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The Effect of Congestion on Productivity in the Semarang Urban Area

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ABSTRACT

Traffic congestion in Semarang City has become a significant issue that impacts the productivity of individuals and businesses. This study aims to assess the effects of traffic jams on work efficiency, stress levels, and transportation costs, as well as to evaluate public perceptions of the adequacy of current transportation infrastructure and policies. A quantitative research approach was used, with data collected through a survey involving 172 respondents from various sectors, including administration, manufacturing, and retail trade. The survey assessed factors such as delays, stress, fatigue, and increased operational costs resulting from traffic congestion. The results showed that a majority of respondents reported being late for work due to traffic jams, with 56.98% strongly agreeing with this statement. Additionally, 52.91% of respondents indicated that the time spent in traffic jams negatively impacted their work productivity. Traffic congestion was also found to increase transportation costs, particularly fuel expenses, as confirmed by 52.91% of the respondents. The survey also revealed widespread support for the development of public transportation to alleviate congestion, with 72.09% of respondents in favor of such initiatives. The findings suggest that traffic congestion has a significant negative impact on productivity and economic growth, emphasizing the need for improved infrastructure and effective traffic management policies. The study provides valuable insights for local authorities and stakeholders in designing strategies to address congestion and promote a more efficient and sustainable transportation system in Semarang.

Keywords: *Traffic Congestion, Transportation Costs, Public Transportation, Traffic Management*

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INTRODUCTION

Traffic congestion is a complex problem faced by many big cities, including Semarang City(Tazaruwah & Nihayah, 2019)). Due to population and economic growth, Semarang City has developed into a metropolitan area in Central Java(Ismiyati et al., 2018) The city of Semarang experiences significant traffic jams at certain times, especially in the morning and evening when workers are on their way to and from work(Supriyadi et al., 2000) Various sectors such as offices, manufacturing and trade are badly affected by prolonged traffic jams, which not only impact individual efficiency but also increase company operational costs(Falcocchio & Levinson, 2015) This phenomenon needs serious attention, especially considering that the goal of economic growth is achieved through

increasing productivity(Iroham et al., 2019). Based on the results of the 2017 ITDP survey, the share of vehicle sharing reached 80%. This means that the use of private cars is still much higher than the use of public transportation. In 2019, the number of electric vehicles registered in Semarang City was 1.6 million . Previous research shows that traffic jams have an impact on employee delays, increased stress, and reduced levels of efficiency at work . Traffic jams result in the loss of productive time that could be used for economic activities or work. This is in line with research conducted by Indrajit et al. in a large city in Indonesia which shows that every minute of time wasted commuting to work reduces daily productivity levels. In Semarang, this impact is exacerbated by the condition of infrastructure which is not yet fully able to accommodate the increase in road users, especially in the central business district.

Traffic jams affect productivity through several main mechanisms, including delays, decreased motivation, and fatigue(Permatasari, n.d.-a). Their research found that workers who had to spend more than 30 minutes commuting to work experienced a decrease in productivity of up to 20%. This condition is exacerbated in cities experiencing rapid urbanization, such as Semarang, where public transportation is not yet fully reliable and adequate alternative routes are not yet available (Suwondo, 2019a) The high proportion of electric vehicles has an impact on traffic congestion problems. Traffic jams in Semarang City reach 37 hours a year, and drivers spend 17% of their time stuck in traffic jams. This is mainly due to the high level of private car use. Traffic congestion has a significant impact on productivity both at the individual and organizational levels(Sutia et al., n.d.) Long travel times, delays, and stress due to traffic jams can reduce effective working time and affect a person's work performance. Additionally, congestion can increase a company's operational costs in the form of increased fuel consumption and longer delivery times, thereby reducing its competitiveness(Clinton Tuan Parmonang & Putra Darmawan, 2018a)). In this research, the author aims to comprehensively analyze the impact of traffic jams on community productivity in Semarang City, with a focus on measuring travel time, work efficiency, and costs incurred by individuals and the business world. It is hoped that the results of this research will provide valuable insights for local governments and other stakeholders in developing more effective transportation policies. By understanding the relationship between congestion and productivity, appropriate steps can be taken to formulate effective strategies to overcome congestion and increase productivity in the Semarang urban area.

METHOD

This study uses a quantitative research approach to analyze the impact of traffic congestion on productivity(Rakhmatulloh et al., 2020) in the Semarang urban area, focusing on various economic sectors. The sample taken includes workers in key sectors such as administration, manufacturing, and retail trade, ensuring a broad representation of the city's workforce.

To obtain a representative sample, this study uses a sampling frame similar to the *Krejcie and Morgan (1970)* method, where the sample size is calculated based on the city's

population. This approach ensures that each sector is represented proportionally and reduces productivity associated with congestion and travel time, as shown in previous studies on the impact of urban congestion on workplace efficiency by considering such declines.

The study is divided into several specific sections that assess several factors related to congestion(Hymel, 2009),including demographic information, daily travel distance, subjective impact on productivity, stress levels, and frequency of Masu travel delays. Using a Likert scale, respondents rate the level of impact they experience from negligible to significant.(Sweet, 2014) This allows for detailed analysis of variables such as stress and decreased productivity due to longer travel. (Striker et al., 1999) To increase reliability, a small pre-test will be conducted with a small group of participants to ensure clarity and consistency with similar studies on urban congestion and productivity loss(Davis et al., 2017)

In addition, secondary data will be collected from Semarang transportation authorities and related private companies to complement these findings(Suwondo, 2019b). The information includes average travel time, vehicle registration data, peak congestion, and operational costs related to fuel consumption and delay time. Therefore, secondary data adds an objective basis to subjective findings and strengthens the analysis by linking individual productivity perceptions to specific traffic metrics. Studies in other congested urban areas such as Metro Manila and Serikembangan have shown that integrating survey data with traffic statistics can provide a clearer picture of the impact of congestion on economic productivity(Vergara et al., 2019)

The data for this study were collected through a structured questionnaire distributed to 172 respondents. The responses were recorded in Google Forms and analyzed using Microsoft Excel. Descriptive statistics, such as frequencies, percentages, and mean scores, were employed to analyze the data.

This analysis identifies the main reasons why congestion reduces productivity, such as delays, stress, and additional fuel costs. These results demonstrate the impact of congestion on the economy and provide valuable insights for policy makers who wish to increase productivity through effective traffic management strategies in Semarang.

FINDING AND DISCUSSION

RESEARCH RESULT

Table 1: Demographic Details

Variable	Category	Frequency(n)	Percentage(%)
Gender	Male	150	87,21
	Female	22	12,79
Age	<20th	70	40,70
	20th	56	33,14
	>20th	45	26,16

Job	Student	63	36,63
	Employed	93	54,07
	Unemployed	17	9,88

Source: Primary data from questionnaire responses, analyzed by the author (2024).

Table 1 presents the demographic details of the respondents, which highlight key trends in gender, age, and employment status. The majority of respondents are male, comprising **87.21%** of the sample, while females represent only **12.79%**. This gender disparity indicates a significantly higher participation rate of males in the study, which could reflect the particular characteristics of the research population or a higher response rate among male participants(Rekers et al., 1989)

In terms of age, the sample is primarily composed of younger individuals. (Aksoy Kartci et al., 2020)**40.70%** of respondents are under 20 years old, while **33.14%** are between 20 and 29 years old, and **26.16%** are over 30 years old. This distribution shows a diverse age group, with a substantial portion of the sample being in the early stages of their career or education(Matunhay, 2022)) The presence of respondents aged over 30 adds depth to the study, offering perspectives from a broader age range(Tamban & Maningas, 2020)

Regarding employment status, the sample includes a mix of students, employed individuals, and the unemployed. **54.07%** of the respondents are employed, while **36.63%** are students, and **9.88%** are unemployed. This suggests that the study captures a broad spectrum of the working population, with a majority being employed, which is particularly relevant for understanding how traffic congestion impacts productivity in the workforce(Ma & Ye, 2019) The inclusion of students also allows for insights into how congestion may affect those still pursuing education. (Wachs, 2010)

Table 2: Responses to Traffic Congestion Questionnaire

Statement	**1**	**2**	**3**	**4**	**5**
Traffic jams caused me to be late for work.	42	4	6	22	98
The time I spend in traffic jams reduces my work productivity.	42	8	11	20	91
Traffic jams cause me to feel tired or stressed, which affects my work performance.	57	6	13	24	72
Congestion increases my transportation costs, such as fuel costs.	39	9	18	13	93
My company experiences increased operating costs due to congestion, such as additional fuel costs.	41	10	16	17	88

The transportation infrastructure in Semarang is adequate to overcome traffic congestion.	30	10	17	17	98
Traffic management policies in Semarang have been effective in reducing congestion.	26	15	10	23	98
I support efforts to develop public transportation to reduce congestion in Semarang.	20	4	10	14	124
Time spent in traffic jams leads to loss of productive time that could be used for other activities.	29	9	9	24	101
Traffic congestion significantly impacts economic growth in Semarang.	26	6	19	16	105

Source: Primary data from questionnaire responses, analyzed by the author (2024).

This table presents the questionnaire results by categorizing each statement into five Likert scale categories(Tazaruwah & Nihayah, 2019) The data in the last column (1 to 5) represent the number of respondents for each level of agreement with the statement. The data source is the questionnaire responses analyzed using Microsoft Excel(Alwin, 2007)

Based on the survey results, the following are the percentages of respondents who provided responses to various statements regarding the impact of traffic congestion on work productivity(Clinton Tuan Parmonang & Putra Darmawan, 2018b) The table below shows the number of respondents who selected each option on the Likert scale, which was then converted into percentages based on the total number of respondents.(Permatasari, n.d.-b)

Table 3: Percentage of Responses to Traffic Congestion Questionnaire

Statement	**1**	**2**	**3**	**4**	**5**
Traffic jams caused me to be late for work.	24,42	2,33	3,49	12,79	56,98
The time I spend in traffic jams reduces my work productivity.	24,42	4,65	6,40	11,63	52,91
Traffic jams cause me to feel tired or stressed, which affects my work performance.	33,14	3,49	7,56	13,95	41,86
Congestion increases my transportation costs, such as fuel costs.	22,67	5,23	10,47	7,56	54,07

My company experiences increased operating costs due to congestion, such as additional fuel costs.	23,84	5,81	9,30	9,88	51,16
The transportation infrastructure in Semarang is adequate to overcome traffic congestion.	17,44	5,81	9,88	9,88	56,98
Traffic management policies in Semarang have been effective in reducing congestion.	15,12	8,72	5,81	13,37	56,98
I support efforts to develop public transportation to reduce congestion in Semarang.	11,63	2,33	5,81	8,14	72,09
Time spent in traffic jams leads to loss of productive time that could be used for other activities.	16,86	5,23	5,23	13,95	58,72
Traffic congestion significantly impacts economic growth in Semarang.	15,12	3,49	11,05	9,30	61,05

Source: Primary data from questionnaire responses, analyzed by the author (2024).

Based on the table above, it can be concluded that the majority of respondents (more than 50%) experience the negative impact of traffic congestion on their work, particularly in terms of delays in reaching their workplace and reduced productivity. The highest percentage was found in the statement "Traffic congestion causes me to be late for work," with 56.98% of respondents strongly agreeing (5), indicating that congestion is a major issue affecting punctuality.

Additionally, more than 50% of respondents also feel that the time spent in traffic reduces their work productivity, with 52.91% agreeing with this statement. This indicates that congestion not only affects time but also the quality of work.

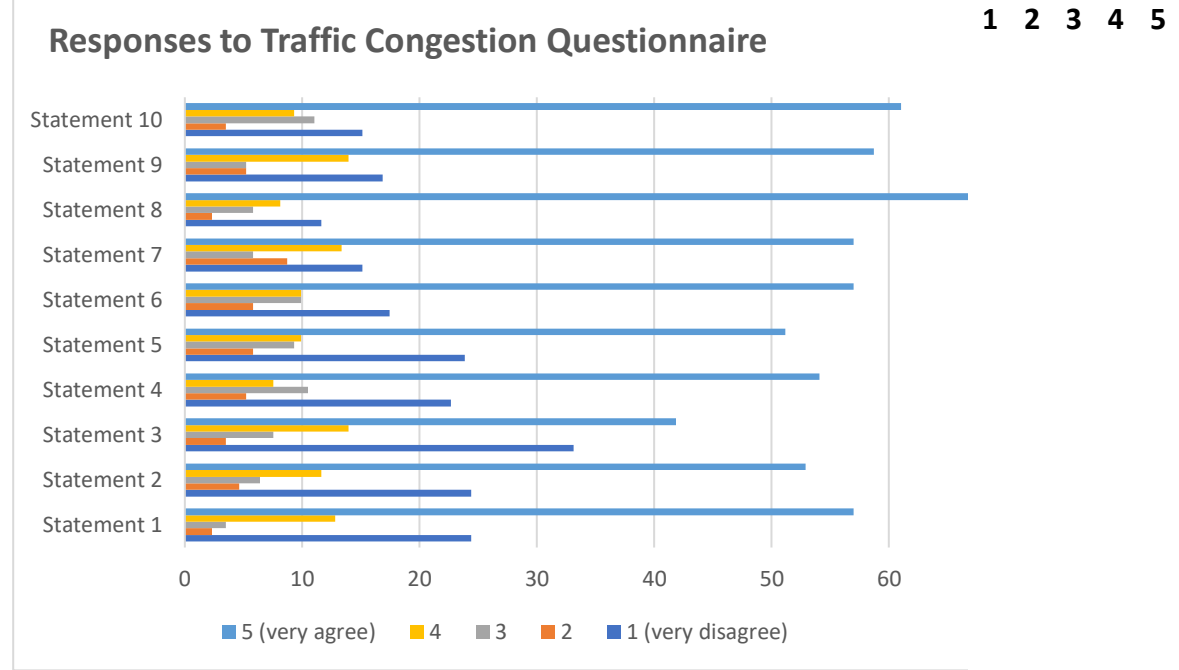
The impact of congestion on stress and fatigue is also quite significant, with 41.86% of respondents acknowledging that traffic congestion causes stress that affects their performance. Similarly, the increase in transportation costs is felt by 54.07% of respondents, who report higher fuel expenses due to congestion.

However, despite the considerable impact of congestion, more than 50% of respondents feel that the transportation infrastructure in Semarang is still insufficient to address the congestion (56.98%), and the majority of respondents also support the development of public transportation as a solution to reduce congestion (72.09%).

Overall, the survey results show that traffic congestion in Semarang has a significant impact on individual and corporate productivity, both in terms of lost time, increased operational costs, and reduced performance due to stress. Therefore, improvements in transportation policies and the development of better infrastructure are

urgently needed to mitigate the negative effects of congestion on the economy and the quality of life for the community.

DISCUSSION



Source: Primary data from questionnaire responses, analyzed by the author (2024).

Based on the survey results, it can be observed that traffic congestion in Semarang has a significant impact on various aspects of work productivity and operational costs. The majority of respondents acknowledge that congestion leads to delays in work, with 56.98% of respondents strongly agreeing with the statement that traffic congestion causes them to be late for work. This shows that congestion is a primary factor hindering timely arrival at work.

Additionally, the time wasted in traffic is also recognized as reducing work productivity, with 52.91% of respondents agreeing that the time spent in traffic reduces their ability to work effectively. Psychological impacts such as stress and fatigue also appear to be significant, with 41.86% of respondents feeling that traffic congestion negatively affects their performance. This indicates that in addition to the time factor, congestion also plays a role in affecting the mental and emotional condition of workers, which in turn can lower the quality of their work.

From a cost perspective, more than 50% of respondents report that congestion leads to an increase in transportation costs, particularly in terms of fuel expenses. This becomes a problem for both individuals and companies, as it can increase the economic burden.

On the other hand, the survey results show a high awareness of the importance of improving transportation infrastructure, with 56.98% of respondents feeling that the

current infrastructure is inadequate to address the traffic congestion. The majority of respondents also support efforts to develop public transportation, with 72.09% expressing support for such initiatives. This shows that the people of Semarang are aware of the need for change and prefer long-term solutions through the improvement of public transportation facilities.

Overall, the survey results emphasize the importance of serious attention to the issue of traffic congestion in Semarang. Efficient transportation policies and planning are needed to reduce the negative impacts of congestion on work productivity, operational costs, and the quality of life of the community.

CONCLUSION

From the survey results, it can be concluded that traffic congestion in Semarang has a significant impact on daily life, especially in terms of work delays, reduced productivity, and increased transportation costs. The majority of respondents feel that congestion disrupts their work both directly through lost time and indirectly through stress and fatigue.

Furthermore, most respondents indicate that the current transportation infrastructure is not capable of addressing the worsening congestion. The people of Semarang want improvements in the transportation system, with a focus on the development of public transportation as a long-term solution to reduce traffic congestion.

Based on these findings, it is recommended that the government and relevant authorities in Semarang focus more on improving transportation infrastructure and implementing more efficient traffic management policies. The development of an integrated public transportation system, as well as the implementation of better traffic management policies, is expected to reduce the negative impacts of congestion on the economy and quality of life for the community.

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