

# Gender Determinant Factors for Bus Shelter Planning in Sustainable Urban Infrastructure

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**Abstract.** This article examines 14 factors related to mainstreaming gender for bus shelter planning in the creation of sustainable urban infrastructure in Semarang city. By conducting an interview survey of 70 male and female respondents, without being restricted by age, significant results were obtained in evaluating the performance of BRT shelters in the Corridor I Semarang using Crosstab technique. There are 4 gender determinant factors were resulted. Those are, in respective orders; availability of seats in the shelter, distance between the floor of the shelter and the bus body when riding/ descending passengers, the length of time waiting in the shelter, and the proximity of the location of the shelter to the pedestrian. It is clear that gender contributes to sustainable infrastructure as it gives equal access the perceptions, interests, needs and priorities of passengers to be weighted in planning and decision making.

**Keywords.** Gender, Bus Shelter, Sustainable Infrastructure

## 1 Introduction

The theme of sustainable urban infrastructure has evolved from the context of urbanism, slums, and the degradation of urban space to the ecological perspective of artificial environments and urban networks. This includes how social and economic aspects influence the development of urban networks. In the field of transportation, a sustainable urban infrastructure includes four aspects of innovation such as new mobility, city logistics, intelligent system management, and live ability[1, 2].

Based on the results of INRIX (a surveyor institution) study (2017) stated that the average congestion rate in the city of Semarang has reached 37 hours a year[3]. Therefore, public transportation modes are needed to facilitate the movement of the population. Demands for high mobility in the metropolitan area, must be balanced with transportation access that is able to meet the needs of all community groups. The mode of public transportation must pay attention to aspects of justice and equality, so that it can regulate share growth and reduce private vehicle use. The issue of BRT transportation access gaps in Semarang City was strengthened by 642 complaints related to the BRT which entered the

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complaint hotline through call center 1500094, Lapor Hendi, newspapers, SMS, and various social media @transsemarang during the period January to October 20, 2018 [4]. The majority of the complaints are related to the completeness and condition of public transportation facilities that have not paid attention to community needs. The gap in public transportation access could have an impact on the limited access of the community to carry out movements, thus inhibiting the community from accessing work, education, and social activities which in turn can reduce community productivity and economic growth in an area.

This article focuses on supporting facilities for the BRT movement in Semarang Corridor I, which is the conditions and quality of bus shelter, based on the results of field observations and analysis of the performance of its services. Why a bus shelter planning is important in the sustainable urban infrastructure? This is because bus shelter planning will influence the high and low crime rates[5-7]. Gender in transportation aims to ensure that the perceptions, interests, needs and priorities of women and men are given equal weight in planning and decision making in[8]. Based on that, most women depend on transportation public (formal and informal), which is often inefficient, uncomfortable, dirty, unreliable, poorly maintained and insecure. Public transportation and supporting facilities are important elements of sustainable transportation and efforts to reduce urban inequality. The social parameters of public transportation policies can be summarized into five, namely: Affordability, Availability, Acceptance, Accessibility[9, 10] and Accuracy[8]. Accessibility refers to a number of opportunities available within a certain distance or trip, and conformity is related to local meaning and cultural gender norms. A nearby bus shelter may not be accessible because roads are not safe, heavy traffic, lack of protection from the sun or rain and or lack of seating.

Therefore, sustainable urban infrastructure is related to the overall transportation environment and it starts with equitable public transportation facilities, accommodating the needs of its users. In the end, an urgent action need to be taken is how policy and planning program responded to gender norms in the form of bus shelter design and planning[5, 11]. With equitable bus shelter planning, it means facilitating access to work, especially for female target groups. In another words, there is an opportunity to manage time between productive and reproductive roles in the household work[12]. This is becoming increasingly clear, and it is urgent that the planning of bus shelters need to be adjusted to the functions of user activity. Especially, if it is associated with travel behaviour conducted by men, women and other groups of user targets.

## **2 Methods**

This study uses a survey research approach. The population was determined from the Semarang City BRT Corridor I users with a sample of 70 respondents; based on calculations using the Lameshow formula for infinite populations. Using gender perspective in the analysis means there is no need to equally divide the respondents, between men and women, but more importantly conducted depth observations to explore their perceptions and experiences in accessing the bus shelter performance.

The crosstab technique was conducted by looking at two aspects, i.e. security and comfort. Based on these two aspects, it was then constructed to 14 indicators based on the performance of BRT services in Corridor I Semarang. They are: (1) lighting in the shelter, (2) criminal acts, (3) availability of seats in the bus shelter, (4) cleanliness in the shelter related to garbage, (5) graffiti on the wall of the bus shelter, (6) smell inside the bus shelter, (7) the room temperature in the bus shelter, (8) the load capacity in the bus shelter, (9) the distance between the shelter floor and the bus body when riding / descending passengers, (10) availability of route related information, (11) tariff transparency (12) availability of

schedules information, (13) length of waiting time, and (14) proximity to shelter locations with pedestrians. The crosstab is useful to determine the importance of these problems to be addressed immediately based on user needs. Respondents were asked the degree of important for the above variables, divided into 4 classifications. Namely: most important, important, less important and not important.

### 3 Results and Discussion

Table 1 shows calculation results of each variable, based on the highest aspect points, for the overall classification (important, not important, very important and less important). This value is taken from the evaluation performance both in the male and female target groups.

**Table 1.** The Crosstabs Analysis Result (*Processed Primary Data, 2019*)

No	Aspect	Female		Male	
		Count % of Total	Meaning	Count % of Total	Meaning
1	Lighting in the shelter	41,4%	Less important	10,0%	Less important
2	Crime in the shelter	41,4%	Less important	10,0%	Not important
3	Seat Availability	<b>41,4%</b>	<b>Important</b>	8,6%	Less important
4	Cleanliness of the shelter	34,3%	Less important	14,3%	Less important
5	Graffiti in the shelter	37,1%	Less important	10,0%	Less important
6	Smell inside shelter	32,9%	Less important	12,9%	Less important
7	The temperature of the room at the shelter	32,9%	Less important	7,1%	Less important
8	Load capacity in the shelter	35,7%	Less important	10,0%	Less important
9	Distance and height of the platform	<b>47,1%</b>	<b>Important</b>	<b>11,4%</b>	<b>Important</b>
10	Availability of routes information	57,1%	Not important	11,4%	Not important
11	Availability of tariff information	44,3%	Less important	10,0%	Not important
12	Availability of bus arrival and departure schedules Proximity to pedestrians	52,9%	Not important	10,0%	Less important
13	Length of waiting time	<b>55,7%</b>	<b>Most important</b>	<b>17,1%</b>	<b>Most important</b>
14	Proximity to pedestrians	<b>52,9%</b>	<b>Most important</b>	<b>10,0%</b>	<b>Important</b>

Source: *Processed Primary Data, 2019*

According to the calculation results using Crosstab method, it is depicted that in general, men assume that all above variables are less important. The scores are less than 10% for all the answered questions. Whereas, women tend to perceive that 4 variables are the most important and important aspects to be recommended for planning better bus shelter. Namely: (1) length of waiting time, (2) proximity to pedestrians, (3) the distance and height of the platform, and (4) the seat availability respectively.

#### 3.1 Duration of Waiting Time in Shelter

The length of waiting time affects the level of security felt by the user. The longer the waiting time for transportation access, besides being able to influence the quantity of movement conducted; will also affects the higher risk of crime such as harassment and pickpocketing, especially at night or in quiet places[13]. It is clear that the length of the waiting time in the shelter is a very important variable for both groups. As it could affect the quantity of trips, they able to do. For group of female users, this can reduce their mobility in carrying out the dual roles they have, namely the productive and reproductive

roles. Whereas, for group of men, the longer the waiting time could have them penalized or sanctioned from the workplace because of late arrival.

The Management of BRT Semarang City began to notice this recently, precisely on May 2, 2019 BLU UPTD Trans Semarang and Semarang City Government launched the Trans Semarang application by Android based. This service performs the whereabouts of upcoming buses and find out when the bus arrives. It helps to minimize waiting time for BRT users and reduce the risk of jostling at the shelter during rush hour because they are informed when the bus will arrive, so user could plan the trip on time effectively.

### **3.2 Proximity of The Location Of The Shelter To The Pedestrian**

The proximity of the location of the shelter to the pedestrian is also a safety factor that needs to be considered in planning the construction of bus shelter. The location of the shelter that is close to the pedestrian could make it easier for users to access the shelter safely without fear of being hit by a vehicle that passes and does not disturb road traffic.

This is because group of women tend to need public transportation which looks more at the comfort, security, and ease of access to public transportation modes[6, 14]. Furthermore, this characteristic is urgent regarding to safety issues[15] suggested the important feature of exclusive BRT corridor to avoid accident cause by other transportation mode driver carelessness.

### **3.3 The Distance and Height of The Platform**

The distance between the floor of the shelter and the bus body when the passenger is too far up /down can have an impact on the inconvenience for passengers, especially women. It is uncommon and not recommended for passengers to jump on riding [16]. This is because the distance between the platform and the bus body is considered too far which can endanger the passengers, and can disturb the comfort of the passengers, especially for women with tight clothing; making it difficult to move.

Although there has been an effort from the BRT manager with a service solution in the form of providing an officer inside the bus to help passengers whom have difficulty up / down. However, for some users, especially women, the elderly, people with disabilities, the presence of an officer does not help, during rush hour and overcrowding of passengers.

### **3.4 Availability of Seats in The Corridor | Shelter**

The availability of seats in the shelter is one of the comfort factors that need to be considered in planning the construction of shelters. The reason is that it could reduce the risk of fatigue for the user due to the trip that is carried out while waiting for the bus arrival. So, it is mainly for health reason.

Availability of seats in the shelter is considered important for users, especially the female user group as much as 41.4%. This is related to the comfort of the user while waiting for the arrival of the bus. The result from field observations reveals the existence of a seat is still lacking and has not been able to meet user needs, which requires users to long stand waiting for the bus arrives.

On the contrary from explanations above, the following variables are classified less important to the user, both women and men. These are: (1) lighting in the shelter, (2) criminal acts, (3) cleanliness in the shelter related to garbage, (4) graffiti on the wall of the bus shelter, (5) smell inside the bus shelter, (6) the room temperature in the bus shelter, (7)

the load capacity in the bus shelter, (8) availability of route related information, (9) tariff transparency, and (10) availability of schedules in the shelter.

### 3.5 Lighting

Lighting inside the shelter is one of the factors to improve security for public transport users [17]. Based on the results in Table 1 it is obvious that 41.4% of women consider that lighting in a bus stop is a less important variable to be addressed immediately. It is related to the operational hours of BRT services in Corridor I, which is only until 18:30 hr. Therefore, lighting in the bus stop is sufficient and does not become an important matter to be addressed immediately even if it is only obtained from street lighting.



**Fig. 1.** Seating Conditions at The Shelter Corridor I



**Fig. 2.** The Condition of The Shelter Corridor I Without Lights



**Fig. 3.** Lighting in Shelter Corridor I Using Street Lighting

*Source: Documentation of Researchers, 2019*

### 3.6 Crime

Crime is one of the factors of insecurity in public transportation that can reduce the quantity of trips carried out by users, especially for groups of female users[18]. In accordance with the results of field observations and previous studies, it is often found that women are vulnerable to becoming victims of non-criminal crimes in public transportation such as harassment, pickpocketing, and other crimes compared to men. This can lead to limited access that women have to public transportation, so often they are afraid to travel alone, especially at night[18].

There is a decrease in the number of crimes related to crimes in the shelter based on the BLU data of the Trans Semarang UPTD in 2018. In addition, this is related to the hours of BRT services which only until 18.30 hour can minimize the occurrence of crime because of the uncrowded traffic on the Corridor route I. If the service hours are extended until night, the service route becomes quiet and the chance of criminal action increases.

### 3.7 Cleanliness

The cleanliness in the shelter in this study was classified into 3 aspects, namely cleanliness in the shelter from garbage, graffiti on the wall, and bad smell. Cleanliness in the shelter is an important factor of the comfort, perceived by women group. According to [19], and [20] it is recommended that women prefer infrastructure, with comfort and physical cleanliness[21].



**Fig. 4.** Condition of The Shelter Being Cleaned



**Fig. 5.** Pile of Garbage Near to Shelter



**Fig. 6.** Graffiti in The Shelter Corridor I

*Source: Documentation of Researchers,2019*

### 3.8 Room Temperature

The temperature of the room inside the shelter is one of the comfort factors that need to be considered in planning a bus shelter. The indicator for a good bus shelter is that it provides a guarantee of comfort with the presence of shade from the sun and rain, so that the user is not experiencing hot temperature or wetness from rain, while waiting for the arrival of the bus. Based on Table 1, it is clear that the room temperature in the bus stop is considered quite good because 40.0% of users consider that the variable is not important to be addressed immediately. This is due to the design of the shelter in corridor I; the majority of which are open shelters, so that the room temperature is not hot due to air flow.

### 3.9 Load Capacity

Unattended load capacity can disrupt the user's comfort because it causes jostling in the bus. Overloaded passenger capacity increases the risk of abuse when the situation in public transportation is congested[17]. Based on Table 1 it reveals that the load capacity in the bus stop is considered less important for the female user group as much as 35.7%.

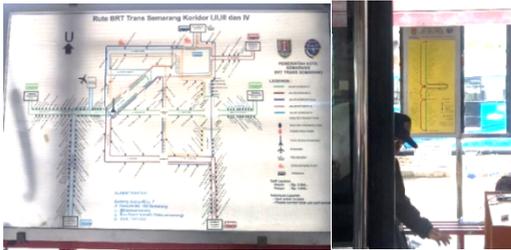
This is because the majority of bus shelters in Corridor I are open spaces, so that if the load capacity inside the shelter is full, passengers can wait outside the shelter. So, passengers do not jostle and can minimize the risk of criminal acts, unlike when compared to closed places such as inside a bus, female users will feel insecure overcrowding in closed shelters.

### 3.10 Availability of Information Regarding routes, tariffs and departure arrival schedules

Availability of route information in the shelter is a supporting instrument that should be a priority. It aims to make easier to travel especially for novice passengers. The information helps them to change trips and inside or outside the shelter[22]; when and where to get in or get off from BRT.

Since the launch of a Trans Semarang BRT application, bus routes could be accessed via mobile phone which is more convenient for millennial user groups compared to reading

route maps. So, users are not too concerned about the unavailability of route maps in the shelter. On the contrary, for passengers group, whom technological blind, the bus routes availability is considered important. In term of tariff, respondents weighted it less important because information related to tariffs has been installed in the fleet. Passengers could easily find out information on how much it costs. In addition, there are ticketing officers at several shelters who tell the passengers what rates to pay. This confirms the statement of Deng & Nelson[15], stated that fare, schedule, service frequency and ticketing mechanism could improve the passengers flow.



**Fig. 7.** Availability of Route Information in The Shelter



**Fig. 8.** Availability of Rates Information in The Bus

*Source: Documentation of Researchers,2019*

## 4 Conclusions

It is clear that crosstab analysis helps to prioritize the important aspect in planning of better bus shelter, especially in Corridor I with regard to the needs of each user group, namely the availability of seats in the shelter, the distance between the shelter floor and the body the bus when riding / descending passengers, the length of time waiting in the shelter, and the proximity of the location of the shelter to the pedestrian.

The less important aspects which consisting of 10 other variables are included in the security and comfort as predominant factors in constructing bus shelter. The evaluation of bus shelter performance of BRT Corridor I Semarang proves to be sufficient and confirm the relationship between the availability of adequate, complete and effective functions to support the passengers movement. As the end result, the role of good bus shelter planning supportS the creation of a sustainable urban infrastructure. The reason why gender is important for planning better sustainable bus shelter, as it conveys perceptions and experiences dealing with BRT performance. In short, gender perspective ensures that the critical aspects are effectively addressed. Therefore, knowing the needs of each group of users related to shelter facilities in this study can be used to plan better transportation for the creation of justice and gender equality.

## Acknowledgement

This research was financially supported by The Faculty of Engineering, Diponegoro University, Indonesia via Strategic Research Grant 2019.

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