

Implementation Study of Smart Mobility and Smart Living in Commuter Line at Sudirman Station, Central Jakarta

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Abstract:- The flow of urbanization continues to show an increase, this is the result of rapid economic growth. Urban problems arise along with the natural rate of population growth, such as traffic jams caused by, among other things, an increase in the number of vehicles. The smart city concept has been developed and implemented in large cities such as Jakarta. Smart mobility and smart living are two of the six parts of the smart city concept, which have now been developed as a solution to solving urban problems, one of which is the improvement and development of public transportation infrastructure in order to improve the quality of efficient and effective services. The aim of this research is to know, understand and formulate critically and objectively the application of smart mobility and smart living, which are examined from the physical and non-physical characteristics of the commuter line transportation mode. This research uses a mixed method or combination approach. Research uses two approaches, namely qualitative and quantitative. Quantitative methods are used surveys and experiments, while qualitative methods themselves are naturalistic methods. The research results have four outcomes including; optimizing intramodal and intramodal accessibility for all users including people with disabilities, realizing sustainable public transportation, integration through technology to realize less cash, efficiency and access to information, as well as public transportation that pays attention to health, cleanliness, safety and security for its users.

Keywords:- Smart City; Smart Mobility; Smart Living; Commuter Line; Sudirman Station.

I. INTRODUCTION

The urbanization phenomenon takes place organically in Jakarta. This is due to greater business opportunities, many job opportunities and adequate facilities. Urbanization is an increase in the rate of population growth that focuses on urban areas. The Directorate General Population and Civil

Registration of the Ministry of Home Affairs in 2023 stated that the population was 11,350,328 people. This figure increased by around 600 thousand people from the previous year. Urbanization has increased economic growth for immigrants, but on the other hand, quite a few urban problems have emerged, such as traffic jams, population density, and increases in vehicle volume. Based on the TomTom Traffic Index Ranking 2023, DKI Jakarta is ranked 9th based on the length of travel time required to cover a distance of 10 km, the average time required to cover the distance is 23 minutes 20 seconds.

High traffic density is caused by the increase in population and vehicle ownership. The very high mobility of people has an impact on increasingly routine traffic jams. According to the Institute for Transportation and Development Policy, adding lanes, roads, or building flyovers is considered a solution to reduce congestion problems. In cities in Indonesia, this is a general approach that has been implemented. Congestion occurs due to the increase in the number of private vehicles, which is not balanced by the increase in road length and infrastructure. As a result, the available roads are unable to accommodate vehicle capacity, especially during rush hours. Through the expansion of roads, new trips by motorized vehicles will arise, or what is known as induced demand. This phenomenon occurs because many people become more comfortable due to the new roads available, so that more people drive.

An economic development, the world's natural environment, and social welfare usually depend on the transportation system. Sustainable transportation is an important topic in cities all over the world, including smart cities. Over the last decade, the smart city concept has been developed, and reducing traffic congestion has become a major concern in smart city development. UNESCO predicts that with the growth and development of the ecosystem in the field of information technology with all its innovations, smart cities will attract great attention to be developed in the world. The integration of technology in a city will make it easier for

people to get information. Through a program called smart city, society and the government can access various 10 bits of information about the city openly and quickly.

IMD released the Smart City Index (SCI) 2023. Jakarta is ranked 102nd as reported on the IMD page, air pollution and road congestion has become an urgent priority in Jakarta. The smart city concept involves smart mobility and smart living. Several previous researchers have focused on the pillars of smart mobility, such as evaluating the application of information technology [1], developing strategies by increasing the number of fleets and providing real time information service facilities [2], then optimizing through a low mobility index (less mobility), and reducing travel time (less travel time) [3]. Through this smart living pillar, we can help create a more decent quality of life, including access to health facilities, maintaining safety and security. Implementing the concept of smart mobility and smart living by reviewing the transportation system more comprehensively. The KRL commuter line transportation mode is the mainstay of daily transportation and is most widely used by the people of Jakarta and its surroundings.

II. LITERATURE REVIEW

➤ *Smart City*

The definition of Smart city (smart city) a city whose residents are able to utilize resources wisely and efficiently, in other words "able to maximize and optimize investment in human resources, transportation, and information technology infrastructure to increase economic growth and comfort of life." Smart economy is the development of an urban economic sector oriented towards the welfare of its population through efforts to increase entrepreneurial activities and currently developing MSMEs, build and increase the spirit of productivity, carry out and increase promotions in prioritizing local Indonesian products, and cultural innovation. Related to e-commerce and e-business. Smart mobility is related to efforts to repair and improve the quality of infrastructure, emphasizing the accessibility aspect of technology and information-based transportation systems as the main factor for increasing urban convenience. Smart living is a paradigm that refers to efficiency, effectiveness and practicality of lifestyle.

Smart people are social infrastructure consisting of intellectual capital or knowledge and social capital that smart cities need because they have the ability to learn, have different attitudes and views socially and ethnically, and can adapt, creative, open-minded, and always participates in community activities [24]. Smart governance (smart government) or Smart governance is an important component as the culmination of smart city development policy initiatives. Essential aspects in implementing smart governance include government transparency or openness and public participation in decision making and the availability of public services.

➤ *Smart Mobility*

The definition of smart mobility covers everything related to mobility in smart cities, sustainability of transportation networks, integrated platforms. The smart mobility concept is a development of the city concept as part of a smart city approach with the hope of providing easy, safe, comfortable and affordable transportation as well as fast service to the community through the application of information technology [25]. Accessibility is a measure of the ease of traveling through a transportation system. Accessibility is measured through the efficiency of time, costs and effort in mobilizing between places and regions. The definition of accessibility is providing convenience aimed at people with disabilities with maximum and optimal implementation in order to achieve equality in accessing various activities, to realize equal distribution of services aspects of life following facility services and access for people with disabilities.

The modern world has faced many challenges, and we need to overcome them to ensure the lives and well-being of current and future generations, an approach known as sustainable development. This is based on a sense of responsibility for human influence on the environment and the use of available resources to prevent the ecosystem from worsening. Sustainable urban mobility requires guaranteeing access to goods and services for city residents and ensuring freedom of movement, access to desired locations, and communication. The sustainability of urban mobility systems is classified into three main areas, including: (1) Environmental Concern: Reducing carbon dioxide emissions, efficient use of energy and use of renewable energy sources; (2) Improvement of the transportation system and management methods: Digitalization, adapting the connection network to user needs, technological innovation, increasing traffic within the city; and (3) Improvement of the transportation system and management methods: Digitalization, adapting the connection network to user needs, technological innovation, increasing traffic within the city.

Sustainable transportation is defined as an effort to overcome environmental problems and resource depletion, broadly covering social and economic welfare. The use of ICT in various fields of smart mobility is key. One of the most common needs is being able to choose different routes to reach a destination, taking into account data collected in real-time. Various applications provide information about possible routes, suggesting different modes of transport to users, so that they can estimate reaching their destination at the desired time by considering traffic information. A citizens or communities who frequently use the internet are likely to be more productive.

➤ *Smart Living*

Smart living is defined by environmental suitability, which is reflected in the harmony of social life, which is inclusive, healthy, safe, and comfortable. Smart living refers to an integrated social life in society that is inclusive, harmonious, comfortable and safe from the threat of crime and criminality. Smart living realizes environmental harmony, guarantees the availability of health facilities and services,

development of transportation and logistics infrastructure as well as security and comfort. The implementation of smart living comes with challenges, as well as benefits such as infrastructure and data security issues. The government is able to collaborate with internet provider stakeholders that have data centers that are secure from the risk of hacking.

Public transportation has the potential to affect the health of individuals. Transportation infrastructure designed to accommodate and encourage non-motorized transportation can have a positive impact on public health. The benefits of physical activity other than exercise, namely "active transportation" such as walking and cycling, can prevent weight gain and reduce the risk of obesity, diabetes and heart disease. Transportation links have a direct and indirect impact on public health. A mode of transport based on humanity that consists of adequate seating, smoke-free facilities, scheduled waiting times, punctuality, and guaranteed safety for users.

Safety is defined as the extent to which harm can be prevented, reduced and responded to appropriately, while safety is defined as the extent to which unintentional harm can be prevented, reduced and responded to appropriately. One article about public transportation security in the smart city era states that there are seven trends that influence transportation in smart cities, including personal safety and security, news about victims of personal data security breaches, physical violence and harassment and concerns about the spread of disease in public spaces. Personal safety and security are the primary concerns of tourists and commuters in Europe. Safety and comfort are top priorities, and safety has the potential to influence travel behavior at every stage of a trip, from pre-trip planning, to the trip itself, to post-trip evaluation.

The quality standards that are accepted worldwide are largely responsible for providing comfort on public transportation. One of these standards is EN 13816, which is accepted by the European Union, which is a public transportation service standard that evaluates the level of

passenger satisfaction based on various factors including comfort, accessibility, information, time or duration, customer service, driving comfort, security and environmental impacts. Driving comfort is defined as the use of facilities that pay attention to environmental conditions, have complete facilities and are ergonomic. Comfort benchmarks are not only measured through density, suitability of schedules and cleanliness, but also the quality of indoor air both on public transportation and at stations. In the Green Building Council Indonesia (GBCI) indoor health and comfort category.

III. RESEARCH METHODE

This research uses a mixed method or combination approach, which involves using both qualitative and quantitative approaches. Quantitative methods are used surveys and experiments, while qualitative methods themselves are naturalistic methods. If differentiated from the qualitative, holistic, dynamic nature of reality, the quantitative nature is concrete, measurable and can be classified. Combination methods can maximize researchers' understanding of a phenomenon. Qualitative data collection techniques are through interviews with informants, while quantitative data is through questionnaires or questionnaires by distributing a list of questions to respondents, with the hope of providing answers or responses to these questions.

IV. RESULT AND DISCUSSION

The process of analyzing the respondents' responses to the research variables involved describing their responses to these questions. The list of questions consists of 26 items, the questions come from smart mobility and smart living variables, divided into 2 parts, each containing 13 question items. The researcher will explain these two variables from the analysis, then get an average value from the lowest average to the highest. In explaining the responses from respondents, the average method (mean) and frequency tables were used. To assess respondents' responses using measuring instruments, see table 1.

Table 1 Measuring Tools for Respondent Responses to Research Variables

Variable	Assessment of range	Classification
Smart Mobility & Smart Living	41,6 - 49,6	Very low /Excellent
	33,7 - 41,7	Less/Good
	25,8 - 33,8	Fairly High/Good Enough
	17,9 - 25,9	High/Not Good Yet
	10.0 - 18.0	Very High/Not Good

➤ *Description of Analysis of Respondent Responses for the Smart Mobility Variable*

Based on the respondents' assessments, it can be concluded that commuter line transportation mobility is considered to still tend to be high, this refers to the overall average value with a value range of 17.9 to 25.9. The lowest average value of 16.2 was obtained from the statements of respondents 20, 22, 35 and 37. The average value recorded by respondents 2, 4, 12, and 27 was the highest, reaching 23.1. From the research results above, it can be concluded that the commuter line public transportation at Sudirman

KRL Station has high mobility, there is still a need for development to solve the problem of moving transportation to support comfort for users.

➤ *Description of Analysis of Respondent Responses for the Smart Living Variable*

That is the overall average value of the smart living variable with 13 lists of questions that have been answered, it shows 18.5, in this case the smart living category on the commuter line public transportation at Sudirman Station shows the classification categories not good. From the

research variable measuring instruments, the overall average value ranges from 17.9 to 25.9. Then, the lowest average value obtained by respondents 34 and 44 was 13.1. The 25th respondent received an average score of 21.5, which was the highest. It is concluded that the feasibility of a lifestyle (smart living) needs to be realized optimally. This aims to support the quality of life of city residents through the realization of a smart city with comprehensive infrastructure.

➤ *The Observations of a Researcher on Variables Related to Smart Mobility and Smart Living*

The commuter line, public transportation, and Sudirman station, which serve as departure and arrival points for passengers, are in need of further development. Sudirman Station often faces overflowing crowds, especially during peak hours. Users of this mode of transportation are dominated by office workers. Reducing crowds can be optimized by increasing the number of train cars, managing arrival and departure times, or by adding platforms to meet the volume of passengers to support daily activities. From the results of observations, with the vending machine there are still a number of problems such as the money not wanting to come in, so you try again to put the money in until it is successful, thus increasing the transaction time longer than with a manual count.

In this case, we cannot always rely on technology one hundred percent to guarantee speed, in fact it is still an obstacle that it should be the manual counter is still an option for transactions if the machine is obstructed, which makes things easier. The Sudirman Commuter Line Station is not accessible to those with special needs (disabled) due to its unfriendly environment, as access is only through manual stairs and escalators, and there is no lift for wheelchair users. Apart from that, the gap between platforms and carriages for people without assistive devices is still considered vulnerable, not just the gap but the elevation is still not safe.

Researchers conducted comfort measurements on train station cars that were heading towards the Sudirman commuter line using a room temperature application. The results showed a comfortable temperature of 32 degrees Celsius and humidity of 60%. If we refer to the comfort standards of the Indonesian Green Building Council, where the thermal comfort level or temperature is at 25 degrees Celsius, then it can be concluded from this value that it is uncomfortable. This is caused by crowded conditions in the commuter carriage line, which causes the temperature to increase. The humidity level is still in the good category, based on the Indonesian Green Building Council's humidity standard of 60%, so it is still safe for users.

How to implement accessibility, sustainability and IT integration in smart mobility at the Sudirman Commuter Line KRL station, research results show that accessibility at Sudirman station only provides two platforms with 1 land line, it can be said that the availability of the rail network is limited. When compared with the volume of passengers, especially during peak hours, it cannot accommodate causing passengers to be crowded together. Up to now, the commuter line is still a reliable form of transportation for city residents,

this is because the fares are very affordable, and it is connected to various areas compared to other forms of transportation. The conclusion is that public transportation is a sustainable mode of transportation that is integrated with communication and information technology.

How the implementation of Health, Safety and Security in smart living at the Sudirman Commuter Line station shows that safety and security are still not optimal, this is because the condition of the station has not yet undergone comprehensive revitalization, so the platforms and stations are still at the old standards. Then, in terms of health, both in the carriage and at the station, it shows quite well, but there is still a need for improvements such as adding air conditioning in the station so that passengers are more comfortable while waiting for the arrival or departure of the commuter line.

V. CONCLUSIONS

Based on the results of research and discussions on the application of smart mobility and smart living on the commuter line at Sudirman KRL Station, Jakarta, it shows different results for the two methods. It can be inferred that public transportation is still being improved and developed, which can encourage people to continue using it for their daily activities. It is hoped that people will switch to using public transportation more, so that reducing congestion due to the increasing volume of motorized vehicles can play an optimal and comprehensive role.

REFERENCES

- [1]. Ahmadjayadi, C., Subkhan, F., Wiradinata, M.R. (2016). Soaring or Running aground? New Indonesia from Smart City to Smart Nation. Jakarta: Kompas Gramedia
- [2]. Pangaribuan, N., Winarni, I., Toha, M., Utami, S. (2017). Optimizing the Role of Science & Technology to Create a Smart City. Banten: Open University.
- [3]. Atmojo, M. E., Fridayani, H.D. (2021). Smart City-Based Urban Governance Perspective of Innovation and City Development on the Island of Java. Yogyakarta: Blue Ocean.
- [4]. Magdalena, D.E., Ardianta, D.A. (2017). Sudirman Station Circulation Arrangement with the Flow Concept. Pomits Journal of Science and Arts. 6(2):2337-3520.
- [5]. Atmawidjaja, E.S., Sastra, Z., Akbar, N.R. (2015). Final Report on the Study of Smart City Development in Indonesia. Jakarta: Directorate General of Spatial Planning, Ministry of Public Works.
- [6]. Montes Jose (2020). A Historical View of Smart Cities: Definitions, Features and Tipping Points. SSRN. 31 Page.
- [7]. Eie Müller. D., Kosmidis. I. (2023). Sustainable mobility in smart cities: a document study of mobility initiatives of mid-sized Nordic smart cities. European Transport Research Review. 15:36.

- [8]. Alonso. C.M., Aleta. N.B., Ruiz. R.M.A. (2016). Smart Mobility in Smart Cities. Congreso de Ingeniería del Transporte València, Universitat Politècnica de València. XII.
- [9]. Wawer. M., Grzesiuk. K., Jegorow. D. (2022). Smart Mobility in a Smart City in the Context of Generation Z Sustainability, Use of ICT, and Participation. MDPI Open access Journal. 15(13):4651.
- [10]. Setyowati. K., Suryawati. R., Parwiyanto. H. (2020). Strategic Planning on Smart Mobility Development. *majoring in social sciences*. 19(2): 180-206.
- [11]. Pratiwi. A., Soedwihajono, Hardiana. A. (2015). Surakarta City's Readiness Level for Smart Mobility Dimensions as Part of the Smart City Concept. *Region Journal of Regional Development and Participatory Planning*. 6(2):34.
- [12]. Prawira. S.A., Pranitasari.D. (2020). The Influence of Accessibility, Innovation and Quality of Public Facilities Services on the Satisfaction of Disabled Passengers on the Jakarta Electric Railway. *Repository of the Indonesian College of Economics*. 1-15.
- [13]. Al-Lami.A. (2023). Sustainability Indicators of Surface Public Transportation. *MDPI Open Access Journal*.15(21):15289.
- [14]. Widiyastuti. I., Nupikso. D., Putra. A. A., Inanny. V. A. (2021). Smart Sustainable City Framework: Proposed Sustainable and Integrative Smart City Model. *PIKOM Journal of Communication and Development Research*. 22(1): 13-20.
- [15]. Raynault. E., Christoper Ed. (2013). How does Transportation Affect Public Health?. *US Department of Transportation Federal Highway Administration*. 76(6).
- [16]. Mihaylova Nadya. (2021). How Transport Offers a Route to Better Health. *Health Foundation Long*. 1-22.
- [17]. Hasibuan. M. H. M., Btubara. H., Lubis. M. ((2019). Study of Economical, Safe, Comfortable and Environmentally Friendly Transportation Equipment. *UISU SEMNASTEK*. 237-245.
- [18]. Johnsen. S. O. (2018). Risk, Safety and Security in the Ecosystem of Smart Cities. *IntechOpen*. 205-221.
- [19]. Imre. S. Celebi. D. (2017). Measuring Comfort in Public Transport: A case study for Istanbul. *Transportation Research Procedia*. 25: 2441-2449.
- [20]. GBC Indonesia. (2013). *Greenship for New Buildings version 1.2*. Green Building Council Indonesia. 1-17.
- [21]. Munandar. Ns. A. (2022). *Quantitative, Qualitative and Combination Research Methods*. Bandung: Indonesian Science Media.
- [22]. Abdullah Ma'ruf. (2015). *Quantitative Research Methods*. Yogyakarta: Aswaja Pressindo.
- [23]. Margaretha. A. M., Nugroho. A.A. (2023). Integrated Public Transportation: Optimizing the Implementation of Smart Mobility in DKI Jakarta. *Journal of Public Policy and Applied Administration*. 5(2):45-56.
- [24]. Nam and Pardo. (2011). Conceptualizing Smart City with Dimensions of Technology, people and Institutions. *Proceedings of the 12th Annual International Conference on Digital Government Research*. 282-291.
- [25]. Kaledi,S, Dewanti and Herwangi, Y. (2019). Smart Mobility Development Startegy Based on Public Transportation inYogyakarta City. *Vol 14(1)*. 112-123.