



Socioeconomic influence on environmental awareness regarding willingness to use public transportation among formal workers

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ABSTRACT

Background: This study investigates the influence of socioeconomic status on environmental awareness and behaviors, particularly in relation to public transportation usage among formal workers in the Jabodetabek area. It highlights how factors such as income and education shape attitudes toward sustainability, with higher socioeconomic groups demonstrating greater environmental concern and engagement in eco-friendly practices. Despite this awareness, barriers including poor public transportation quality, high costs, and accessibility issues deter usage, leading many workers to prefer private vehicles due to safety concerns and system inefficiencies. **Methods:** A qualitative approach was employed, utilizing random sampling and an online questionnaire, yielding 100 valid responses analyzed through SPSS. **Findings:** The findings reveal that while socioeconomic factors correlate with environmental awareness, they do not directly influence public transportation use; instead, the quality of public transport significantly impacts willingness to use it. Limitations include a small, homogeneous sample, suggesting the need for future research to encompass a broader demographic. **Conclusion:** Proposed solutions to enhance public transportation include increasing service frequency, expanding coverage, and implementing traffic regulations that prioritize public transport. These improvements require collaboration among stakeholders to foster sustainable urban living and reduce environmental degradation. **Novelty/Originality of this article:** The study emphasizes the necessity of integrating environmental awareness with practical solutions to enhance public transportation systems.

KEYWORDS: awareness; environmental; public transportation; socioeconomic.

1. Introduction

In the community, there are many variations within socioeconomic status, and they will contribute to form complex behaviors to the environment (Hayward & Helbich, 2024). Behaviors toward the environment may differ greatly ranging from neglectful to caring attitude because of many factors contributing. One of the factors is environmental awareness, which measures community awareness towards environmental issues and their impact on everyday life. Environmental awareness involves understanding environmental issues, adopting good practices for preservation, and incorporating diverse perspectives to enhance environmental quality and promote eco-friendly behavior (Dabbous et al., 2023). High environmental awareness within community is seen from the caring attitudes about

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issues on the environment and their effect, coupled with real action to improve the issue. They are also more likely to participate in community initiatives aimed at improving environmental quality and to advocate for systemic changes that address root causes of environmental degradation. On the contrary, low environmental awareness tends to neglect environmental issues, even to the point of considering that environmental issues are not real. This can lead to behaviors that exacerbate environmental issues, such as littering, excessive consumption of non-renewable resources, and resistance to environmental regulations and initiatives.

Caring attitudes towards the environment are the result of community behavior that is shaped by common practice on everyday life. Socioeconomic factors play an important part in determining how communities will interact in daily life, especially their interaction with the environment. Study by Evans & Kantrowitz (2002) shows lower socioeconomic status is associated with greater exposure to environmental risk factors that are detrimental to health, which shows that low socioeconomic status indirectly affects environmental awareness. Socioeconomic status encompasses a range of factors, including income, education, occupation, and access to resources, all of which can influence how individuals and groups perceive and interact with their surroundings. Socioeconomic factor that plays a part on affecting environmental awareness is income, which shows that higher income contributes to higher awareness on environmental issues (Low et al., 2020). Other study also mention that having more disposable income may affect to more valuation towards environmentally sustainable product (Peterson et al., 2021). As a determining factor, other socioeconomic factor like education may also promotes high environmental awareness, for example, community with relatively high education level tend to have higher access to information and resulting to knowledge of environmental issues surrounding them and how to tackle these issues. On the other hand, communities with relatively lower education sometimes have limited access to information and resulting to limited knowledge of environmental issues, to the extent of ignorance. Low environmental awareness significantly impact communities' willingness to participate in environment activities (Gan et al., 2021). Although environmental awareness may affected by education level or grade, sometimes it may not related due to undeveloped environmentally responsible attitudes and behavior (Oğuz et al., 2011). Specialized education on environment instead of general education can improve the environmental awareness (Grimmette, 2014).

Environmental awareness can be built by implementing multi factors approach. Formal environmental education proposals can nurture students' action competence by promoting real participation, reflection on complexity, critical thinking, and community involvement (Varela-Losada et al., 2016). Besides formal education, engaging outdoor experiences and non-formal education can also build environmental awareness within the community (Nazir & Pedretti, 2016; Teane, 2020). Improving environmental awareness also can be started at relatively young age, by giving narrative-based environmental education, it shows that the method can improve children's environmental awareness (Yang et al., 2022). Unorthodox method may also implemented to improve environmental awareness, such as using a mobile game as media (Santos et al., 2013). Furthermore, direct involvement in environmental activities is important to build environmental awareness, such as planting trees, sorting waste, and energy saving. Being constantly doing those activities, it may become habit and promote higher environmental awareness. Study shows person who has high environmental awareness is also more likely doing environmentally sustainable activity, especially choosing low emission mode of transportation (Bai et al., 2020).

One of indicators that shows high environmental awareness is willingness to use public transportation (Arbeláez Vélez, 2024). Public transportation, as shown in many studies, provides better outcome to the environment (Bi et al., 2024; Din et al., 2023; Hassan et al., 2021; Huber et al., 2022). Public transportation that is well-maintained and built based on the necessity of the community, may become an effective solution to many problems in the city. Daily life problems such as traffic jams to more complex problems such as air pollution can be solved by fixing public transportation systems. As addition to environmental and traffic benefits, public transportation also offers economic benefit in form of lower

transport cost than private transportation (Jakob et al., 2006). Better public transportation systems led to increase in willingness to use public transportation, reducing usage of private transportation, reducing the air pollution, and ultimately making better air quality in environments. However, public transportation usage in some studies tends to be underutilized (Chuen et al., 2014; Steg, 2003). Study shows low willingness to use public transportation in relatively high traffic congestion area due to many factors (Baqarizky & Jachrizal Sumabrata, 2022).

There are many factors that caused low willingness to use public transportation. Based on study by (Watthanaklang et al., 2024), the main factor is the quality of the public transportation itself. Poor maintenance and low availability are among the deciding quality factors of the public transportation. Public transportation quality also has significant and direct relationship with perceived accessibility (Friman et al., 2020). Other non-technical factors, including expensive ticket price, preference, and access to private transportation may also drive the willingness to be low. Multi-dimensional factors mentioned may also connect and influence each other creating complex social and technical factors. These factors, with addition of socioeconomic backgrounds may create dynamics factors that interplay, affecting many community layers, whether public transportation user or non-user.

Formal workers, having the privilege of relatively higher monthly income among the community and high mobility, are expected to have high environmental awareness, especially the use of public transportation. They commute regularly between their home and work area taking most of the mobile society (Giménez-Nadal et al., 2024). The mobility of formal workers also generates transportation needs among them. Sometimes, it can be fulfilled easily by those who have access to private transportation. On the other hand, those who does not have the access, rely solely to public transportation or taxis (Hu et al., 2024). Many factors, such as socioeconomic may also contribute to workers' choice of mode of transportation (Stewart et al., 2017). Study in Perth (Badland et al., 2014), shows 87% of worker respondents use private vehicles, mainly caused by relatively far public transportation stop distance from either workplace or home. Another study also suggest that lower frequency of public transportation availability makes the work with multiple stops inefficient (Rest & Hirsch, 2016). As cases from Ethiopia, safety and security factors on public transportation also significant, especially for working women (Kacharo et al., 2022). From the local observations and studies, there are still many workers who prefer to use private transportation over public transportation, each with their own reasons.

This study aims to connect the relation of socioeconomic and cultural status with environmental awareness and the willingness to use public transportation. The important relation will help to understand and formulate better solutions for increasing environmental awareness within communities, and ultimately tackle environmental issues to move towards a sustainable way of life.

2. Methods

Method used in this research is qualitative method, done by random sampling using questionnaire. The respondents' criteria are formal workers and reside within the Jabodetabek area. Responses collected within 2 weeks and resulting to 110 total respondents, which 10 outlier responses were taken out. Questionnaires contain both closed and open questions, categorized by sections; demographics and socioeconomic backgrounds, environmental awareness, and willingness to use public transportation. Total valid respondents are based on Slovin formula (Sugiyono, 2016), with formula as follows:

$$n = \frac{N}{1 + Ne^2} \quad (\text{Eq. 1})$$

Whereas N is total population, assuming as total formal workers in Jakarta as 2023, which was resulting to 3,234,641 workers (BPS DKI Jakarta, 2024). e was the margin of

error, taking 0.1 for big population. Calculating both variables, resulting n (total samples) to 99.99 samples, round up to nearest value to 100 samples.

For demographics and socioeconomic backgrounds as independent variable and nominal scale, the variables are age, sex, marital status, education status, incomes, and work area backgrounds. Likert scale was used for the environmental awareness, with variables of environmental knowledge, environmental concern, public transportation benefit knowledge, and carbon capture knowledge as ordinal scale and both dependent and independent variable. The last section of willingness to use public transportation is dependent variable and contain both nominal and ordinal scale, collects data about habit of using public transportation and open questions regarding unwillingness to use public transportation. Data gathered will be analyzed using descriptive statistics to summarize data tendency, variability, and distribution. Inferential statistics with correlation analysis and multiple regression analysis are also used to determine the relationship and mathematical model of the data. Software used to analyze data was SPSS.

Table 1. Variables used in questionnaire

Main Variable	Sub Variable	Scale
Socioeconomic and Demographic Factors (x)	Age (x_1)	Nominal
	Gender (x_2)	
	Education Level (x_3)	
	Income (x_4)	
	Home to Workplace Distance (x_5)	
	Access to Private Transportation (x_6)	
Environmental Awareness (y)	Environmental Issue Knowledge (y_1)	Ordinal
	Environmental Issue Concern (y_2)	
	Public Transportation Environmental Benefit Knowledge (y_3)	
	Carbon Footprint in Work Concern (y_4)	
Willingness to Use Public Transportation (z)	Public Transportation Usage Frequency (z_1)	Ordinal
	Factors Affecting Unwillingness to Use Public Transportation (z_2)	Nominal
	Willingness to Use Public Transportation if Factors is eliminated (z_3)	Nominal

The study initiated by literature review of socioeconomic conditions that caused different levels of environmental awareness, strategies to increase the awareness, and the correlation between environmental awareness and willingness to use public transportation. Following literature review, data collection was conducted by online questionnaire to respondents with a random sampling among formal workers who reside in Jabodetabek area. Data collected from the procedure before was analyzed using SPSS. All participants provided informed consent, with a clear explanation of the study's objectives and methods. To protect their identities, no personal data is collected, and the data were stored securely to ensure confidentiality. However, because the study employed a qualitative approach, the results may not be widely representative to larger groups. Additionally, the reliance on self-reported data could lead to potential biases. Future studies could improve by including a larger sample size and incorporating a mixed-methods approach to gain a deeper insight into formal workers' willingness to use public transportation.

3. Results and Discussion

The total questionnaire response gathered was 110 responses, with 10 outliers eliminated through SPSS box data analysis resulting in 100 final data to be processed. Next, data was inputted into SPSS to determine the distribution of demographic and socioeconomic background. The sample consisted of 100 formal worker respondents. Male has majority of the responses at 64%. As of respondents age, mainly at 31–40 years old (47%) and 21–30 years old (40%), followed by small fraction of 41–50 years old (9%), > 50 years old (4%), and no responses on <21 years old. Most respondents have a bachelor's

degree (67%), followed by high school (13%), master's degree (12%), and small fractions of diploma degree (5%), doctoral degree (2%), and elementary (2%). As for income, middle high income (6–10 MIDR) nearly tied with high income (>10 MIDR) with 42% and 43%, respectively, followed by middle low income (2–6 MIDR) and low income (<2 MIDR) with 11% and 4%, respectively. For distance between home and workplace, the data is relatively distributed compared to other variables, with distance <5 km consists of 10%, 5–10 km consists of 32%, 10–20 km consists of 37%, >20 km consists of 19%, only 2% of respondents is working from home. Lastly, the transportation mode for work mainly consists of private transportation users (62%), followed by public transportation (29%), taxis (7%), and walking/cycling (2%). Further analysis by Pearson correlation was done to determine connection between independent variables.

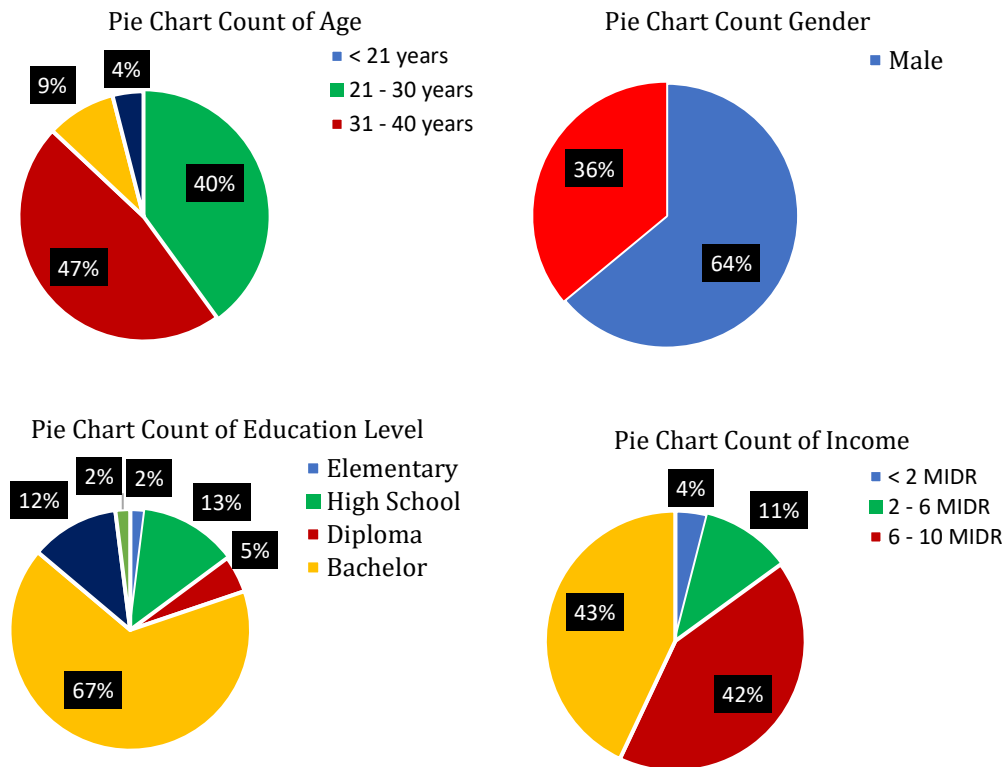


Fig. 1. Pie chart or frequency

(a) Age (b) Gender (c) Education Level (d) Income (e) Workplace Distance (f) Transportation Mode

Although independent variables – as definition – is the determining factor to dependent variables, but the relation between independent variables may have the connection each to each other. First, the correlation between age and income was examined, the results show that both variables are not correlated ($p > 0.01$). Next, the correlation between education level and income was tested. Interestingly, there is the moderate correlation between these 2 variables ($p < 0.01$ and $r = 0.498$), showing that 2 variables might affect each other. Another interesting correlation was tested between income and transportation mode, the result is correlated ($p < 0.01$) but relatively low correlation ($r = -0.345$). Some studies show that relatively high income will also make transportation modes tend to be more private. However, due to relatively low cost of private transportation in Jabodetabek area, the correlation might be lower than other studies where the private transportation is higher. Next, the gender variables are tested to other variables, result shown that there is no correlation of gender with other variables ($p > 0.01$) indicating that gender were not determining factors of other independent variables. Next data to be analyzed was environmental awareness.

Table 2. Pearson correlation test of demographic and socioeconomic variables

Correlation	X ₁	X ₂	X ₃	X ₄	X ₅	X ₆
x ₁ Pearson Correlation	1	-0.316**	0.069	0.218*	0.228*	-0.049
Sig. (2-tailed)		0.001	0.494	0.029	0.023	0.625
N	100	100	100	100	100	100
x ₂ Pearson Correlation	-0.316**	1	0.103	-0.147	-0.064	0.273**
Sig. (2-tailed)	0.001		0.310	0.146	0.529	0.006
N	100	100	100	100	100	100
x ₃ Pearson Correlation	0.069	0.103	1	0.498**	0.204*	0.059
Sig. (2-tailed)	0.494	0.310		0.000	0.042	0.561
N	100	100	100	100	100	100
x ₄ Pearson Correlation	0.218*	-0.147	0.498**	1	0.417**	-0.345**
Sig. (2-tailed)	0.029	0.146	0.000		0.000	0.000
N	100	100	100	100	100	100
x ₅ Pearson Correlation	0.228*	-0.064	0.204*	0.417**	1	-0.201*
Sig. (2-tailed)	0.023	0.529	0.042	0.000		.045
N	100	100	100	100	100	100
x ₆ Pearson Correlation	-0.049	0.273**	0.059	-0.345**	-0.201*	1
Sig. (2-tailed)	0.625	0.006	0.561	0.000	0.045	
N	100	100	100	100	100	100

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

For environmental awareness variables, all variables mean are calculated to determine the average score of each variables. First, the environmental knowledge mean was 3.48, indicating that average respondents have relatively moderate environmental knowledge. As for environmental concerns, public transport environmental benefit knowledge, and carbon footprint have similar mean of 3.97, 3.85, and 3.80, respectively. The variables of environmental knowledge, environmental concern, public transport environmental benefit knowledge, and carbon footprint are further aggregated using average score. The resulting mean of the aggregate, environmental awareness, was 3.78, just below the high (4.0) environmental awareness. This result might indicate that the majority of respondents already have moderate to high awareness. The variables of willingness to use public transportation are next analyzed.

Interesting data was shown in public transportation usage frequency, as the data is very varied for each frequency. Starting from 'never', the result was 11%, 'rare' was 28%, 'sometime' was 22%, 'often' was 25%, and 'always' was 14%. Factors of unwillingness to use public transportation were a multiple response data, the main factor of unwillingness was convenience (41%), availability (39%), time efficiency (34%), and transit place (28%). Other factors are relatively low including safety (11%) and cost (5%). The factors then aggregated to show how many factors each respondent was taken as their unwillingness to use public transportation. The results shows that mainly only one factor that contribute to their unwillingness (67%), and lower statistically as each factors increased (2;16%, 3;10%, 4;5%, 5;1%, and 6;1%) When asked about their willingness to use public transportation if barriers were resolved, 86% of respondents responded 'yes', 9% were 'hesitant', and 5% said 'no'. From the results, it was shown that the public transportation factors might be the main causes of unwillingness to use public transportation, regardless of socioeconomic and environmental awareness factors. This result is relevant from previous study that the public transportation factors were correspond with the willingness to use (Watthanaklang et al., 2024). Also, the safety factor results relatively low and might not be relevant to previous study (Kacharo et al., 2022). The assumption is that the previous study mentioning that the safety is closely related to female whereas in this study, the majority of respondents were male. However, the relationship of gender and safety result would be interesting to examine. Next, the data will be processed with inferential statistics to analyze the relationship between independent and dependent variables.

Table 3. Pearson correlation test of demographic and socioeconomic variables to environmental awareness

Correlation	X1	X2	X3	X4	X5	X6	y
y Pearson Correlation	0.125	0.119	0.635**	0.528**	0.231*	-0.115	1
Sig. (2-tailed)	0.217	0.238	0.000	0.000	0.021	0.256	
N	100	100	100	100	100	100	100

** . Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Next, the study of inferential statistics is examined. First, the relationship between socioeconomic background and environmental awareness is studied using Pearson correlation analysis. For age and environmental awareness correlation, there were no significance correlations ($p < 0.01$) as well as the correlation of gender and environmental awareness. Similar results also apply to workplace distance and transportation, and their relation to environmental awareness. Interestingly, both education level and income have significance correlation ($p < 0.01$) with the relatively moderate correlation, $r = 0.635$ and $r = 0.528$, respectively. These findings align well with the finding from previous study (Low et al., 2020; Peterson et al., 2021). Although not mentioning environmental knowledge or issues specifically, formal education may become the revelation into up-to-date issues regarding environmental. As for income, the correlation might show that certain workers with more money tend to buy more environmentally-friendly products thus resulting in higher environmental awareness. The correlations between both education level and income were positive value, meaning that the higher education level and income, the higher environmental awareness will be, further confirming the previous study. Next, the data is tested for its linearity to know whether the correlation can be shown as linear regression, simultaneous F-test will be used for this test. Based on the significance, the test showed that education level and income was significant (sig. < 0.01 and F-result $> F$ -table). However, due to the nominal data type nature of independent variables, it may not suggest predicting environmental awareness using multiple regression variables. The correlation between environmental awareness and willingness to use public transportation is studied next.

Table 4. Multiple regression analysis of public transportation usage frequency from environmental awareness

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	0.985	0.597		1.648	0.103
y ₁	0.007	0.273	-0.005	-0.025	0.980
y ₂	-0.681	0.321	-0.437	-2.120	0.037
y ₃	0.071	0.265	0.054	0.269	0.789
y ₄	1.192	0.693	0.733	1.720	0.089

a. Dependent Variable: z₁

For the next correlation, environmental awareness will be split again into initial variables then analyzed its regression into willingness to use public transportation, indicated by public transportation usage frequency. First, environmental knowledge and public transportation usage frequency shows significant correlation ($p < 0.01$) but relatively low moderate correlation ($r = 0.360$). For environmental concern and public transportation usage frequency, the result shows non-significant correlation ($p > 0.01$) of both variables. As for public transportation benefit knowledge, it shows significance correlation ($p < 0.01$) but again, low moderate correlation ($r = 0.395$). Similar results also occur on carbon footprint concern, where the correlation is significant ($p < 0.01$) but relatively low moderate correlation ($r = 0.363$). The results may be affected by complex relationships affecting the public transportation usage frequency other than pre-accounted environmental awareness variables. Based on simultaneous F-test, environmental awareness variables were significant (sig. < 0.01 and F-result $> F$ -table) against public transportation usage frequency.

Assuming the linearity assumptions were fulfilled, we can rewrite the multiple regression predicted equation as below

$$z_1 = 0.985 + 0.291y_1 - 0.383y_2 + 0.369y_3 + 0.298y_4 \quad (\text{Eq. 2})$$

Whereas z_1 is the public transportation usage frequency, scaled to 1 (never) to 5 (always), y_1 is the environmental knowledge, scaled to 1 (very limited) to 5 (very knowledgeable), y_2 is environmental concern, scaled to 1 (not very concerned) to 5 (very concerned), y_3 is public transportation benefit knowledge, scaled to 1 (very limited) to 5 (very knowledgeable), and y_4 is carbon footprint concern, scaled to 1 (not very concerned) to 5 (very concerned). The equation may be useful in order to predict similar variables used in this study. However, as the variables are more complex or the respondents covering broader categories, the equation may not successfully predict the result. This finding is aligned with previous study (Arbeláez Vélez, 2024), showing that higher environmental awareness tend to influence workers to take public transportation. Lastly, for inferential statistics, the correlation between socioeconomic and willingness to use public transportation is studied.

Table 5. Pearson correlation test of demographic and socioeconomic variables to public transportation frequency

	Correlation	x ₁	x ₂	x ₃	x ₄	x ₅	x ₆	z
z	Pearson Correlation	-0.056	0.117	0.289**	0.073	0.085	0.470**	1
	Sig. (2-tailed)	0.583	0.248	0.004	0.468	0.401	0.000	
	N	100	100	100	100	100	100	100

** . Correlation is significant at the 0.01 level (2-tailed).

* . Correlation is significant at the 0.05 level (2-tailed).

For the next correlation analysis, there is no significant correlation between age (x_1), gender (x_2), education level (x_3), income (x_4), and workplace distance (x_5) and willingness to use public transportation, indicated with public transportation usage frequency (z_1), with $p > 0.01$. It may happen because of independent factors that interfere with each other and simply socioeconomics was not determining factors for willingness to use public transportation. For example, higher education workers, as discussed in the previous part, may have higher environmental awareness, resulting in higher usage of public transportation. However, this is not the case when we compare the education level to the willingness to use public transportation directly, which have other factors that make the willingness to be low, such as availability, distance, and also private transportation access.

Therefore, based on this finding, there is no direct correlation of socioeconomics variables and willingness to use public transportation. Factors of unwillingness, along with the willingness after the factors eliminated will be discussed in more details in the next part. Factors of unwillingness were categorized into 7 categories, which are availability, safety, cost, comfort, transit distance, travel time, and other (factors that specifically do not refer to previously mentioned categories). The factors were multi answers question, which respondents may freely choose their factors of unwillingness from 1 factor up to 7 factors. Based on the number of factors that respondents chose, mainly only 1 factor that respondents chose (67%), followed by 2 factors (16%), 3 factors (10%), 4 factors (5%), 5 and 6 factors (1%), and 7 factors (0%). This finding shows that workers have specific 'main' factors that mostly affect their decision for not taking public transportation. This finding is further supported by correlation test between public transportation usage frequency (y_1) and number of factors of unwillingness, which shows no significant ($p > 0.01$) correlation. Several factors may have high or low significance to workers' decisions, and it was purely subjective. As shown in previous study (Friman et al., 2020; Watthanaklang et al., 2024), public transportation factors were some of the main drivers of unwillingness to take the public transportation.

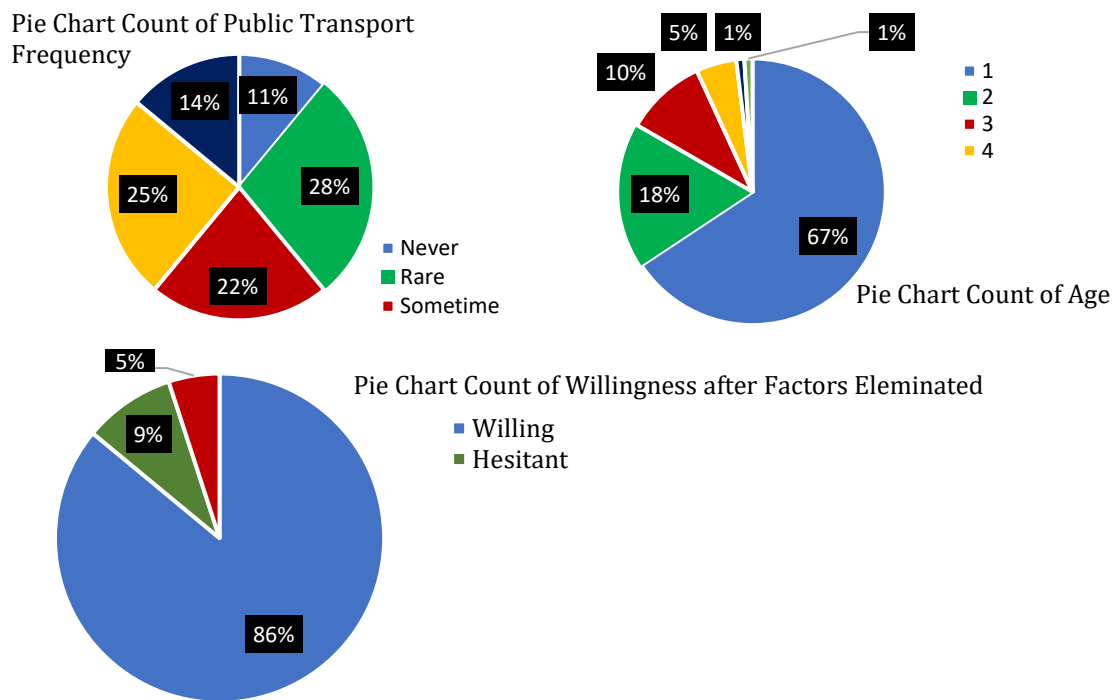


Fig. 2. Pie chart of frequency
(a) Public transportation usage (b) Factors of unwillingness (c) Willingness after factors eliminated

Most of the respondents answered that their main factor of unwillingness was comfort (41%), followed by availability (39%), and travel time (34%). Other than the top 3, factors with significant results were transit distance (28%) and safety (11%). Cost (5%) were relatively insignificant compared to other factors. Also, 2% of respondents have other factors for their unwillingness which was including the of respondents lifestyle of rarely travelling. The results may reflect that most of public transportation in Jabodetabek area is still relatively uncomfortable for the workers. Public transportation is often packed with workers in rush hour, making it less popular with, for example, more private areas of private transportation. The main solution for this factor is no other than adding public transportation frequency, especially during rush hour.

However, as the solution is mainly cost-based solution, it may become expensive and difficult to realize in short term. The second and fourth factors, availability and transit distance, are closely related with public transportation that serves the workers. In Jabodetabek area, the lines of buses were relatively extensive but only reached the majority of central Jakarta, not covering the entire suburban area surrounding it, thus making workers prefer taking private transportation as it eases them to reach work area from their home. Again, the effective solution may be very expensive, by adding more lines to serve workers from previously absent public transportation areas.

It also has to be studied carefully to determine the right target for new lines. If it is not carefully studied, it may become deadline with just few passengers using it. For third factors, travel time, it may be caused by traffic jams, or too many stops that public transportation have to make on each trip. Compared to private transportation that does not need to stop when travelling to destination, private transportation users will have difficulty switching to public transportation. In order to solve this factor, regulation, such as public transportation priority, may affect the travel time to be faster. Also, by making new lines and transport diversification, it also may make the travel time faster by offering workers different routes to their destinations by diverse choice of public transportation. For the cost, it may have a low percentage as the Jabodetabek public transportation is much lower in cost per kilometer compared to private transportation. Next, we study how the respondents' willingness after the factors of their unwillingness is solved.

Table 6. Factors of unwillingness frequencies

Factors	'Yes' Responds	'No' Responds
Comfort	41%	59%
Availability	39%	61%
Travel time	34%	66%
Distance	28%	72%
Safety	11%	89%
Cost	5%	95%
Other	2%	98%

Majority of respondents were willing to take public transportation after their factors of willingness are solved (86%), with relatively low respondents were hesitant (9%) and not willing (5%). This finding corresponds well with previous study (Friman et al., 2020) which has shown that factors of public transportation is main drivers of unwillingness to take public transportations.

The study found that comfort, availability, and travel time are the main barriers to public transportation use among formal workers, overshadowing socioeconomic factors like age, gender, and income. While environmental awareness showed some influence, it was weak compared to practical barriers. Most respondents (86%) indicated they would use public transportation if these barriers were resolved. To address these issues, solutions include increasing service frequency to reduce overcrowding, expanding public transport coverage to underserved areas, and implementing traffic regulations that prioritize public transportation. These improvements require significant investment and careful planning to ensure efficiency and meet workers' needs effectively. To address the barriers identified in the study, stakeholders must collaborate to improve public transportation and promote its usage among workers. Government authorities should prioritize increasing service frequency during peak hours, expanding coverage to underserved suburban areas, and implementing traffic policies such as dedicated lanes to reduce travel time. They must also establish frameworks for data-driven planning to ensure cost-effective investments in new routes. Public transport operators can enhance comfort by upgrading facilities and ensuring timely, reliable services while regularly collecting user feedback to adapt to commuter needs. Urban planners should focus on integrated transit hubs that combine multiple transport modes, strategically locate stops close to residential and commercial areas, and optimize traffic flow on critical routes. Employers can support public transportation by offering subsidies, allowing flexible work hours to ease peak-hour congestion, and providing last-mile connectivity through workplace shuttles. Finally, environmental advocacy groups can raise awareness of public transportation's environmental benefits, engage policymakers to push for sustainable mobility solutions, and educate communities on the importance of reducing reliance on private vehicles. By addressing comfort, availability, and travel time issues through these measures, stakeholders can make public transportation a more attractive and viable option for workers.

Nevertheless, this study is limited to a small portion of formal workers in Jabodetabek area and having possibility of homogeneous background over a diverse one. Future study to observe more diverse population samples, which include other groups such as informal workers and students may be more representative for robust conclusion as they will give broader characteristics regarding public transportation. There are also weak correlations found in this study, such as environmental concern with the public transportation frequency, suggesting that the variables choice may be irrelevant and promoting the usage of new variables, especially external variables, such as urban planning or employer policies to be examined. Lastly, this study also mainly consists of nominal data scales, which limiting the data to be processed using predictive statistical method such as regression analysis, further study may implement more of continuous numerical scale (ratio or interval) to enable more robust statistical analysis.

4. Conclusions

The study provides significant insights into the interplay between socioeconomic factors, environmental awareness, and public transportation usage among formal workers in the Jabodetabek area. One of the key findings is the moderate correlation between education and income levels with environmental awareness, suggesting that individuals with higher socioeconomic status are more likely to be informed about environmental issues and engage in sustainable practices. This relationship underscores the importance of education as a tool for enhancing environmental consciousness, which can lead to increased participation in eco-friendly behaviors, such as using public transportation. However, the study also reveals that despite a high level of environmental awareness among respondents, this does not directly translate into a willingness to use public transportation, primarily due to barriers related to comfort, availability, and travel time.

The contribution of this research lies in its identification of specific barriers that hinder public transportation use, which are often overlooked in discussions about environmental sustainability. By highlighting that factors such as convenience and the quality of public transport significantly influence commuting choices, the study emphasizes the need for systemic improvements in public transportation infrastructure. This finding is crucial for policymakers and urban planners, as it suggests that enhancing the quality and accessibility of public transport could lead to increased usage, thereby promoting more sustainable urban living. The study's results indicate that addressing these barriers could not only improve public transport adoption but also contribute to broader environmental goals.

Despite its valuable contributions, the study has notable limitations. The sample size of 100 formal workers may not adequately represent the diverse population of the Jabodetabek area, particularly as it predominantly includes individuals with similar socioeconomic backgrounds. This homogeneity could skew the findings and limit the generalizability of the results. Additionally, the reliance on self-reported data introduces potential biases, as respondents may overstate their environmental awareness or willingness to change their commuting habits. The study's use of nominal data also restricts the depth of statistical analysis, suggesting that future research should incorporate continuous numerical scales to allow for more nuanced insights.

Future research should aim to address these limitations by expanding the sample size and including a more diverse range of participants, such as informal workers, students, and residents from various socioeconomic backgrounds. This broader approach would provide a more comprehensive understanding of the factors influencing public transportation use and environmental awareness across different demographics. Furthermore, longitudinal studies could be beneficial in examining how changes in public transportation infrastructure and policies impact commuting behaviors over time. By addressing the identified limitations and expanding the scope of future research, stakeholders can develop more effective strategies to promote sustainable transportation practices and enhance environmental responsibility among diverse populations.

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Author Contribution

The sole author was responsible for the conceptualization, methodology, data collection, analysis, and writing of this study. All aspects of the research, including literature review, interpretation of results, and manuscript preparation, were conducted independently by the author.

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