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IMPACT OF BOARDING PLATFORM GAP ON BRT STATION TO EVALUATE SAFETY PASSENGER CASE STUDY: TRANSJAKARTA CORRIDOR 4 & CORRIDOR 13

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Abstract. Transjakarta is the first BRT System in Indonesia that has been operating since 2004. One of the basic things owned by a BRT System is platform-level Boarding which ensures the safety of passengers. In reality, on Platform-Level Boarding there are still horizontal gaps that are not following standards that can cause passenger accidents and other problems. This research is focused on the impact caused by the gap between the bus and the bus stop to evaluate the safety of BRT passengers. This research used a qualitative method with primary data collection method by observing and secondary data obtained through previous research. Based on observations, boarding platform gaps on Transjakarta still occur and cause passenger accidents and passenger access difficulty.

Keyword: *Transjakarta, Bus Rapid Transit, Boarding Platform Gap, Passenger Safet*

INTRODUCTION

Transjakarta is the first BRT system in Indonesia that was inaugurated in 2004 by the Governor of DKI Jakarta. Today, Transjakarta has 247 routes with 13 main corridors and has a path length of 251.2 km, operating for 24 hours by operating 260 BRT Stations (Transjakarta.co.id, 2016).

On January 27, 2007, Transjakarta corridor 4 began operating, with the travel route from Pulogadung Station until ICBC Tosari Station, having a route length of 11.9 km and 18 stops (Ulumidin et al., 2013). While corridor 13 was inaugurated on August 16, 2017, with the travel route from Ciledug station route until Kapten Tendean Station, carrying the concept of the elevated lane with 15 stops and 9.4 km long (Hamdy & Ferdiansyah, 2019).

Every year, the number of Transjakarta passengers has always increased. In 2019 Transjakarta managed to transport 264.6 million passengers, an increase from the previous year, namely in 2018 as many as 188.9 million passengers and in 2017 as many as 144.72 million passengers (Setyaningsih, 2020), with the increasing number of passengers, the safety of passengers must be improved and must continue to be improved.

There is still a gap between the bus stop and the Transjakarta bus which has the risk of causing passenger injury. When the gap position is too far vertically or horizontally, this usually occurs due to the position of the bus stop that is too high or too low, the bus does not meet the bus stop's high standards, and driving skills. This certainly will have an impact on passenger safety, ease of passenger access, and passenger loading and unloading speed (Office, Moscoe, & Henke, 2006) (Herawati & Mutharuddin, 2012).

The previous studies discussed the tools used to reduce gaps by using a guide wheel, optical guidance, guide strip (Hedges & West, 2017). Another previous study discussed how to reduce gaps by training bus drivers (Rickert, 2010). The focus of this journal is to make observations to prove the existence of gaps between the Bus Stop and Transjakarta Bus that exceeds standards that endanger the safety of users or passengers.

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THEORETICAL BASIS

1. Urban Transport

   Transportation is the movement of people or goods using a vehicle, related to the movement of trips from the origin to the destination in urban areas (Fitriyani, Krisma, Sampurna & Sholihah, 2018). Urban transportation has an important role in urban development, the smooth mobility of people and goods, and the growth of the city's economy (Aminah, 2007). The benefits of implementing urban transportation are that the government can control the use of private vehicles which can cause pollution, excessive oil and energy consumption, and congestion in urban areas (Safitri & Andari, 2011) (Aminah, 2007).

2. Bus Rapid Transit

   Bus Rapid Transit (BRT) is public transportation that uses buses as a mode of transportation, BRT is very effective and becomes reliable transportation for urban communities, with high capacity, speed of service, quality of service, and affordable prices. Implementation of the BRT system can reduce motor vehicle use, congestion, and air pollution (ITDP, 2016). Ease of accessibility that can be reached by everyone both on the way to the bus stop, when stopped, or while on the bus (Wirasinghe et al., 2013).

3. Platform-Level Boarding

   Having the same station floor height or level as the bus floor is an effective way to reduce vertical gaps that will reduce passenger up and downtime (ITDP, 2016) (Roderick B. Diaz et al., 2004). Reduction and elimination of horizontal gaps between the station floor and the bus will improve passenger safety, passenger comfort while riding or going down the bus, and with easy access for passengers, especially for passengers with disabilities, parents, pregnant women (ITDP, 2016)(Rüger & Simić, 2011)

4. Passenger Safety

   According to Kurniati, (2014) safety is a safe condition, in a condition that is safe physically, socially, emotionally, at work, psychologically, or educationally and avoiding threats to these factors.

   To meet passenger safety, transport operators must meet safety standards set by the government such as having standard operating procedures for safety and providing safety facilities (Olowosegun Adebola, 2014).

RESEARCH METHODS

The method used in this study was a qualitative approach, according to Sugiyono (2013: 21-22) Qualitative research is conducting research directly to the data source, and researchers become key instruments, presenting data in the form of words or images, and not emphasizing numbers. To obtain data and information, the primary data collection methods were used, namely data collection by direct observation and using questionnaires. Also, secondary data collection by taking sources from research that has been done, relating to Platform-Level Boarding.

RESULT AND DISCUSSION

Platform Boarding Regulation

The Government of Indonesia, in this case, the Ministry of Transportation has set the Minimum Road-Based Mass Transportation Service Standards listed in the Appendix to the Minister of Transportation Regulation of the Republic of Indonesia Number PM 27 of 2015. To support comfort, the Government regulates for the ease of boarding and alighting passengers, the height of the bus floor with stops must be parallel and there is no height difference.

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In the Attachment of DKI Jakarta Governor Regulation Number 33 the Year 2017 regarding Minimum Service Standards Transjakarta Public Transport Services regulates to support the comfort of passengers when boarding and getting off the bus, the maximum tolerance distance for the height difference between the bus floor and the bus stop is 10 cm.
In the 2016 BRT Standard issued by ITDP, the criteria for assessment in the BRT Standard determine the distance of the vertical gap with a distance of 1.5 cm and the horizontal gap of 10 cm even though the BRT Standard allows larger gaps.

Observation Result
Observations were made in corridor 4 and corridor 13 by taking 10 samples at several bus stops in each corridor. Corridor 4, researchers took 10 samples from 16 stops and in corridor 13, researchers took 10 samples from 12 stops. Here are the observations:

Table 1. Observation Result at Transjakarta Corridor 4 and Corridor 13

No.	Gap Observation Results	Gap Percent
1	In Corridor 4, there are 29 vertical gap cases from 160 samples	18.12% (vertical)
2	In Corridor 4, there are 149 horizontal gap cases from 160 samples	93.1% (Horizontal)
3	In corridor 13, there are 23 vertical gap cases from 120 samples	19.166% (Vertical)
4	In corridor 13, there are 117 horizontal gap cases from 120 samples	97.5% (Horizontal)

In this observation, the researchers find several findings that caused a vertical gap and horizontal gap in the two corridors.

Table 2. Observation Findings on the Transjakarta Corridor 4

No	Invention	Stop	Gap type
1	Driving skills	Every Stop	Horizontal
2	Bus Suspension Height	Every Stop	Vertical
3	Bus stop location	Manggarai	Horizontal
4	Height of the bus stop	• Tosari (Boarding side) • Matraman (tosari direction)	Vertical

Table 3. Observation findings on Transjakarta Corridor 13

No	Invention	Stop	Gap type
1	Driving skills	Every Stop	Horizontal
2	Bus Suspension Height	Every Stop	Vertical

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3	Bus stop location	Kebayoran Lama	Vertical
4	Height of the bus stop	• Swadarma • Seskoal	Vertical

The vertical gap that occurs ranges from 5-20 cm and the horizontal gap that occurs ranges from 20 cm - 45 cm in Transjakarta Corridor 4 and Corridor 13

Platform Impact Gap Boarding
Based on these observations, it can be concluded that the safety impact caused by vertical and horizontal gaps that occur to passengers supported by the results of the questionnaire are as follows:

1. Falls while riding by Transjakarta bus

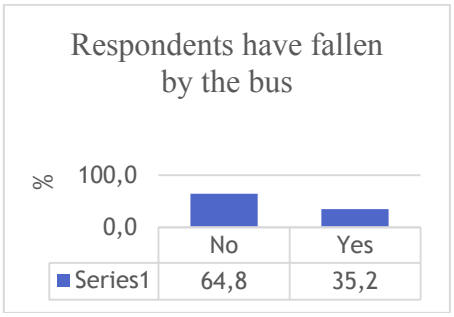

Figure 1. Respondents have fallen on board or off the bus

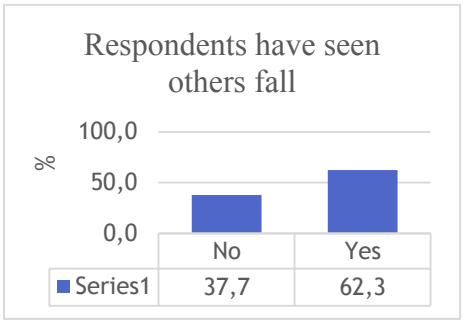

Figure 2. Respondents have seen another person fall

A gap between the bus and the platform causes the passenger to fall while riding or descending the bus. Evidenced by the percentage of respondents who have fallen while riding or getting off the bus with a percentage of 35.2% while those who have never fallen is 64.8%. In addition, the number of respondents who have seen another person fall is 62.3% while the respondents who have never seen another person fall by 37.7%.

2. Stumbled while riding by Transjakarta bus

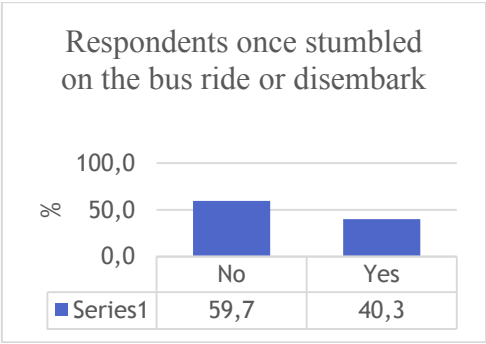

Figure 3. Respondents have stumbled while on or off the bus.

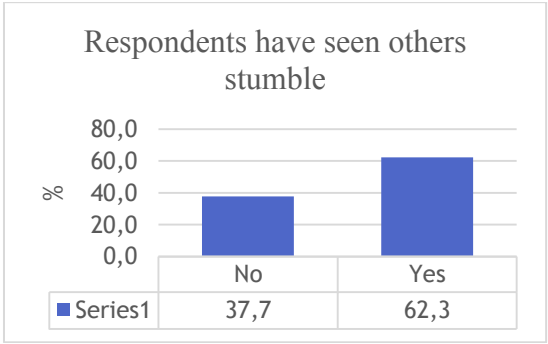

Figure 4. Respondents have seen others stumble

The gap between the bus and the bus stop platform causes passengers to stumble, as evidenced by the percentage of respondents who have tripped or climbed down when the bus has a percentage of 40.3% while those who have never tripped with a percentage of 59.7%, as well as the number of respondents who have seen others stumbled by a

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percentage of 63.5% while those who have never seen someone else stumbled shows a percentage of 36.5%.

3. Difficult access for disabled passengers

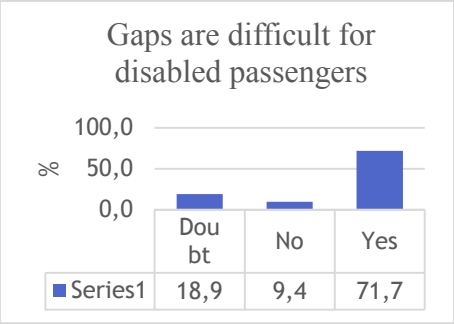

Figure 5. Gaps are Difficult for disabled passengers

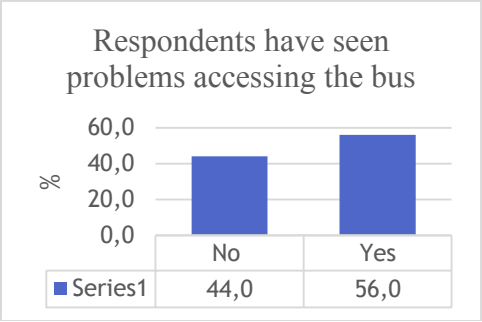

Figure 6. Respondents have seen disabled passengers having difficulty in accessing buses.

The gap between the bus and the bus stop platform which causes access difficulty in disabled passengers when boarding or disembarking on passengers with disabilities is evidenced by the percentage of respondents who answer "yes" by 17.0%, respondents who answer no as much as 20.8% and respondents who answer doubtfully as much as 62.3%. Whereas respondents who have seen disabled passengers having difficulty in accessing buses show a percentage of 56.0% while the number of respondents who have never seen disabled passengers having difficulty in accessing buses shows a percentage of 44.0%.

4. Difficult access for Elderly

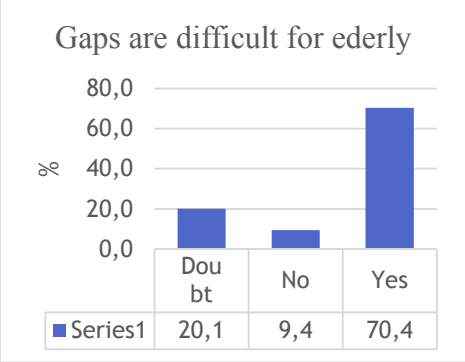

Figure 7. Gaps make it difficult for elderly

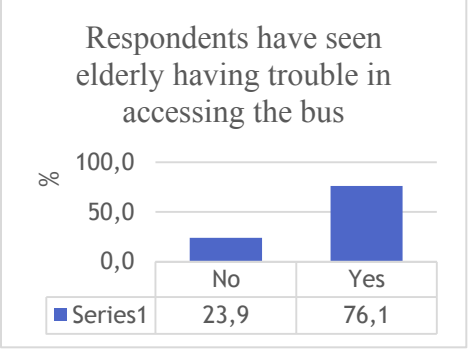

Figure 8. Respondents have seen elderly having difficulty in accessing the bus

The gap between the bus and the bus stop platform which causes difficult access for elderly on board the bus, evidenced by the number of respondents who answer "Yes" by 70.4%, respondents who answer "No" are 9.4% while those who answer doubtful are 20.1%. Moreover, respondents who have seen elderly having difficulty in accessing the bus show a percentage of 76.1% while respondents who answer not as much as 23.9%.

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5. Difficult access for pregnant women

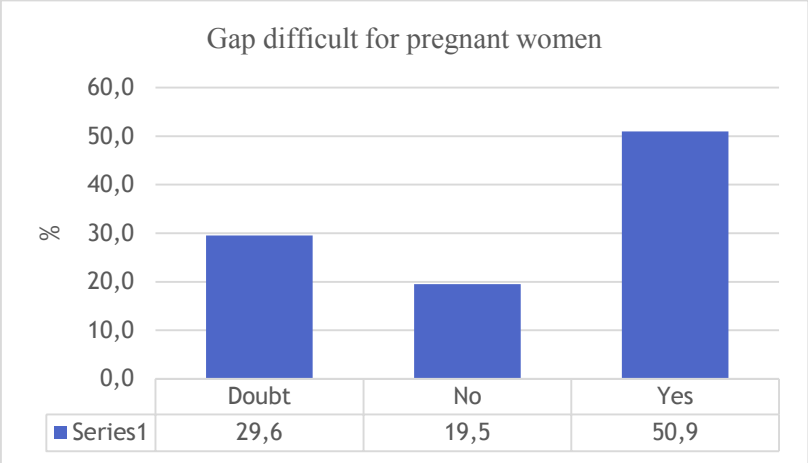

Figure 9. Gaps make it difficult for pregnant women

Platform gaps cause difficulties for pregnant women when getting on or off the bus. It is evidenced by the number of respondents who answer "Yes" as much as 50.9%, respondents who answer no as much as 19.5%, and the rest answer doubtfully as much as 29.6%

Technology Used by BRT in Several Countries to Eliminate Boarding Platform Gap.

The technology used by the Curitiba BRT System (Brazil, South America) is Bridge plates, this system works When the bus stops and opens the door, before the door opens, the bridge plates will go down first and proceed by the door that opens. This system is installed under the bus door or the front of the bus door which is useful for easy access to cross the gap between the bus and the bus stop, functioning before the bus door is opened.

The technology used by the Yichang BRT System (China, East Asia) is the platform extension boarding: the Yichang BRT system has developed the latest technology to reduce gaps, the platform extension works when the bus stops, using sensors to read how far the distance is between the bus and the bus stop, then it will give a command on the platform extension to reach the bus door. This platform system is installed at the bus stop and uses sensors to determine the distance of the bus from the bus stop.

CONCLUSION

Regulations in Indonesia have governed the gap between the bus stop platform and the bus, allowing or tolerating height differences of up to 10 cm. ITDP in the BRT Standard allows or provides tolerance limits for horizontal gaps of up to 10 cm and vertical gaps of 1.5 cm, although ITDP still accepts if there is a Boarding Platform Gap that is more than the tolerance limit.

Vertical gaps are found in Transjakarta corridor 4 at 13 shelters from 16 shelters studied and corridor 13 at 7 shelters from 12 shelters studied. Horizontal gaps are also found in Transjakarta Corridor 4 at 16 shelters from 16 shelters studied and Corridor 13 at 12 shelters from 12 shelters studied.

This vertical gap and horizontal gap cause a passenger accident in the form of a tripping passenger and stumbling passengers when boarding and getting off the bus. Also, there are

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difficulties of accessibility for elderly, disabled people, and pregnant women when boarding or getting off a bus.
To eliminate platform gap boarding, some BRTs in other countries use technology in the form of bridge plates used by Curitiba BRT, this system is installed on the Bus and platform extension boarding used by Yichang BRT, this system is installed on the Bus Stop.

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