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Welcome to ICISS 2021

Dear Colleagues,

It is my great pleasure to welcome you to the International Conference on ICT for Smart Society 2021.

I would like to welcome our keynote speakers and all the honourable guests.

First, we would like to introduce our annual conference which was initiated by the Smart City and Community Innovation Center of Bandung Institute of Technology to promote smart society initiatives. The first ICISS was held in 2013 in Jakarta. And then, subsequently, we held the subsequent events in several other cities: Bandung, Surabaya, Tangerang Selatan, and Semarang. We were planning to hold the conference at ITB. However, because of pandemic circumstances, we have to deliver this year's conference virtually over the Internet.

This conference is a special conference with a specific topic on information and communication technology for smart city and society, including cutting-edge technology, governance, and socio-economic aspects of smart society. This year we raise digital twin for smart society as the main theme of the conference.

We would like to thank our keynote speakers,

1. Prof. Carlo Ratti, Director of MIT Senseable City Lab, Founding Partner at Carlo Ratti Associati Design and Innovation Office
2. Ginandjar, Director of Marketing & Solutions Lintasarta
3. Prof. Suhono Harso Supangkat, Smart City & Community Innovation Centre – Bandung Institute of Technology ITB
4. Prof. Dr Toshio Obi, Director of APEC e-Government Research Center, Senior Researcher at Institute of Digital Government, Waseda University, Japan
5. Ryan Lai, Regional Business Development Manager, Advantech International

6. Prof Hsueh-Yung Benjamin Koo, Founders of iCenter@Tsinghua University and Professor of Tsinghua University, China
7. Dr. Robby Soetanto B.Eng., M.Eng., Researcher of Construction Engineering Management at Loughborough University, England
8. Prof. Dr. Mohamed Essaaidi, IEEE Global Cities Alliance, MEA Chair
9. Prof. Tomasz Janowski, Ph.D., Head Department of Informatics in Management, Gdańsk University of Technology, Poland
10. Dr. Jalaluddin Abdul Malek, Associate Professor of Social Science and Humanities University Kebangsaan Malaysia
11. Dr. Ir. Hammam Riza, M.Sc., Head Assessment and Application of Technology (BPPT) – Indonesia
12. Arief Pribadi, Technical Director Nutanix Indonesia

We also would like to thank our sponsors and also the IEEE Indonesia Section for its support for the publication and technical guidance in delivering this conference.

We do hope that you enjoy your attendance at the ICISS 2021!
Thank you for your participation.

Fadhil Hidayat – Organizing Comittee ICISS 2021

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The Smart Mobility Insight of Bus Rapid Transit (BRT) Trans Jateng Purwokerto-Purbalingga Ridership

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***Abstract*— The rapid development of technology presents a new paradigm, one of which is in the transportation sector. The concept of smart mobility is one of the components in the realization of a smart city, which is closely related to the transportation sector. The Purwokerto-Purbalingga Bus Rapid Transit (BRT) is the government's effort to encourage the transportation sector towards smart mobility. It requires three crucial categories: accessibility, sustainability, and communication and information technology. This study proves and explains that these three categories can be fulfilled by the Purwokerto-Purbalingga Bus Rapid Transit, especially from women's perception, indicated by an average accessibility score of 4.04, sustainability of 4.22, and Information and Communication Technology of 3.80. Efforts that can be taken by the government and Bus Rapid Transit managers include monitoring and evaluating bus stops and bus arrival frequencies as well as developing mobile-based applications that provide real-time information related to bus rapid transit.**

Keywords— Smart Mobility, Smart City, Bus Rapid Transit, Transportation

I. INTRODUCTION

Rapid technological advances, especially in transportation, have encouraged smart mobility globally [1], one of them is Indonesia. Smart mobility is a smart city's indicator, a mobilization system that seeks to fulfill needs in a fast movement [2] [3].

Rapid transit systems are used in urban areas to carry large numbers of passengers with limited distances and high mobility frequency. Rapid transit systems are usually used to support transportation modes such as trams, buses, ferries, park vehicles, and bike-sharing. Transportation plays an essential role in supporting the country's development, specifically in people's economic activities [4].

The implementation of Bus Rapid Transit (BRT) in Indonesia is one of the rapid transit system implementations that mushroomed in various big cities [5]. The Central Java Provincial Government has chosen mass transportation as an alternative policy solution. The mass transportation mode is Bus Rapid Transit (BRT) [6]. One of BRT's operations in Central Java Province is the Purwokerto-Purbalingga route since 2018 [7]. It aims to provide public transportation with excellent bus quality by relying on comfort, affordable prices, and accommodating the mobility of urbanites [8]. Also, BRT is intended as public transportation that provides easy access [9] and promotes equality for marginalized people such as the poor and other populations with low income to reduce travel time and health benefits [10].

Encouraging transportation in urban areas such as BRT is critical in realizing a smart city known as smart mobility because it will solve congestion problems and city operations [11]. Besides, As one of the transportation that utilizes technology in its operations, BRT's concept may have met the Smart Mobility dimension criteria. However, further proof and explanation are needed. This research will try to prove and explain that the Purwokerto - Purbalingga BRT is a mode of transportation included in smart mobility to build a smart city in Indonesia. In addition, the study will focus on the perception of women as the primary users because, based on [12], more than 70% of BRT users are women.

II. RELATED WORKED AND METHODOLOGY

The concept of a smart city is one way to improve the city's function, efficiency, and competitiveness and overcome urban environmental challenges [4] [13]. A metropolitan city that becomes a smart city is the primary key to improving the welfare of the population [14]. The term smart city is often associated with innovative solutions to solve urban problems such as congestion, health, climate change, urban planning, and city operations [11] [15]. A smart city is often

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interpreted as a city with good performance, described in six characteristics: economy, society, government, mobility, environment, and life [16].

As one of the six characteristics [17], smart mobility is one of the main alternatives in building a sustainable transportation network [18]; [19]; [1]. This is closely related to other definitions, namely that a smart city has an information network, internet, mobile, security, convenience, and sustainability [20]. Smart mobility aims to provide a robust ICT infrastructure and a sustainable transportation system [21]. Lyons [22] has his view. In his opinion, Smart Mobility and Sustainable Mobility are contexts related to one another with different meanings where there are four relationships depicted in the Venn diagram.
Smart mobility has the following framework as a part of a smart city (Table I) [1].

TABLE I. SMART MOBILITY CATEGORIES AND INDICATOR

Category	Indicator
Accessibility	- Public transportation needs - Public transportation routes - Transit Stop Density
Sustainability	- The existence of environmentally friendly buses - There are sidewalk facilities - Continuous innovation
Information and Communication Technology	- The existence of ICT-based security facilities - Availability of e-ticketing - Availability of route, schedule, and time information electronically at each stop

According to [11], digital service to users describe the ICT dimension. The indicators include the availability of applications/information systems to support transportation, the existence of an ICT project to improve the community's security and quality of life, and free wifi access services for the community. This is in line with the ICT category in Table I.

To prove and explain that the Purwokerto-Purbalingga Bus Rapid Transit is a dimension of smart mobility in a smart city, this research uses a quantitative and qualitative descriptive methods. The quantitative method is used to see BRT passengers' demographics, especially those from Purwokerto and Purbalingga, and survey indicators in the smart mobility framework. While the descriptive qualitative method is used to describe, analyze, and construct the meaning of some of the facts found.

A. Demographics of BRT Ridership

BRT Purwokerto-Purbalingga ridership are surveyed at 209 respondents in Purwokerto and Purbalingga. The demographics of the BRT ridership can be seen on Table II.

TABLE II. DEMOGRAPHICS OF BRT RIDERSHIP

User variable		Distribution (%)
Residence	Purwokerto	51,2
	Purbalingga	36,8
	Others	12
Job	Student	27,8
	Lecturer/Teacher	6,7
	Employees	24,9
	Merchant	9,6
	Housewife	25,8
	Others	5,3
Age	Less than 15 Years old	1,9
	15-25 Years old	35,4
	26-35 Years old	23,4
	More than 35 Years old	39,2
Routine	Everyday	27,8
	Rare	34,9
	Twice a week	16,3
	Uncertain	21
The Objective of BRT use	Studying	11,5
	Working	20,6
	Traveling	13,4
	Visiting	34,4
	Shopping	5,7
	Get Treatment	8,1
	Transit	6,2

From table I, it can be seen that concerning the area where passengers live, the majority of passengers come from Purwokerto (51.2%) than Purbalingga (36.8%) and other areas (12%). It shows that BRT can be used as a mode of transportation with adequate facilities.

From the job, it can be seen that the majority of passengers are students (27.8%), civil servants/private (24.9%), and housewives (25.8%) who have the majority aim to work (20.6%). , school (11.5%), and visit relatives (34.4%). If we look further, the majority of passengers who use BRT are mostly over 35 years old (39.2%) and between 15-25 years (35.4%), with the majority of using BRT sometimes (34.9%) and indeterminate (21%). This is natural because when this research was conducted, the conditions of the Covid-19 pandemic were still hitting Indonesia, so that passengers were less and less certain about traveling outside the home.

B. Creation of Research Criteria

In compiling the research indicators, several main references are compared, namely from [1], [23], and [11],so that the results of the indicator mapping and criteria statement items are as follows (Table III).

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TABLE III. RESEARCH CRITERIA

Indicator	Criteria	Code
- Public transportation needs - Public transportation routes - Transit Stop Density	- Bus Rapid Transit accommodates bus stops at the beginning of the trip - Bus Rapid Transit accommodates stops for the final destination of the trip - Bus Rapid Transit is always there all the time - If the BRT is full, I am willing to wait for the next BRT - The arrival of BRT on time made me comfortable in traveling	Q1 Q2 Q3 Q4 Q5
- The existence of environmentally friendly buses - There are sidewalk facilities - Continuous innovation	- The capacity of the BRT is in accordance with the health protocol - The availability of adequate sidewalks and road access to bus stops makes me feel comfortable - The orderliness of the BRT in operation makes me comfortable - I love the clean BRT stops - I feel comfortable if the BRT stops are equipped with adequate seating facilities - The design of the bus stop is according to your needs	Q6 Q7 Q8 Q9 Q10 Q11
- The existence of ICT-based security facilities - Availability of e-ticketing - Availability of route, schedule, and time information electronically at each stop	- The design of the bus stop is in accordance with my needs- An online surveillance system via CCTV makes it safe for me to travel with BRT - An electronic payment system (E-money) is required - Real time information and other news related to BRT that can be accessed via cellphone makes it easier for me to travel using BRT	Q12 Q13 Q14

From several questionnaire items then the results will be analyzed using a Likert scale with the following scale (Table IV).

TABLE IV. INTERVAL

Interval	Category
4,21-5,00	Strongly Agree
3,41-4,20	Agree
2,61-3,40	Neither agree
1,81-2,60	Disagree
1,00-1,80	Strongly Disagree

III. RESULT AND DISCUSSION

The analysis results of the fulfillment of the dimensions of smart mobility were carried out based on the categories and indicators specified in the previous section, along with questionnaire items distributed to 209 respondents. Then based on the existing conditions in the field, it was identified whether the Purwokerto-Purbalingga BRT could fulfill every element in smart mobility.

A. Accessibility

The accessibility category emphasizes the availability of comfortable and affordable transportation for all society levels [1]. Based questionnaire results, it was found that public perceptions of accessibility were as follows (Table V).

TABLE V. RESULTS OF ACCESSIBILITY CATEGORY

Category	Criteria	Average Score
Accessibility	Q1	4,05
	Q2	3,94
	Q3	3,92
	Q4	4,01
	Q5	4,28
Total Average		4,04

The results in Table V show that for each research questionnaire on the accessibility aspect, it has a total average rating of 4.04, which means that the general public believes that the Purwokerto-Purbalingga BRT has been able to meet the accessibility aspect in the smart mobility dimension. If we look deeper the criteria Q1 to Q4 (above 3.41), community agrees that presence of BRT accommodates them both at the beginning and the end of the trip through the bus stop. The Q3 and Q4 criteria more emphatically prove that they believe that BRT is always available at all times, so they are still willing to wait for the next BRT even though the BRT they want to board is already full. Furthermore, the Q5 criterion (above 4.20) shows that the community is very confident and feels that the BRT's arrival so far is on time to make them comfortable traveling at all times.

B. Sustainability

The sustainable category is related to the guarantee that the transportation provided is clean, environmentally friendly, and able to adapt to service innovations following the latest urban conditions. This innovation is needed to maintain the sustainability of BRT so that passengers feel more at home so that it becomes the primary mode of transportation for daily operations. Based on the questionnaire results, the community's perceptions of sustainability were obtained as follows (Table VI).

TABLE VI. RESULTS OF SUSTAINABILITY CATEGORY

Category	Criteria	Average Score
Sustainability	Q6	4,30
	Q7	4,16
	Q8	4,26
	Q9	4,33
	Q10	4,37
	Q11	3,88
Total Average		4,22

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Based on the results in the Table VI, it shows that for each research questionnaire on the sustainability aspect, it has a total average rating of 4.22, which means that the general public strongly believes that the Purwokerto-Purbalingga BRT has been able to meet the sustainability aspects in the dimension of smart mobility. This is demonstrated for the criteria Q6, Q8, Q9, and Q10, with a total average score above 4.21. This score shows that the government can provide BRT facilities such as adequate seating and an atmosphere both on the bus and at the bus stops that is environmentally friendly and very clean in its implementation. Also, what should be paid attention to considering that currently, Indonesia's condition is still dealing with the Covid-19 pandemic is that the government as a manager is also able to innovate by regulating bus capacity according to health protocols where only 50% can be filled by setting the distance between passengers according to set standards. Then the criteria Q7 and Q11 (above 3.41) also show that the community feels comfortable and the bus stops' strategic and attractive design. The community feels comfortable because access to the BRT stops is also provided with adequate sidewalks.

C. Information and Communication Technology

The Information and Communication Technology (ICT) category emphasizes the use of technology to increase the effectiveness and efficiency of passenger behavior when traveling using BRT. The existence of a mobile-based platform that passengers can access wherever they are in which there is content containing real-time information related to BRT operating, which is the hope of the whole community. For more details, based on the questionnaire results, public perceptions of ICT development are obtained as follows (Table VII).

TABLE VII. RESULTS OF ICT CATEGORY

Category	Criteria	Average Score
ICT	Q12	3,85
	Q13	3,47
	Q14	4,08
Total Average		3,80

Table VII shows that compared to the two previous smart mobility categories, the ICT category has fewer criteria. Using ICT in the Purwokerto-Purbalingga BRT is still not optimal because there are only a few ICT components such as CCTV and bus monitoring by BRT managers. Services for the community are still in the development stage. Based on the results in the VII table, it shows that for each research criteria on the sustainability aspect, it has a total average assessment of 3.80, which means that the general public believes that the Purwokerto-Purbalingga BRT has been able to meet the ICT aspects in the dimension of smart mobility even though it is not optimal. Especially for the community. For the security aspect through CCTV at each bus stop where this criterion is the most apparent use (Q12), it is believed that the community can make them safe while traveling is indicated by a score of 3.85. Business processes that can be supported by ICT in the Q13 criteria, namely the application of e-money for payment aids, are believed by the public to increase effectiveness and efficiency when paying so that officers on the bus do not need to approach passengers one by one even though currently people still feel comfortable with conventional payments indicated by a score of 3.47. And finally, even though it has not been fully implemented, realtime information and other news related to BRT are expected by the community to be implemented immediately because they believe it can make it easier for them to predict when traveling with BRT (Q14) because it has a high enough score compared to other criteria in the ICT category, which is 4, 08.

IV. CONCLUSION AND RECOMMENDATION

The dimension of smart mobility in a smart city can be fulfilled by looking at the three categories it contains, namely, accessibility, sustainability, and ICT. Based on the results of the analysis in the previous section, it can be concluded that the Purwokerto-Purbalingga BRT can fulfill the three categories as evidenced by the average score for the accessibility category of 4.04, the sustainability category of 4.22, and the ICT category of 3.80. The Central Java Provincial Government and BRT managers still have to pay attention to two categories that can be improved, namely accessibility and ICT. For the category of accessibility, when viewed from the lowest score, namely the Q2 and Q3 criteria, which still have an average score below 4, efforts can be made, namely monitoring and regularly evaluating the bus stops and the frequency of bus arrivals so that there is no congestion or traffic. Change of route outside the plan. Then, what is no less important is the sustainability aspect of Q11. The public still sees that the bus stops' design can be made more attractive and makes passengers feel at home, for example, by collaborating with local designers to add various details to the stop. The most important thing to pay attention to is the ICT category, especially in the Q13 criteria. The government must accelerate mobile-based application platforms containing various kinds of information about BRT in real-time.

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