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PM	2:15	2:30															
PM	2:30	2:45															
PM	2:45	3:00															

Form-4. Daily Activity Survey (6 Years Old and more only)

Village Code | Household Code | Household Member Seq. |

Activity Date (dd/mm) dd mm

Activity at Home (1-6)
[1] Sleep
[2] Preparation
[3] Eat / drink
[4] TV / Radio/ Internet etc.
[5] Cooking, Cleaning, washing
[6] Others at Home

Main Transport Mode (1-13)
[1] Walking
[2] Bicycle
[3] Motorcycle
[4] Tuk tuk, Jambo.
[5] Passenger Cars, pick-up, 4WD, Taxi
[6] Van
[7] 2 Axles Rigid Truck
[8] 3 Axles and more Truck
[9] Tailers
[10] Sonteo
[11] Regula Bus, Inter-city bus
[12] Other bus
[13] Other vehicle

Activity at Other Place
[7] Working at Usual Place
[8] Working (personal business)
[9] Working (firm business)
[10] School/Institute (to study)
[11] Send off/pick up person
[12] Social (visit friend/family etc)
[13] Private (shopping, eat, drink)
[14] Hospital
[15] Other private activity

Time			Activity														
			Act. at Home (1-6)	Moving		Activity at Other Place (and address)											
				Transport Mode (1-13)	Public Transport/Parking Fee (Kip.)	type of act. (7-17)	Province	District	Village	Landmark	Village Code (Coding staff use)						
PM	3:00	3:15															
PM	3:15	3:30															
PM	3:30	3:45															
PM	3:45	4:00															
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