

Research Articles

Inequality in Travelling by Public Transport: A Case Study of Electrified Train Services in the Bangkok Metropolitan Region

Atipon Satranarakun,

Faculty of Economics, Rangsit University

Email: atipon.satra@gmail.com

Tanpat Kraiwanit Assistant Professor in Economics,

Faculty of Economics, Rangsit University

Email: tanpat.k@rsu.ac.th

Abstract

This study examines the potentiality of passengers in the access to electrified train services against their current incomes across the Bangkok Metropolitan Region. This is a qualitative research based completely on secondary data. The findings show that when comparing the work periods to earn a city train ticket, Thai workers spend the longest time on their work to obtain a ticket. Moreover, electrified train service fares are extremely high compared with other countries. This rate is not balanced with the income of most Bangkok people, leading to unaffordability in purchasing electrified train tickets and transport inequality. In order to control fares of city train services, a price ceiling needs to be set based on the income of most Bangkok people to control the maximum ticket prices in a period of time. Moreover, the lack of an integration mechanism is the factor causing expensive tickets, so the Thailand Transport Portal should push the mass transit providers to create and develop integrations of mass transits. In addition, bus services served five times the number of trips than city train services and charged lower fares, which should be considered for development and investment to enhance the affordability and accessibility of public transport.

Keywords: *inequality, public transport, mass transit system, electrified train, Bangkok, Thailand*

Received: October 16, 2020, **Revised** May 3, 2021, **Accepted** May 9, 2021

Acknowledgement : This research was successfully funded by *Faculty of Economics, Rangsit University*

Introduction

Transport is a significant facility of social inclusion and well-being that has an influence on economic and social outcomes, as well as inequality (Gates, Gogescu, Grollman, Cooper & Khambhaita, 2019). Inequalities in the access to transport can be measured by the opportunities that individuals can reach and the levels of accessibility increasing a person's freedom (Neutens, Schwanen, Witlox & De Maeyer, 2010; Van Wee & Geurs,

2011). If everybody in a community cannot access transport equally, some of them may be excluded from the society; therefore, transport plays an important role in enabling people to come together and connect. Hence, there is a challenge for transport providers and policy makers to be part of a multi-stakeholder approach that can decrease such inequality (Gates et al., 2019).

The report of the Department for Transport of the United Kingdom (2017) shows a relationship between income and type of transport used. This report states that people with lower incomes tend to use buses more than those with higher incomes, and those with higher incomes commonly use cars and trains more than those with lower incomes. This is a consequence of accessibility rather than choice, since the costs of bus tickets are cheaper than the costs of train tickets and purchasing one's own car. Hence, cost is a primary obstacle to the access to transport. Income is definitely one of the defining factors causing socio-economic inequality; as a result, transport costs and affordability can impact transport inequality among people. If transport costs are significantly expensive, then people cannot travel to work or journey for education and training to enhance their prospects. Perceiving expensive costs of transportation can also affect one's decision-making related to choice of transportation mode, even though there is just a slight difference or no difference in actual cost between modes. In some circumstances, when there is a lack of options in public transport, people are unfortunately pressured to spend a high proportion of their income on personal vehicles such as cars because this is the only choice to access their work.

The Bangkok Metropolitan Region of Thailand is defined as the area of Bangkok and five nearby provinces, including Nakhon Pathom, Nonthaburi, Pathum Thani, Samut Prakan, and Samut Sakhon. The National Statistical Office of Thailand (2019) reports that there were 10.9 million people living across the Bangkok Metropolitan Region in 2019. The Office of Transport and Traffic Policy and Planning, the Ministry of Transport of Thailand (2017), reports the total number of 32.65 million journeys per day in 2017 for people who traveled across the Bangkok Metropolitan Region. Most journeys were travelling within Bangkok, amounting to 54.2%, followed by travelling between Samut Prakan and Bangkok and Nonthaburi and Bangkok, accounting for 2.40% and 2.05%, respectively. People living in the Bangkok Metropolitan Region always face traffic congestion, particularly during the rush hour in the morning (7:00 AM – 8:00 AM) and evening (6:00 PM – 7:00 PM); consequently, these traffic problems cause economic loss in many ways. The Office of Transport and Traffic Policy and Planning (2017) also reports that 20.2% of people in the Bangkok Metropolitan Region travelled by public transport, and 3.33% of passengers travelled by electrified trains, including BTS-Skytrain (BTS), Metropolitan Rapid Transit (MRT), and Airport Rail Link (ARL), in 2017. However, in 2018, the proportion of passengers travelling by public transport decreased slightly to 17.90%, while the proportion of those travelling via electrified trains increased to 3.38% (Office of Transport and Traffic Policy and Planning, 2018).

An excellent public transportation system must include security, passenger transfer efficiency, and ease of use; hence, travelling via city train services is a reliable option for passengers and has become popular, but this exceptional option needs to be exchanged with high costs. It is therefore interesting to study the relationships between transport costs of electrified train services across the Bangkok Metropolitan Region and incomes of populations living in this area in order to understand the potential of people in choosing suitable transportation based on their incomes. As the links between transport and inequality in Thailand are not well defined, this case study will be the example that can explain the transport inequality in Thailand, and it might raise awareness of related sectors to enhance equality in the access to public transport across the country.

Objective of the Research

To study the potentiality of passengers in the access to electrified train services against their current incomes

Research Methodology

The study is a qualitative research based completely on secondary data, including journals, reports, official Thai government sector websites, research papers, and other academic publications. All collected literature was reviewed and analysed thoroughly by systematic search, inclusion, and synthesis processes to understand the inequality in travelling via electrified trains across the Bangkok Metropolitan Region. This study focuses on the potentiality of passengers in the access to city rail services across the Bangkok Metropolitan Region; therefore, the scope of the study can be divided into main two points: (1) average incomes of the Bangkok Metropolitan population in 2019 reported by the National Statistical Office of Thailand (2020) and (2) city train fares across the Bangkok Metropolitan Region (Bangkok Mass Transit System, 2018; Bangkok Expressway and Metro, 2018; Airport Rail Link, 2021).

Results & Discussion

1. Average monthly income of the Bangkok population

The National Statistical Office of Thailand (2020) reported the average monthly income per household of the Bangkok population in the Survey of Socio-economic Status of Households in Bangkok for 2019. This article focuses only on two factors of income: average monthly income per household by sources of income, and percentage of household by average monthly income.

Table 1 Average monthly income per household by sources of income of the Bangkok population in 2019

Source of income	Total households	
	Baht	%
Total monthly income	39,459	100.0
1. Total current income	39,356	99.7
1.1. Money income	34,621	87.7
1.1.1. From work	30,995	78.5
- Wages and salaries	23,490	59.5
- Net profit from business	7,498	19.0
- Net profit from farming	7	0.0**
1.1.2. From current transfers	3,197	8.1
1.1.3. From property income	429	1.1
1.2. Non-money income*	4,734	12.0
2. Non-current money income	104	0.3

* Including estimated rental value of dwelling (including own dwelling)

** '0.0' is assigned to all values less than '0.1'.

Note. Adapted from *Survey of socio-economic status of households in Bangkok for 2019* (p. 13), by National Statistical Office of Thailand, 2020, Bangkok, Thailand: Text and Journal Publication. Copyright 2020 by National Statistical Office of Thailand. Adapted with permission.

Table 1 shows the average monthly income per household by sources of income of the Bangkok population in 2019. A household in Bangkok earned 39,459 baht per month on average. The majority of income was from work, accounting for 78.5%, and this proportion consists of 59.5% of income from wages and salaries and 19.0% of income from net profit from business. However, some income sources were not from work, including income from other contributors such as public sectors and outsiders, accounting for 8.1%, and property income such as interests, accounting for 1.1%. In addition, 12% of income per household was non-money income, including the estimated rental value of a dwelling.

Table 2 Percentage of households by average monthly income of the Bangkok population in 2019

Income	Total (%)
Monthly income per household	100
Less than 1,500 baht	0.0*
1,500 – 3,000 baht	0.1
3,001 – 5,000 baht	0.4

5,001 – 10,000 baht	4.7
10,001 – 15,000 baht	11.4
15,001 – 30,000 baht	32.6
30,001 – 50,000 baht	26.8
50,001 – 100,000 baht	19.2
More than 100,000 baht	4.8
<hr/>	
<i>Monthly current income per capita</i>	100
Less than 500 baht	0.0*
500 – 1,500 baht	0.0*
1,501 – 3,000 baht	0.4
3,001 – 5,000 baht	2.9
5,001 – 10,000 baht	24.4
10,001 – 15,000 baht	29.8
15,001 – 30,000 baht	32.8
30,001 – 50,000 baht	7.4
50,001 – 100,000 baht	2.1
More than 100,000 baht	0.3

*'0.0' is assigned to all values less than '0.1'.

Note. Adapted from *Survey of socio-economic status of households in Bangkok for 2019* (p. 17), by National Statistical Office of Thailand, 2020, Bangkok, Thailand: Text and Journal Publication. Copyright 2020 by National Statistical Office of Thailand. Adapted with permission.

The percentage of households by average monthly income of the Bangkok population in 2019 is shown in Table 2. Focusing on monthly income per household, the largest proportion of Bangkok households, 32.6%, obtained 15,001 – 30,000 baht monthly, followed by earning 30,001 – 50,000 baht monthly per household and 50,001 – 100,000 baht monthly per household, accounting for 26.8% and 19.2%, respectively. The proportion of households earning less than 1,500 baht per month was lower than 0.1%, while the proportion of households obtaining more than 100,000 baht monthly amounted for 0.3%. Regarding the monthly current income per capita, the majority of Bangkok residents earned 15,001 – 30,000 baht per month individually, accounting for 32.8%, followed by earning 10,001 – 15,000 baht monthly and 5,001 – 10,000 baht monthly, accounting for 29.8% and 24.4%, respectively. The proportion of Bangkok residents earning 1,500 baht and lower was less than 0.1%, while the proportion of persons obtaining more than 100,000 baht per month accounted for 0.3%.

2. Average monthly expenditure in transport of the Bangkok population

The National Statistical Office of Thailand (2020) reported the average monthly expenditure per household of the Bangkok population in the Survey of Socio-economic Status of Households in Bangkok for 2019. This paper just emphasises expenditure related to transport and travel of the Bangkok people.

Table 3 Average monthly expenditure* per household by type of expenditure of the Bangkok population in 2019

Type of expenditure	Total households	
	Baht	%
Total monthly expenditure	31,753	100
1. Consumption expenditure	26,879	84.7
1.1. For food, beverage, and tobacco	8,720	27.5
1.2. For goods and services	18,159	57.2
1.2.1. Transport and communication	7,105	22.4
- Vehicle purchase/repair & maintenance	2,083	6.6
- Local transportation/travel	3,763	11.9
- Communication	1,258	4.0
1.2.2. Others	11,054	34.8
2. Non-consumption expenditure**	4,874	15.3

* Expenditure for necessary items for daily life, which excluded saving and capital formation expenditures such as purchase or hire–purchase of house or land and saving, etc.

** Includes taxes, gifts & contribution, insurance premiums, lottery tickets, interest on debts, and similar expenses.

Note. Adapted from *Survey of socio-economic status of households in Bangkok for 2019* (p. 14), by National Statistical Office of Thailand, 2020, Bangkok, Thailand: Text and Journal Publication. Copyright 2020 by National Statistical Office of Thailand. Adapted with permission.

Table 3 shows the average monthly expenditure per household by type of expenditure of the Bangkok population in 2019, and it can be seen that a Bangkok household spent 31,753 baht per month on average. Bangkok households spent 6.6% of their expenditure or 2,083 baht on average on personal vehicles, and this includes purchasing, repairing, and looking after their vehicles, while they spent 11.9% of their expenditure or 3,763 monthly on local transportation or travelling, including public transportation. To sum up, households in Bangkok spent 18.5% of their expenditure on transportation and travelling.

3. Transportation fare of electrified trains across the Bangkok Metropolitan Region

The current mass transit system in the Bangkok Metropolitan Region or Bangkok Mass Transit includes four main metro lines: (1) Elevated Train in Commemoration of H.M. the King's 6th Cycle Birthday or Green Line, commonly known as BTS Skytrain; (2) Metropolitan Rapid Transit Chaloem Ratchamongkhon Line or MRT Blue Line; (3) Metropolitan Rapid Transit Chalong Ratchadham Line or MRT Purple Line; and (4) High-Speed Rail Linked 3 Airport or Don Mueang–Suvarnabhumi–U-Tapao high-speed railway, considering all three metros including Airport Rail Link (main line), Airport Rail Link (extension), and Don Mueang – U-Tapao high-speed train.

3.1 Current situations of Bangkok Mass Transit

The main line of the Green Line train or BTS Skytrain, Sukhumvit Line, and Silom Line serves around 253 million trips per year, which is the highest number of passengers compared to the other three metro lines. Regarding the proportion of income and cost, BTS spent total costs of 4,478 million baht and earned 6,800 million baht for ticket sales; therefore, the proportion of these two factors equalled 1.52 times. This means that BTS obtained profit.

The MRT Blue Line served approximately 107 million trips per year, and the cost of service accounted for 15.21 baht per person per kilometre. The proportion of income and cost equalled 1.15 times, which is calculated from 3,745 million baht of income from ticket sales and 3,352 million baht of total costs, defined as earning profit.

The number of passengers of MRT Purple Line is the lowest among the four electrified train services, accounting for only 12 million trips per year. As it is the latest mass transit service, launched in August 2016, passengers are not crowded yet compared with other metro services. The proportion of income and cost of this line equalled 0.08 times, which is calculated from 158 million baht of income from ticket sales and 2,044 million baht of total costs, showing loss.

Recently, High-Speed Rail Linked 3 Airport can be divided into three sections: (1) Airport Rail Link (main line), Suvarnabhumi – Phaya Thai, providing the services at the moment; (2) Airport Rail Link (extension), extending two more stations including Bang Sue station and Don Mueang station, becoming Suvarnabhumi – Don Mueang line, which will be available in phase 2 of the project; and (3) Don Mueang – U-Tapao high-speed train. The Airport Rail Link (main line) serves customers around 22 million trips per year, with 12.39 baht of costs per person per kilometre. The proportion of income and cost of this line equalled 0.24 times, which is calculated from 686 million baht of income from ticket sales and 2,861 million baht of total costs, obtaining loss. Another two sections, Airport Rail Link (extension) and Don Mueang-U-Tapao high-speed train, are under construction; therefore, there is no information about these sections.

Table 4 Annual person-trips of travel by transport mode across the Bangkok Metropolitan Region and connected areas in 2019

Mode of transportation	Person-trips* (million)
BTS	252.69
MRT	131.36
ARL	23.11
Total of electrified train services	407.16
Bus	2,227.50
Personal vehicles (million trips per year)	8,989.75

* Person-trips are trips by one person in any mode of transportation (The Bureau of Transportation Statistics, US Department of Transportation, 2016). For example, two passengers in the same household travelling together in one car are counted as two person-trips.

Note. Adapted from *Transport infrastructure report 2018* (p. 24) by Office of Transport and Traffic Policy and Planning, Ministry of Transport of Thailand, 2018, Bangkok, Thailand: Author. Copyright 2018 by Office of Transport and Traffic Policy and Planning, Ministry of Transport of Thailand. Adapted with permission.

Even though there were more than 400 million trips annually of travelling via city train services, as shown in Table 4, this number is far less than the number of trips of travelling by bus, around 2,000 trips per year, and travelling by personal vehicles, about 9,000 million trips per year.

3.2 Ticket prices of electrified train services in the Bangkok Metropolitan Region

Since the contracts of Bangkok Mass Transit projects are public-private partnership contracts based on an individual project, fares and other details of each metro line are different depending on each project contract; as a result, ticket prices of each city metro line vary.

Table 5 Average ticket price per ride of electrified train services

		BTS (main line)	MRT-Blue	MRT- Purple	ARL (main line)
Average	ticket	28 baht	26 baht	N/A	30 baht
price/ride					
(min-max)		(16-44 baht)	(16-42 baht)	(16-42 baht)	(15-45 baht)

Table 5 shows types of tickets and average ticket price per ride of electrified trains across the Bangkok Metropolitan Region (Bangkok Mass Transit System, 2018; Bangkok Expressway and Metro, 2018; Airport Rail Link,

2021). The average ticket prices of MRT Blue Line is the lowest, 26 baht, while ARL services show the highest prices, 30 baht.

Table 6 Ticket prices based on the number of stations of electrified train services (single-ticket fares)

Number of stations	BTS (main line)	MRT–Blue	MRT– Purple	ARL (main line)
0	16	16	14	15
1	16	16	17	15
2	23	19	20	20
3	26	21	23	25
4	30	23	25	30
5	33	25	27	35
6	37	28	30	40
7	40	30	33	45
8	44	32	36	-
9	44	35	38	-
10	44	37	40	-
11	44	39	42	-
12	44	42	42	-
13 and over	44	42	42	-

Note: The data of Airport Rail Link (ARL) are the main line data because the extensions are developing.

Table 6 expands the picture of the ticket price system between each city metro line (Bangkok Mass Transit System, 2018; Bangkok Expressway and Metro, 2018; Airport Rail Link, 2021). Ticket fares of electrified train services are based on the number of stations, not distance. This means the more stations taken per ride, the more prices charged. BTS charges the highest fares at 44 baht, when exceeding seven stations per ride, and 15 baht will be added on if a passenger travels in the extension areas. MRT Blue Line charges the highest fares at 42 baht, when exceeding 11 stations per ride, while the Purple Line charges the highest fares at 42 baht, when exceeding 10 stations per ride. Emphasising a 23-baht ticket, a commuter is able to travel up to two stations for the BTS skytrain, three stations for the MRT Purple Line, or four stations for the Blue Line. Travelling for a station, MRT Purple Line charges the highest price among other metro services, 17 baht, while when travelling a longer distance, ARL charges the highest rate, 45 baht.

3.3 Potentiality of the Bangkok Metropolitan Region people in the access to electrified train services against their current incomes

The average monthly income of Bangkok people is around 40,000 baht per household, and they spend around 6,000 baht per household for transportation and travelling. This ratio of income and expenditure in transportation seems reasonable and sufficient for people of the Bangkok Metropolitan Region. However, when focusing on the individual level, more than half of this population, 57.5%, earned 15,000 baht and under monthly. In general, in Thailand, the minimum wage of a worker is 300 baht per day, and the minimum salary of an undergraduate worker is 15,000 baht per month; therefore, there are many concerns whether people are able to afford electrified train tickets in their daily life, since those city train services have become the popular option for travelling due to their ease. This section will clarify this issue.

Transtime (2020) reported that the Thailand Development Research Institute (TDRI) compared costs of public transportation around the Bangkok Metropolitan Region and found that electrified train service fares compared to purchasing power parity (PPP) are extremely high, accounting for 28.30 baht per ride on average. This amount is 50% higher than the average value in Singapore, which is 13.33 baht per passenger per ride, and slightly lower than the amount in London, which is 34.04 baht per passenger per ride, while this value in Hong Kong is 16.78 baht per passenger per ride, as shown in Figure 1. This research also shows that low-income earners are able to purchase a metro train ticket at 11.69 baht per passenger per ride, while middle-income earners are able to buy a ticket at 20.33 baht per passenger per ride. These affordable prices for both groups are lower than the average price of 28.30.

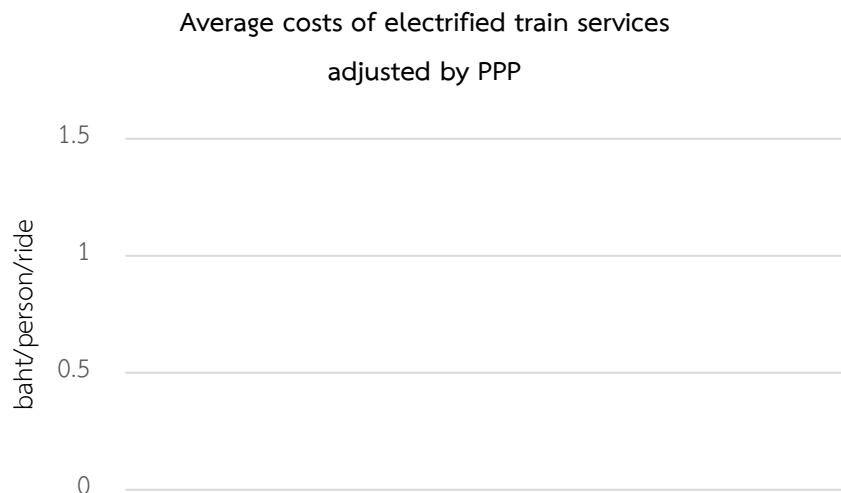


Figure 1: Comparisons of costs of electrified train services in London, Singapore, Hong Kong, and Thailand, competing with purchasing power parity (PPP) in a unit of baht per passenger per ride (Transtime, 2020)

When comparing the city metro fares in many countries against the minimum wage of those countries, it can be summarised that mass transit fares in Paris, France, are 1.90 Euros or 71 baht throughout a journey, including all connections that are undergrounds, buses, boats, and other rail services (Paris Convention and Visitors Bureau, 2020), while the minimum wage of Parisians is 9.88 Euros or 370 baht per hour (Salaire Minimum Interprofessionnel de Croissance, 2020); therefore, people in Paris work around 12 minutes in order to pay for a public transport ticket. The average ticket price of the underground in New York, USA, is 2.75 US dollars or 91 baht (Metropolitan Transportation Authority, 2020), competing with the minimum wage of New Yorkers of 12 US dollars or 395 baht per hour (City of New York, 2020); hence, New York workers work around 14 minutes to buy an underground ticket. In Seoul, South Korea, even though the minimum wage of this country, 7,530 South Korean won or 221 baht per hour (The Korea Herald, 2020), is lower than that of other developed countries, the fares of city train services are in accordance with this rate. The underground fares in Seoul are based on distance, and the lowest fare is 1,250 won or 37 baht, while the highest fare is 3,250 won or 96 baht (Seoul Metro Line 9, 2020). These fares are around 17–43% of the minimum wage per hour; hence, Seoul people work around 10–26 minutes to obtain a ticket. The Australian government assigns the minimum wage of Australians at 18.93 Australian dollars or 457 baht per hour (Fair Work OMBUDSMAN, 2020), while metro fares are between 3.54 and 10.6 Australian dollars or 85 and 256 baht (Transport for NSW, 2020); therefore, Australians need to work 12–36 minutes for a ticket. The minimum wage in London, England, is 7.83 pounds or 331 baht per hour (Crown, 2020), and underground fares are from 2.8 to 6.0 pounds or 119 to 253 baht (London Toolkit, 2020); hence, Londoners have to work 22–46 minutes for a ticket.

The Thai government assigns the minimum wage at 300 baht per day, and Thai people usually work full-time for 8 hours per day in general; therefore, the minimum wage of Thais is 37.5 baht per hour. The cheapest city train services are the MRT Blue Line and Purple Line, with fares between 16 and 70 baht, when integrating two lines. Hence, people must work 26 minutes for the cheapest ticket and 1 hour and 48 minutes for the highest-fare ticket.

Conclusion & Suggestions

It cannot be denied that traffic congestion has been one of the most concerning crises of the Bangkok Metropolitan Region for a long time, and effective solutions are not established yet. Hence, the electrified train system is the best option for travelling, especially during rush-hour periods, because the services offer many advantages, such as ease of use, security, cleanliness, and punctuality. It can be clearly seen that, in general, these city train services have provided excellent services. However, these excellent services charge significantly high costs; therefore, there are many concerns whether people of the Bangkok Metropolitan Region can access the electrified train services equally. This study examined the income of the Bangkok population and city train

fares to explore the potentiality of passengers in the access to electrified train services against their current incomes.

The findings show that the average monthly income per household of the Bangkok population in 2019 was around 40,000 baht, and the expenditure related to transportation and travelling among this group was around 6,000 baht per household. This ratio between income and expenditure is likely to be adequate for people of the Bangkok Metropolitan Region in making journeys every day. However, when emphasising monthly income per capita of this population, more than half of the Bangkok population earned 15,000 baht and under monthly. Commonly, the minimum wage of a Thai worker is 300 baht per day, and the minimum salary of a worker who obtained a bachelor's degree is 15,000 baht per month. When comparing the work period to earn a city train ticket in many countries, including France, the USA, South Korea, Australia, and England, it is found that Thais spend the longest time on their work in order to buy an electrified train ticket. The summary of this comparison indicates that Thai people need to spend one out of eight hours of their working time in order to purchase a city train ticket, and this rate does not include other modes of transport fares. Furthermore, the findings indicate that electrified train service fares adjusted by PPP are extremely high, amounting to 28.30 baht per ride on average, which is slightly lower than the amount in London and 50% higher than the average value in Singapore; hence, this amount is not balanced with the income of most Bangkok people, leading to unaffordability in purchasing electrified train services and transport inequality across this region. In order to control fares of city train services for higher affordability and accessibility of mass transit services, related sections such as the Bangkok Metropolitan Administration (BMA), the Mass Rapid Transit Authority of Thailand, and the Thailand Transport Portal need to set a price ceiling based on the income of most Bangkok people to control the maximum ticket prices in a period of time, such as daily, weekly, or monthly. Moreover, for a short journey, the fares of these services have to be adjusted for more reasonable prices as well, so that more people are able to afford the city train services.

One factor of the high ticket prices of the city train services in Thailand is the lack of integration mechanism at two levels: ticketing system integration and fare integration. Some train lines have partial integration, including MRT Blue line and MRT Purple line, and some lines have no integration at all. Focusing on ticketing system integration between MRT Blue line and MRT Purple line, there are some problems in the agreements. For example, when there are more than two transfers of a train line, the provider of the second route will never earn an entrance fee, since the passenger just passes through this route, but the entrance fee is obtained by the providers of the first and the third routes. This conflict can happen in the future due to the complications of rail networks. Nonetheless, the Thailand Transport Portal should push the mass transit providers to create and develop integrations of mass transits.

When considering the number of trips of Bangkok people travelling via various modes of public transport, it shows that the number of trips via city train services is far less than the number of trips by bus and personal vehicles. The number of trips travelling by personal vehicles such as cars and motorbikes of Bangkok people accounts for around 9,000 million trips per year via personal vehicles, 20 times higher than the rate of electrified trains. This suggests that public transport might not be reliable or accessible. Since the fares of electrified train services are significantly high compared with Bangkok people's income, and there were only 400 million trips annually, other modes of public transport such as buses, accounting for 2,000 million trips per year, need to be considered for development and investment to improve the quality of bus services. Bus services served five times more trips than the rate of city train services, and bus fares are far cheaper than city train fares, so it is practical to improve bus services; therefore, the affordability and accessibility of public transport will increase significantly. Consequently, the traffic congestion crisis might be relieved due to an increase of public transport use.

Since people in the Bangkok and Metropolitan Region spend more than 10% of their income on local transport, if all recommendations are applied and fares of electric trains are adjusted to affordable prices, more people will be able to access public transport, leading to decreased transport inequality across this area.

References

- Airport Rail Link. (2021). *Calculate time*. Retrieved from <https://www.srtet.co.th/index.php/en/>
- Bangkok Expressway and Metro Public Company Limited. (2018). *Integrated fares table of MRT–Blue lines and MRT– Purple lines*. Retrieved from https://admin.bemplc.co.th/Upload/%E0%B8%AD%E0%B8%B1%E0%B8%95%E0%B8%A3%E0%B8%B2%E0%B8%84%E0%B9%88%E0%B8%B2%E0%B9%82%E0%B8%94%E0%B8%A2%E0%B8%AA%E0%B8%B2%E0%B8%A3%E0%B8%A3%E0%B9%88%E0%B8%A7%E0%B8%A1%E0%B9%80%E0%B8%AB%E0%B8%A3%E0%B8%B5%E0%B8%A2%E0%B8%8D2021_83171783_1614674213..pdf
- Bangkok Mass Transit System. (2018). *Route and fares*. Retrieved from <https://www.bts.co.th/eng/routemap.html>
- City of New York. (2020). *Minimum wage law*. Retrieved from <https://www1.nyc.gov/site/dca/about/minimum-wage.page?fbclid=IwAR0vbJYolO55RraFFuzXIHXAudCqQLmNLaj-LRF2mxuCKqVau2kSbBGfgSE>
- Crown. (2020). *National minimum wage and national living wage rates*. Retrieved from https://www.gov.uk/national-minimum-wage-rates?fbclid=IwAR0nw4d8V5HTkXLksTK19DaT6xx6Rptz-xnF__Hw711h0_KaP0TXZWEOLX0

- Department for Transport of United Kingdom. (2017). *Impact of the local sustainable transport fund: Summary report*. London, England: Crown.
- Fair Work OMBUDSMAN. (2020). *Minimum wages*. Retrieved from <https://www.fairwork.gov.au/how-we-will-help/templates-and-guides/fact-sheets/minimum-workplace-entitlements/minimum-wages?fbclid=IwAR3fQEj11XmfoH0iglpNRMYN3iZgzLrlf4Z8grdj3umNZFktmUpKTDMfQII>
- Gates, S., Gogescu, F., Grollman, C., Cooper, E., & Khambhaita, P. (2019). *Transport and inequality: An evidence review for the Department for Transport*. London, England: NatCen Social Research.
- London Toolkit. (2020). *London underground: 2020 fares and how to use them*. Retrieved from https://www.londontoolkit.com/briefing/underground.htm?fbclid=IwAR23fUk8Neg8iVn_N4IEJN62lbpPU1O8hdZdx4u9AUzSJ5-1ttlfVsFWnB8
- Metropolitan Transportation Authority. (2020). *Everything you need to know about transit fares and tolls in New York*. Retrieved from <https://new.mta.info/fares>
- National Statistical Office of Thailand. (2019). *2019 Thailand population from registration categorized by age, gender, state, and province* [Data file]. Retrieved from <http://statbbi.nso.go.th/staticreport/page/sector/th/01.aspx>
- National Statistical Office of Thailand. (2020). *Survey of socio-economic status of households in Bangkok for 2019*. Bangkok, Thailand: Text and Journal Publication.
- Neutens, T., Schwanen, T., Witlox, F., & De Maeyer, P. (2010). Equity in service delivery: A comparison of different accessibility measures. *Environment and Planning A*, 42(7), doi: 10.1068/a4230
- Office of transport and traffic policy and planning, Ministry of Transport of Thailand. (2017). *The journey of population in Bangkok Metropolitan Region and connected areas*. Retrieved from http://www.otp.go.th/uploads/tiny_uploads/DataStatistics/2562/25611012-SumData01.pdf
- Office of transport and traffic policy and planning, Ministry of Transport of Thailand. (2018). *Transport infrastructure Report 2018*. Retrieved from http://www.otp.go.th/uploads/tiny_uploads/PDF/2562-07/25620723-ReportTransportInfrastructure-2561.pdf
- Paris Convention and Visitors Bureau. (2020). *Public transport: Fares, travel passes and reductions*. Retrieved from <https://en.parisinfo.com/practical-paris/how-to-get-to-and-around-paris/fares-travel-passes-reductions>
- Salaire Minimum Interprofessionnel de Croissance. (2020). *The values of the French minimum wage (gross and net) in 2020*. Retrieved from <http://www.smic-horaire.com/?fbclid=IwAR2vPSINGH2LaUApGLK247Ejq6wbS53VrXN6t-WZI-FO1Jv4bqsJLs2sHVs>
- Seoul Metro Line 9. (2020). *Fare system*. Retrieved from https://www.metro9.co.kr/site/homepage/menu/viewMenu?menuid=002001004001&fbclid=IwAR07c5BaNLwm_tEYwsefAw9NZi8TwliwOLli7QRfr9YWYq8zVtD_aqfZBQ

- The Korea Herald. (2020). *S. Korea to raise minimum wage for 2019 by 10.9%*. Retrieved from <http://www.koreaherald.com/view.php?ud=20180714000027&fbclid=IwAR2lRSul-BP6F13SwBXuw91MerCKZhs1XephHca7F1zLfdC4ZyxtVs2lG5g>
- Transport for NSW. (2020). *Adult fares*. Retrieved from <https://transportnsw.info/tickets-opal/opal/fares-payments/adult-fares?fbclid=IwAR0tXODeG7rgxyTdCmQGT1zKLyHcNALLh6YlBXXZxXo1Wi1z5x-48vRmHRY>
- Transtime, (2020). *Thai electrified train fares is the most expensive, exceeding Singapore and London already*. Retrieved from <https://www.transtimenews.co/5059/>.
- The Bureau of Transportation Statistics, U.S. Department of Transportation. (2016). *Passenger travel facts and figures 2016*. Retrieved from https://www.bts.dot.gov/sites/bts.dot.gov/files/docs/PTFF%202016_2l.pdf
- Van Wee, G. P., & Geurs, K. (2011). Discussing and social exclusion in accessibility evaluations. *European Journal of Transport and Infrastructure Research*, 11(4), doi: 10.18757/ejtir.2011.11.4.2940