The characteristics investigation of women commuters who participate to use Jabodetabek commuter line rail to analyse its service system quality

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Abstract. The high level of road density in Jabodetabek that caused by urban sprawl phenomenon prompted the government to increase the number of commuter who use Jabodetabek Commuter Line Rail (KRL). According to that, women commuters have higher participation in using mass public transportation than men. However, it must be supported by a service system that accommodates their needs. Therefore, the research about the characteristics of women commuters using KRL is important to analyse the KRL service system quality which accommodate their needs. It refers to four variables: age, income level, destination distance, and marital status, collected by questionnaire. The questionnaire was distributed to 120 respondents who were daily commuters and users between 2013-2020. The reasons for participation were collected by an in-depth interview with 15 informants who were also part of the respondents. The result is the service system in KRL (facility design, cost, access, and time travel) caused women commuter KRL users are dominated by productive age with varying income levels, married, and do activities in areas 1-3 km from a station. The conclusion is not all women commuters in Jabodetabek participate to use KRL because the service system has not accommodated all their needs.

1. Introduction
The role of Jakarta as Indonesia's capital city has led to economic activity and national development centralized [1]. The centralized has an impact on the high HDI value in Jakarta. By 2019, Jakarta's HDI value reached 80.76, which made Jakarta the highest HDI city in Indonesia [2]. It triggers a high level of urbanization in Jakarta that always goes 100% and occupies Indonesia's most elevated position from 2010-2035 [3]. The high level of urbanization forces expanding Jakarta's fringe area, thus forming the Jabodetabek area due to the conurbation between Jakarta and its four satellite cities [4]. Its four satellite cities are Bogor, Depok, Tangerang, and Bekasi, the peri-urban areas of Jakarta.

The conurbation is not accompanied by an integrated city planning and structuring system, which triggers the urban sprawl phenomenon [4]. This phenomenon results in high interactions between Jakarta and its four satellite cities, which impact the high number of Jabodetabek population mobility, especially commuters [5]. By 2019, the number of commuters making daily mobility between Jakarta and its four satellite cities is 13% of the total Jabodetabek population or equal to 3.19 million people [6]. Sixty percent of them use private transportation resulting in high levels of road congestion [6].
The high level of road congestion has encouraged the government to restrict the number of road transportation that passes. It is implemented through the policies to reduce private transport use and increase the use of mass public transit. These policies include the Regulation of the Minister of Transportation of the Republic of Indonesia No. 172 of 2015, Presidential Regulation No. 61 of 2011, Presidential Regulation No. 103 of 2015, Presidential Regulation No. 55 of 2018, and the Governor of Jakarta Instruction No. 66 of 2019. These five policies explain that governments are targeting 60% of the Jabodetabek population using mass public transportation. It aims to support the plan to reduce 26%-41% of the total greenhouse gas (GHG) emissions in Indonesia [7]. The project is in Presidential Regulation No. 61 of 2011 concerning the National Action Plan for reducing greenhouse gases.

The government also firmly stated that the solution to reduce road density and its various impacts is to shift road transportation to Jabodetabek Commuter Line Rail (KRL). KRL has a large number of passenger capacity but relatively a small amount of fuel consumption. The total passenger capacity for each trip in the KRL is 1,500 people, while the other is 8-40 people [8]. The amount of fuel used by KRL for each trip is only 0.33 liters, while others use 2 and 9 liters of energy for each trip [8]. It also impacts the minimal amount of fuel cost and GHG emissions generated by KRL compared to other mass public transportation modes. Government calculations show that shifting road transportation to the KRL can save fuel costs by 90% of the current total value of fuel [9].

On a deeper level, the government also stated that KRL’s positive impact could not be realized maximally if the Jabodetabek population, especially commuters, do not participate in using it. According to commuter participation, women commuters have higher participation in mass public transportation than men [6] [10]. However, it must be supported by a service system that accommodates their needs [11]. It indicates that the KRL service system, which houses the demands of women commuters, can reduce road transportation use. Referring to the number of women commuters in Jabodetabek, this service system's provision can reduce 30% of road transportation users on weekdays. It causes a decrease in road density, which also impacts reducing the amount of fuel consumption and GHG emission produced by the road transportation sectors.

The explanation makes the author interested in seeing whether the service system in the KRL has accommodated all woman commuter characteristics who use it. This interest is implemented in the form of investigations into participating women commuters who use KRL. This investigation aims explicitly to examine the proportion of each woman commuter characteristics who use KRL and its reason.

2. Method

2.1. Study area
This research was conducted in Jabodetabek but was not undertaken explicitly in the Jabodetabek Commuter Line Rail (KRL) station or carriage. It was caused by the Covid-19 pandemic, which did not allow the author to interact directly with respondents who were at station and carriage.

2.2. Data collection
This research used a questionnaire for collecting data about the majority characteristics of a woman commuter who use KRL. It was conducted for one month by August using the Google Form application. The questionnaire questions refer to four research variables that are characteristics of age, income level, destination distance, and marital status. In this case, the four variables affect woman travel behavior [12]. Furthermore, the result of the questionnaires was deepened using deep interview activity. This activity aims to obtain the reasons for the proportion of the existing characteristics.

2.3. Population and sample
The questionnaires were distributed to 120 respondent’s daily commuter in Jabodetabek and KRL daily users between 2013-2020. It aims to examine the coverage of women commuter users' characteristics after the improvement of the KRL service system in 2013. Fifteen people of the respondents will be selected to be an informant of this research. In this research, the informant's characteristics must represent each of the traits that exist in the questionnaire result.
3. Results and discussion

3.1. Characteristics of the age

Based on the result of questionnaire, the age proportion of women commuters who participate using KRL is proportional to the age proportion of commuters in Jabodetabek. In that age proportion, the most women commuters using KRL are dominated by the productive age group with total of 100%, while the productive age group for commuters in Jabodetabek reaches 94% [6]. In this case, the productive age group for participating women commuters are divided into 3 groups that are adolescent (15-22 years), adult (23-60 years), and Elderly (61-64 years). The adult age group has the highest percentage, reaching 95.83% which is followed by the adolescent age group at 4.17% and the elderly age group at 0%. A more detailed explanation can be seen in Table 1 and Table 2.

Table 1. The proportion of all age group.

| No. | Children (5-12 years) | Adolescent (13-22 years) | Adult (23-60 years) | Elderly (>60 years) |
|-----|------------------------|--------------------------|---------------------|---------------------|
| 1.  | 0%                     | 4.17%                    | 95.83%              | 0%                  |

Table 2. The proportion of adolescent and adult age group.

| No. | The Grouping | Adolescent | Adult  |
|-----|--------------|------------|--------|
| 1.  | 13-16 years  | 0%         | -      |
| 2.  | 17-19 years  | 40%        | -      |
| 3.  | 20-22 years  | 60%        | -      |
| 4.  | 23-29 years  | -          | 69.56% |
| 5.  | 30-39 years  | -          | 22.61% |
| 6.  | 40-49 years  | -          | 6.09%  |
| 7.  | 50-59 years  | -          | 1.74%  |
| 8.  | >59 years    | -          | 0%     |

Data in Table 2 also explains that the adult and adolescent age group is dominated by 20s with the main activity is being work. It is different with the proportion of productive age Jabodetabek’s commuters using mass public transportation which dominated by 30s with a total of 87.21% [13]. This difference is motivated by the design segmentation of KRL’s facilities and infrastructure that has not fully focused on the needs of all women commuter groups [14]. Furthermore, the design segmentation of mass public transportation facilities in Jakarta, especially KRL, tends to focus on the needs of middle-class men commuters who work [15]. It is because men workers and commuters in Jabodetabek are still dominate with the amount of 2,079,133 people or around of 71.50% [13], even though the number of women worker commuters in Jabodetabek continues to increase [6].

The focus on design segmentation of KRL is more easily adapted by women commuters in 20s than women commuters in 30s and over. It is because women aged > 29 years have a physical condition that begins to weaken as well as a higher level of privacy and tolerance than < 30 years [16]. Those conditions create uncomfortable feelings for them when using KRL with the design of facilities and service system which are very communal and dynamic (fast movement). It is confirmed by the results of the in-depth interview that the low number of commuting women aged > 29 years old, especially > 50 years old, is due to most KRL users’ fast movement.
They argued that they often have difficulty adapting to the pace of the action. It made amenities challenging to obtain, especially during rush hours. Their physical condition does not support their ability to move quickly, but the facilities design in the KRL does not accommodate their needs. They also considered that the most KRL user’s fast movement causes the tolerance level of women passengers aged < 30 years to be low, resulting in women passengers aged > 29 years who have higher tolerance level to be eliminated by the competition of all women passengers. In addition to the tolerance level factor, the spatial privacy that is not facilitated by the design of KRL’s facilities is also the cause of inconvenience for women passenger aged > 29 years when using it. Those explanations show that the higher participation level of women commuters in mass public transportation [6] [10], especially KRL, is strongly influenced by the level of suitability between its design facilities and the characteristics of their needs. It should be an important concern for the government to increase the number of Jabodetabek’s commuters using mass public transportation to reach 60% [7].

3.2 Characteristics of the income level

The results of the questionnaire show that 80.83% of women commuters who participate to use KRL have an income. It accordance with the majority types of their activities that is work as described in the previous section. That majority type is related to the difference in wages earned by women who work in the suburbs and the centre of city. In this case, women who work in the Bodetabek area which is suburbs area have a lower wage rate of 7.8% than the women who work in Jakarta [17]. This difference causes women workers to dominate the use of KRL as one of the Jabodetabek’s mass public transportation. In this case, they have varying income level as can be seen in Table 3.

| No. | Income Level       | Percentage |
|-----|--------------------|------------|
| 1.  | 0.5-1.5 million    | 3.09%      |
| 2.  | >1.5-4 million     | 7.22%      |
| 3.  | >4-6 million       | 59.79%     |
| 4.  | >6-10 million      | 18.56%     |
| 5.  | >10-15 million     | 1.03%      |
| 6.  | >15 million        | 10.31%     |

Table 3 shows that the number of women commuters who have an income above the Regional Minimum Wage (UMR) is more than those who earn below it. The number of them who have an income above the Regional Minimum Wage (UMR) is 89.69% while the others are 10.31%. However, the proportion of income level shows that the magnitude of income level does not affect the participation level of women commuters when using KRL. Based on Table 3, the percentage at each level of income is not in order. It indicates that the ability to pay of women commuters using KRL does not affect the amount of their expenditure to get the convenience of public transportation facilities. It also shows that the theory of willingness to pay which states that the ability to pay is directly proportional to the amount of expenditure for convenience [18] does not occur with women commuters using KRL.

In this case, all of women commuters using KRL choose to use it because of the low cost. All of them stated that the cost is more important than the convenience of the service system. It explains that the importance of comfort in the design of KRL’s facilities and service system is in second place after cost level. The importance of the cost level is influenced by the high level of their expenditure to meet their needs as women, thus encouraging them to be more economical in spending, including transportation cost [19]. Most of the needs of women are influenced by the characteristics of them, both physically and psychologically [19].
3.3 Characteristics of the destination distance

Based on the results of the questionnaire, the distance of the activity place of women commuters who use KRL is divided into three groups, which are 1-3 km, 5-6 km, and 7-9 km. Those who carried out activities at a distance of 1-3 km have the highest proportion with a percentage of 52%, followed by distances of 5-6 km and 7-9 km as can be seen in Table 4.

Table 4. The distance of activity place from stopping station.

| No. | Destination Distance | Percentage |
|-----|----------------------|------------|
| 1.  | 1-3 km               | 52%        |
| 2.  | 5-6 km               | 28%        |
| 3.  | 7-9 km               | 20%        |

The data in Table 4 shows that the farther location of the activity from the station causes the lower number of women commuters who participate to use KRL. In this case, the distance affects the level of ease of access which has an impact on the cost, length of travel time, and security level which they can get. The farther distance from the location of the activity results in a lower level of ease of access, which is indicated by higher transportation costs and travel time [19]. Therefore, the level of ease of access is one of the priorities for women including women commuters using KRL when choosing mode of transportation. It is related to their characteristics of women that are (1) thrifty because of their lot of expenses and (2) time-bound because of their many roles, especially for those who are married [19]. It explains that the distance of KRL’s station is one of the consideration for woman commuters when choosing to use KRL. According to that, all of KRL’s stations are located in the centre of the commuter’s activity areas. It indicates that KRL’s service system makes women commuting users easy to access their activity place.

3.4 Characteristics of the marital status

Based on marital status, woman commuters who participate to use KRL are dominated by those who are married with an amount of 58.3% as can be seen in Table 5. This proportion is proportional to the proportion of commuters in Jabodetabek which is also dominated by those who are married with a total of 58.1% [6].

Table 5. The proportion of marital status.

| No. | Married  | Unmarried |
|-----|----------|-----------|
| 1.  | 58.3%    | 41.67%    |

The high number of women commuters who are married is related to the domestic role that they have. The domestic role that women have after marriage makes them very time-bound so that the length of travel time on the modes of transportation is important for them when choosing the mode of transportation [19]. Therefore, the short travel time on KRL is the main reason for the large number of married women commuters use it. In KRL, the percentage value on the travel time indicator reaches 59%, which is greater 21% than the percentage value on the cost indicator [14]. It is also the reason of pregnant women passengers continue to use KRL even though the service system has not fully accommodated their needs. The results of the questionnaire showed that 66% of them continued to use KRL, as can be seen in Table 6. In this case, pregnant passengers also state that the speed of KRL’s travel time is able to provide a sense of security for them and reduce fatigue when travelling. It helps them reduce anxiety when travelling and thus supports their condition.
4. Conclusion
Woman commuters who participate to use KRL were dominated by productive age with varying income levels, married, and did activities in areas 1-3 km from the station. In this case, travel time, cost, and design of service facilities are indicators that affect the level of participation. Based on priority scale, the indicator of travel time is in the first position, while the indicators of cost and design of service facilities are in the second and third positions. However, the KRL’s service system tends only to accommodate the majority group's needs in a productive age group and did activities in areas 1-3 km from the station. Therefore, not all of women commuters in Jabodetabek participate to use KRL. Consequently, the number of road transportation users has not been reduced by 30%. Therefore, the research suggests focusing on discussing a woman-friendly service system in KRL to attract women commuter's interest.

Acknowledgements
The authors would like to appreciate the School of Environmental Science at the Universitas Indonesia. Hibah PUTI of Social Humanities from the Universitas Indonesia with the number is NKB-2596/UN2.RST/HKP.05.00/2020 that has funded this research to completion. We also thank all our families, friends, and the others who have supported this research's implementation.

Table 6. The proportion of users during pregnancy.

| No. | Use | Not Use |
|-----|-----|---------|
| 1   | 66% | 54%     |

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