

Comparative Study on Sustainable Mobility: Assessing Public Transportation Effectiveness in Jakarta and Bangkok

*Affan Naufal Mahali*¹, *Achmad Nurmandi*², and *Helen Dian Fridayani*^{3,*}

^{1,2,3} Department of Government Studies, Universitas Muhammadiyah Yogyakarta, Indonesia

Abstract. In urban areas experiencing population growth, the escalating quantity of automobiles presents several issues, including traffic congestion and air pollution. This research purpose to assess effectiveness of public transportation for the public in Jakarta and Bangkok. Furthermore, this research will analyze how these two cities implement the Smart City concept in their public transportation, using three main indicators: ICT integration, Innovation, and public mobility. This research uses a descriptive qualitative research method using secondary data obtained from various publications and news sources related to public transportation in the two cities. NVivo 14 software was used to process the secondary data, which enabled a thorough trend analysis and helped find relevant patterns. The results of this study show that transportation modes in Jakarta are more effective than Bangkok. The data analysis revealed that the mode of transportation significantly influences people's interest in using public transportation in both Jakarta and Bangkok. Jakarta and Bangkok are actively seeking sustainable solutions to alleviate traffic congestion problems. Both cities are making continuous efforts to improve infrastructure related to public transportation.

1 Introduction

The increasing number of automobiles in urban areas with expanding populations gives rise to a range of issues, including traffic congestion and increased air pollution. Jakarta and Bangkok, as urban cities, are not immune to these problems. The origin of the problem is due to the high level of urbanization, which leads to overcrowding and inadequate road infrastructure, including parking spaces. According to [1], Jakarta's population is estimated to reach 11,436,004 by 2024, while Bangkok's population is estimated to reach 11,233,869. The increasing mobility of people and private vehicles has an impact on inefficient travel time and disrupts other activities, such as the economy. In 2023, the traffic index in Jakarta reached 53%, while in Thailand it reached 62% [2].

Advances in information technology in the industry 4.0 era have resulted in significant changes in urban management. The Smart City concept is emerging as a solution to complex urban problems. The Smart City concept is the utilization of information and communication technology to improve the quality of life and sustainable economic growth through

* Corresponding author: helen.dian@umy.ac.id

community participation [3]. Smart city enable cities to manage their resources to achieve sustainability and improve people's quality of life through the use of social and human capital and information communication technology [4]. According to the data processed [5], traffic congestion and air pollution are the main problems faced by Jakarta. In Bangkok, the main problems are air pollution and data security.

One important dimension of a smart city is smart mobility. Smart mobility is a concept that seeks to reduce people's dependence on private vehicles by building efficient public transportation systems in urban cities [6]. This concept allows urban citizens to use more efficient modes of transportation and take shorter travel times. For example, Jakarta is building a public transportation infrastructure that integrates various modes of transportation. In Bangkok, an integrated payment system was developed in partnership with the private sector. In addition, research shows that public transportation can address environmental issues such as air pollution caused by an uncontrolled number of vehicles. By adopting electric energy, public transportation is thought to reduce carbon emissions, as well as reduce traffic congestion and traffic accidents caused by human error [7].

The purpose of this study is to determine how effective public transportation is for the public in Jakarta and Bangkok. Analyzing the implementation of the smart mobility concept through indicators of the use of information and communication technology, innovations developed, and integration of routes and modes of transportation available. As there are relatively few studies conducted on the comparison of smart mobility between countries based on literature findings, it is imperative to conduct research on this subject. The results of this study are expected to provide an overview of how these two cities adapt the concept of smart mobility to improve the quality of public transportation so that urban areas become more attractive to live in. The novelty of this research is the smart mobility approach in public mobility, innovation, and Information and communications technology (ICT) indicators to identify the level of effectiveness of existing public transportation mode services in the capital cities of Jakarta and Bangkok.

2 Literature review

The development of ICT is currently being used in the field of city management with the aim of updating traditional services to achieve public welfare. According to [8], defines a "smart" city as one that integrates physical, information technology, social, and commercial infrastructure. Smart city transformation requires IoT sensors, cloud computing, big data, AI, mobile devices, and applications. Research [9] defines "smart city" as cities with technology integrated into the infrastructure, enabling residents to connect to city services. The British Standards Institute describes smart cities as the successful integration of physical infrastructure, digital technology, and people in a sustainable urban environment [10].

Conversely, the European Union asserts that smart cities use a variety of methods outside technology to enhance urban administration and efficiency [11]. They use ICT to maximize resource use and reduce pollution. Smart city, as defined by [12], are contemporary metropolitan areas, these cities use technology to improve infrastructure and transform conventional services for citizens and businesses. According to further research, smart cities are identified by certain attributes, one of which includes a strong emphasis on environmental preservation [13]. According to [14], the development of sustainable technological infrastructure in cities should consider the natural environment, thus promoting the creation of environmentally conscious and responsible cities.

Smart mobility can address issues of traffic management, information provision, the interaction between vehicles and roadways, emergencies, and most importantly safety [15]. Mobility refers to the accessibility of various transportation options in each area, including private cars, public transit, bicycles, motorcycles, scooters, and more. Mobility systems help

urbanites to travel freely. Rapid transportation innovations such as public transit and traffic management can improve the quality of life for urban citizens [9]. All forms of movement within the city are considered part of urban mobility [16], including people’s daily commutes and commodity deliveries.

Sustainable urban mobility improves accessibility, enhances quality of life, and increases the attractiveness of urban areas as places to live. Traffic congestion have become a major problem for urban mobility, economy, and environment [17]. Improving urban mobility requires new technologies, urban planning, infrastructure, regulations, mobility services, and travel behavior. The goal is to improve urban planning, minimize private car accidents, and reduce environmental damage [18]. Smart mobility services use autonomous, electric, and networked vehicles to provide unlimited movement capacity. Public transportation is increasingly using battery technology and low-emission cars. Electric buses have emerged as a replacement for conventional modes of public transportation, such as trem and trolley buses [13].

3 Research Method

The research method used in this study is descriptive qualitative. Secondary data sources were used in the qualitative data collection approach [19]. The case study approach helps understand a topic through programs, events, activities and others to obtain in-depth information [20]. The data sources include past research acquired from the Scopus and Google Scholar database on the subject of “Smart Mobility”. The Google Scholar database is especially tailored to search and retrieve scholarly articles, theses, dissertations, books, abstracts, and other academic material from a wide range of disciplines. This includes internet news articles from the years 2018-2024, including both local news in Jakarta and Bangkok. Among the online news sources are Nation Thailand (8 news), CNN Indonesia (10 news), Detik News (10 news), Tempo (10 news), Kompas (11 news), and ThaiPBS World (11 news).

The four stages conducted in this research consist of :



NVivo 14 software will be used to analyze the data. Within the framework of the smart city concept introduced by Giffinger (2007), smart city indicators include 1) smart economy, 2) smart people, 3) smart governance, 4) smart mobility, 5) smart environment, and 6) smart living [8]. The purpose of this research is a comparative study between two capital cities, namely Jakarta and Bangkok. ICT, innovation, and public mobility are the indicators that will be used in this research on smart mobility. From the results of this data analysis, it can be determined which city public transportation is more effective between Jakarta and Bangkok.

4 Results and Discussion

The increasing urban population will affect private vehicle ownership. Traffic congestion reduce people’s productivity and quality of life as the number of vehicles increases. City dwellers need efficient and low-cost transportation to get around. In Jakarta and Bangkok, smart mobility uses technology and innovation to increase efficiency and reduce traffic

congestion. These plans aim to improve people’s mobility, connect areas, and minimize pollution.

4.1 Word Cloud



Fig. 1. Smart Mobility Word Cloud.

Figure 1 illustrates the results of data processing with NVivo 14 software, which visualizes the Word Cloud results. In this figure, the most frequently used words are depicted in order of their frequency. The most frequently discussed topics are indicated by the size of each word, which corresponds to its frequency of occurrence. The analysis shows that the most frequently occurring words are “MRT”, “Jakarta”, “BTS”, “Line”, and “Application”.

This indicates that these words are the most frequently discussed and the main focus in online news. The words “MRT” and “Jakarta” are often mentioned in the same sentence, indicating a special emphasis on the transportation system in Indonesia’s capital city. The words “BTS” and “Line”, which relate to the transportation system in Bangkok, are significant to inter-regional access in transportation in Thailand’s capital city. While the word “Application” comes from the online news topic of utilizing technology and applications to facilitate smart mobility.

4.2 Crosstab query

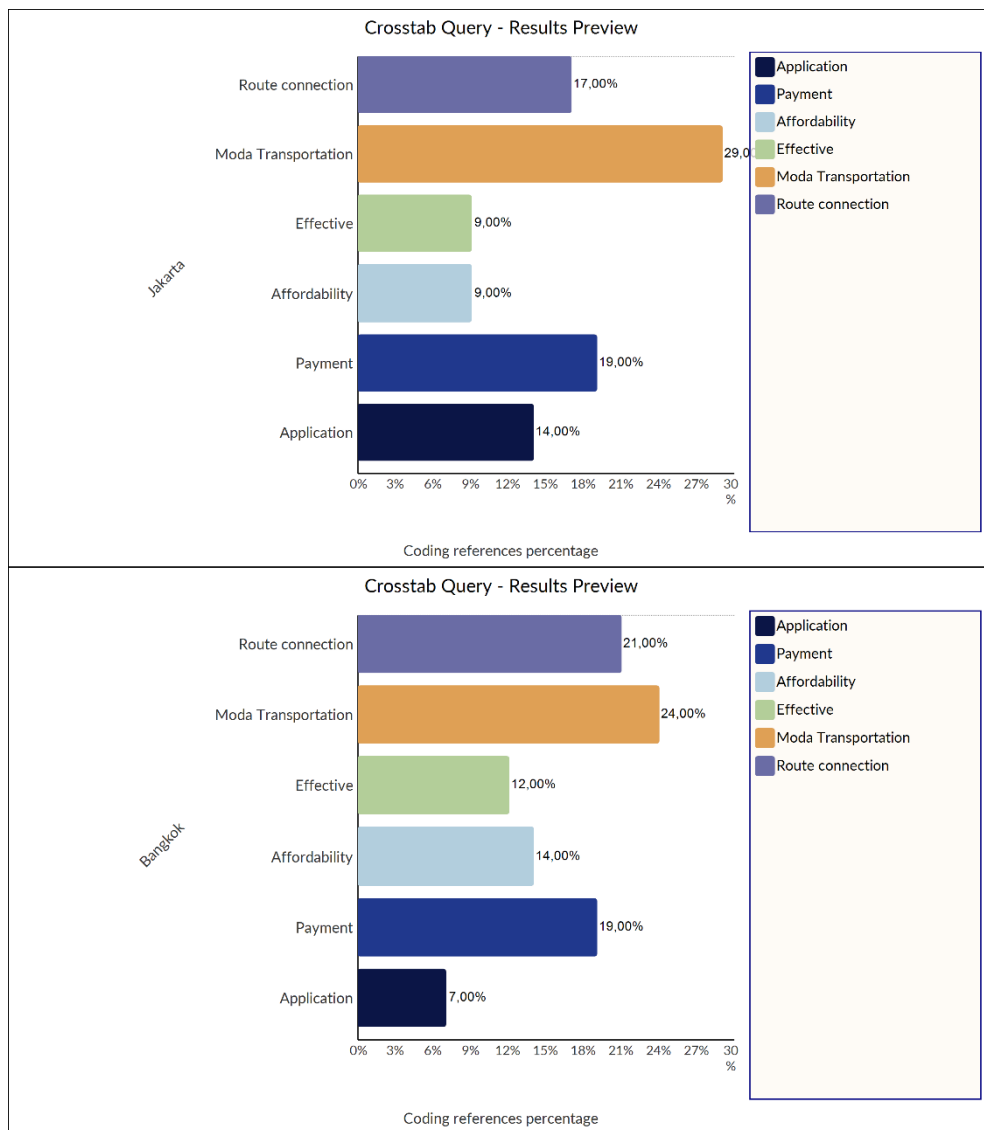


Fig. 2. Crosstab query-Smart mobility in Jakarta and Bangkok.

Data analysis conducted using the Crosstab query resulted in Figure 2, which indicates that the transportation mode parameter in Jakarta has the highest percent (29%). This means that the availability of transportation modes has the most influence on the level of interest in using public transportation for mobility in Jakarta. Based on research [21], this analysis shows that adequate facilities play an important role in motivating individuals to choose public transportation as their mode of travel. One reason for this is the abundance of diverse public transit options in Jakarta, including KRL, MRT, LRT, and TransJakarta.

Meanwhile, the availability of public transportation modes in Bangkok is also an important factor in urban mobility (24%). In Bangkok the modes of public transportation are

integrated. The Yellow Line, BTS Skytrain, MRT Subway, and BRT are examples of the various forms of transportation included in Bangkok’s public transportation network. Not only that, the Airport Rail Link (ARL), which is directly connected to the BTS Skytrain station, makes it easier to make connections to the airport for travelers.

4.3 Public mobility comparison

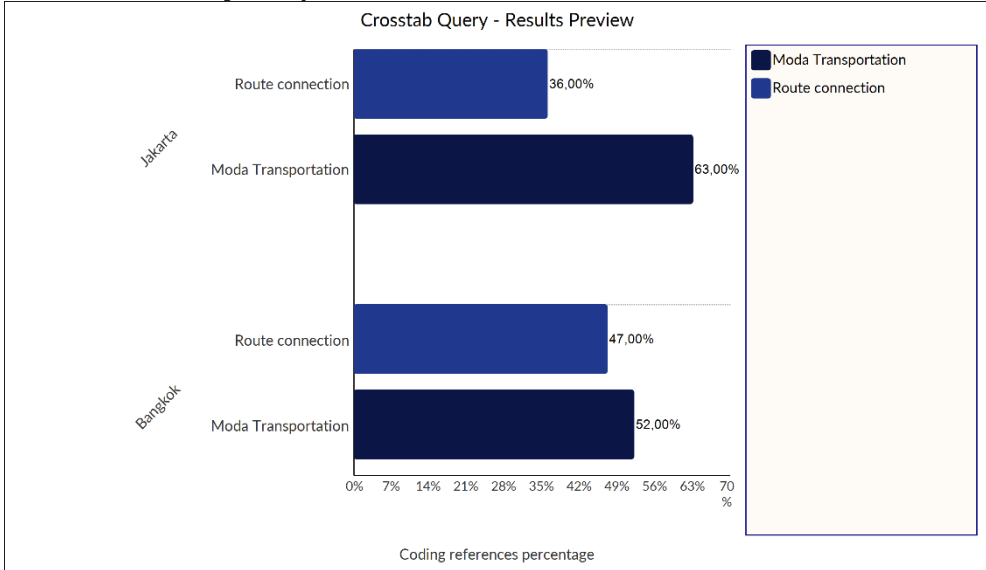


Fig. 3. Crosstab query-public mobility comparison.

Figure 3 shows the percentage comparison of public mobility. Public mobility indicators are divided into two parameters: 1) route connection and 2) mode of transportation. The percentage of route connection parameters in Jakarta (36%) and in Bangkok (47%). The transportation mode parameter in Jakarta (63%) while in Bangkok (52%). The route connection parameter is more integrated in Bangkok. More Skytrain and MRT stations are integrated with Bangkok city center locations. The transportation mode parameter is superior in Jakarta, public transportation infrastructure is being intensively developed. According to research [22] transportation infrastructure system is very important in the smart city concept. Public transportation infrastructure in Jakarta has undergone substantial improvements, especially the Jakarta MRT and LRT, which are modern and effective in reducing traffic congestion and reducing travel time.

4.4 Public transportation scores

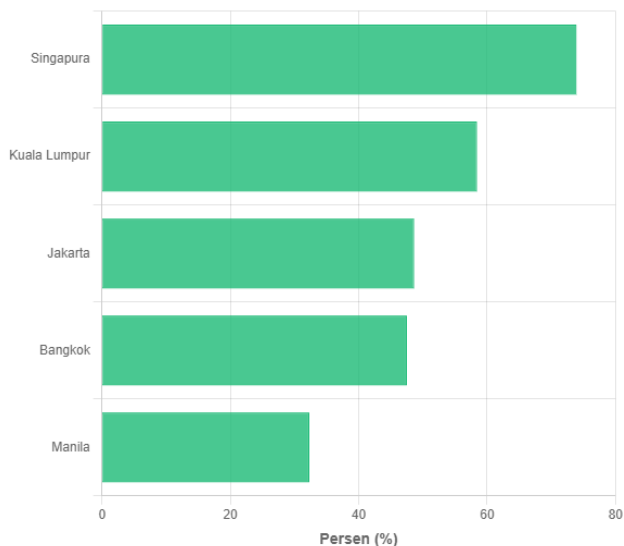


Fig. 4. Public transportation scores of ASEAN countries in 2023 [23]

Figure 4 displays the ASEAN Public Transportation Index, which shows that the public transportation system in Jakarta is more effective than Bangkok. Jakarta ranked 37th, while Bangkok ranked 42nd out of a total of 65 cities assessed. The urban mobility assessment includes dimensions related to urbanization, mobility, infrastructure, and transport ecosystem. Jakarta scored 48.6% while Bangkok scored 47.5%.

Jakarta has integrated transportation mode services tailored to the needs of users, specifically pedestrians [24]. The choice of transportation mode in Jakarta according to [25], depends on several factors, including pedestrians moving from one public transportation to another, private vehicle users switching to public transportation, and destinations that are only served by several types of public transportation. Users usually choose the mode of transportation that offers the most benefits in terms of economy, efficiency, and service quality. In Bangkok, the choice of transportation mode is influenced by socio-economic factors, based on education level and high income preferring the use of private vehicles [26]. Other categories, such as pedestrians, consider the accessibility of public transportation and public transportation infrastructure.

4.5 Challenges and future

Despite the implementation of the odd-even rule, traffic congestion in Jakarta is still a significant problem [27]. During peak hours, traffic congestion is caused by inadequate public transportation infrastructure. To create a more sustainable transportation system, some of the suggested solutions are safe pedestrian paths, direct access to departure points, installation of escalators and travelators, increasing feeder public transport, increasing the number of bus stops in underserved areas, increasing the amount of green open space [28], and creating sustainable infrastructure networks, such as electric vehicles and high-speed trains.

The biggest problem in Bangkok is traffic congestion, even though private cars dominate the road network. The public transport system only supports activity and connectivity in the city center, hence many trips are made privately [26]. Private vehicle owners perceive public

transportation as unreliable, overcrowded, and slower, while low-income groups dominate public transportation. Therefore, alternative methods to reduce traffic congestion should be explored to create a sustainable transportation system. Some solutions include the Bangkok government improving sustainable public transit infrastructure that connects different areas [29]. This user group requires subsidies as Bangkok's transportation system is one of the most expensive [30]. Environmentally friendly electric vehicles. Car-free parking and zones limit the use of private vehicles.

5 Conclusion

Based on this research study, it can be concluded that the mode of transportation in Jakarta is superior to that in Bangkok. Through the data analysis conducted, the mode of transportation significantly affects people's interest in using public transportation in both Jakarta and Bangkok. Jakarta offers a variety of public transportation options, including KRL, MRT, LRT, and TransJakarta. Public transportation options in Bangkok include BTS Skytrain, MRT, BRT, and ARL. Jakarta and Bangkok are actively seeking sustainable solutions to alleviate traffic congestion problems. Both cities are making continuous efforts to improve infrastructure related to public transportation.

While this research has generated useful insights that help to understand the effectiveness of public transportation in Jakarta and Bangkok, it also has several limitations. The findings presented in this publication are derived from research that has been conducted in the past. The main limitation of this paper relates to the relatively small number of online news stories. However, in the future, research into other cities may be the subject of future studies. Research on public satisfaction surveys of public transportation in other Asian countries would be an interesting topic to research. In addition, it would be interesting to analyze the policies made by the government regarding sustainable urban mobility.

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