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Mobile Hawkers in Cities: a Local Wisdom and its Impact on Urban Planning Sustainability

The Case Study of Nongko Market Area, Surakarta

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Abstract

Mobile hawkers are important in providing accessible products, particularly to the urban community. For years, traditional on-demand vegetable hawkers have been benefiting from local wisdom. The presence of mobile hawkers who come to customers can reduce community movements by shortening the distance that customers must travel to shop. By reducing the length traveled in daily shopping, it is possible to reduce the usage of motorized vehicles, which further impacts urban sustainability. The purpose of this research is to compare the environmental impact of community activities with and without mobile hawkers on daily shopping activities. In this research, the Wilcoxon test was employed to determine whether there is a mean difference between two paired samples. The results reveal that mobile hawkers can help reduce the carbon footprint of community daily shopping mobility.

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1. Introduction

Mobile hawkers are a vital component of the informal economy in many regions, and they offer an essential role in providing accessible products, particularly to the inhabitants of cities. Mobile hawkers' movement allows them to go to different regions and cater to various customers. They often alter areas, busy streets, markets, festivals, or places where they believe there is an opportunity for them. Food and beverages, fresh products, shoe repair, punctured tire repair, and other services are shared among mobile hawkers.

People living in Indonesia (and other regions of Southeast Asia) purchase for their everyday needs in slightly different ways than people in countries elsewhere. They frequently purchase veggies, fruits, and fresh food from vegetable hawkers who pass their homes. Vegetable hawkers are mobile merchants who offer new commodities (vegetables and other products) for daily family cooking. One of the benefits of buying

from vegetable hawkers is the low cost of their products. Prices are often competitive with both other vegetable hawkers and traditional markets.

Vegetable hawkers move from markets to residential areas, mostly in urban areas. Mobile hawkers frequently set up stopping points in public areas, encouraging neighborhood participation and social interactions. Not only do hawkers move closer to customers, but customers are also moving closer to mobile hawker-stop locations near their homes. Local wisdom has allowed traditional, on-demand vegetable hawkers to maintain their existence for a long time (Russell, 2019). The ease with which people can enter the informal sector increases the number of mobile hawkers (Prasetyo et al., 2020). As stated by Fajarini (2014), local wisdom refers to everything related to the knowledge and art of managing life in the form of activities carried out by local communities to answer various problems in meeting their daily needs. It can be seen from the way people shop with their neighbors at mobile vegetable sellers so that they can greet each other in public spaces. This activity is also a form of collective communication and exchanging information both between traders and customers and among customers themselves. By reducing the distance customers must travel to go shopping, the existence of mobile hawkers who come to them could potentially reduce public movement. By reducing the distance traveled in daily shopping, it is possible to reduce the usage of motorized vehicles, which further impacts environmental sustainability.

Vegetable hawkers move daily from the market to residential areas, typically on motorized vehicles. The use of motorized vehicles at the same time will affect air pollution caused by residual fuel combustion (Rini et al., 2018). The city's sustainability will be impacted if the fuel used by mobile hawkers increases in urban areas. In addition, how people purchase can harm the sustainability of the city's environment. Carbon emissions in urban areas will rise if individuals use motorized vehicles to go farther for daily shopping, risking the city's sustainability. So, examining the carbon emissions created by people's regular purchasing habits is critical. This article will look at the characteristics of people's daily shopping and the emissions that result from it. Then, determine whether there is a difference in emissions produced by the presence or absence of mobile hawkers. Thus, how the presence of mobile hawkers affects environmental sustainability will be known.

Nongko Market is a traditional market in Surakarta that serves the community's daily needs. Nongko Market not only fulfills food needs but also daily household needs. Located in Banjarsari District, the center of Surakarta City, Nongko Market can be relied on to meet the daily needs of the surrounding community and the people passing through it.

2. Methods

The information collected in this research gathering took place in June 2022. We collected data from the community within a two-kilometer radius of the Nongko traditional market in Surakarta. Data were gathered from two types of respondents: mobile hawkers transiting through the study area and mobile hawker customers. There were 39 mobile hawker respondents who traded in the study area. In terms of determining mobile hawker customer respondents, the entire population has the same chance of becoming a research sample. The sample calculation was based on the approximated interval approach for an unknown population size due to the unknown population size of mobile hawker customers. The formula used is by Smith and Söderhäll

(1983), quoted by Suliyanto and MM (2018), with the minimum number of samples is 96.04, assuming a standard deviation of 0.25, a confidence level of 95% and an estimation error of less than 0.05. However, since there are 86 mobile hawker stopping spots spread throughout the study area, it is estimated that the number of samples for each stopping point is two customers for 172 samples of mobile hawker customers. In this case, respondents are determined in data collection using accidental sampling or convenience sampling, which takes respondents who can be located as a source of data with criteria that are relevant to the research topic (Sugiyono, 2017). Customer data included the distance from the customer's home to the nearest mobile hawker stop point and Nongko market, the frequency of shopping at mobile hawkers and markets, and the mode used for mobility to itinerant hawkers and markets.

Meanwhile, data from mobile hawkers includes trade mobility routes, trading distances, and daily trading modes. Motorcycle exhaust emission parameters for CO_2 are based on emission factors from the Minister of Environment's Regulation No. 12/2010 on implementing Air Pollution Control in the Region. These data were then used to determine CO_2 emissions from daily shopping mobility, both by mobile hawkers and by the customers of mobile hawkers. Carbon emissions (CO_2) from transportation operations are analyzed using the emission scope of the Intergovernmental Panel on Climate Change (IPCC) guidelines for national GHG inventory (Eggleston et al., 2019).

The researcher created a scenario of emissions originating from daily shopping activities if there were no mobile hawkers and all customers bought at traditional markets based on the results of the emission calculation. The present emission data (customers purchasing via mobile hawkers or markets) was then compared to the scenario emission data (all customers shopping at markets). Wilcoxon statistical analysis was conducted to determine if there was a difference in emissions between mobile hawkers and not mobile hawkers (all customers shop at traditional markets). Because the data was not normally distributed, the Wilcoxon test was used to examine it. The Wilcoxon test is beneficial for repeated measurements of the same topic under two different conditions (Scheff, 2016).

3. Results and Discussion

Mobile hawkers and Surakarta local wisdom

In Surakarta City, Indonesia, mobile hawkers already have daily schedules and routes (Figure 1). This characteristic contrasts the characteristics of mobile hawkers in New York (USA), who are moving targets with irregular hours and locations (Lucan et al., 2013). Surakarta's mobile hawkers specialize in providing raw supplies for everyday meals. Surakarta's mobile hawkers are also known as vegetable hawkers since they primarily offer fresh vegetables and cooking materials.

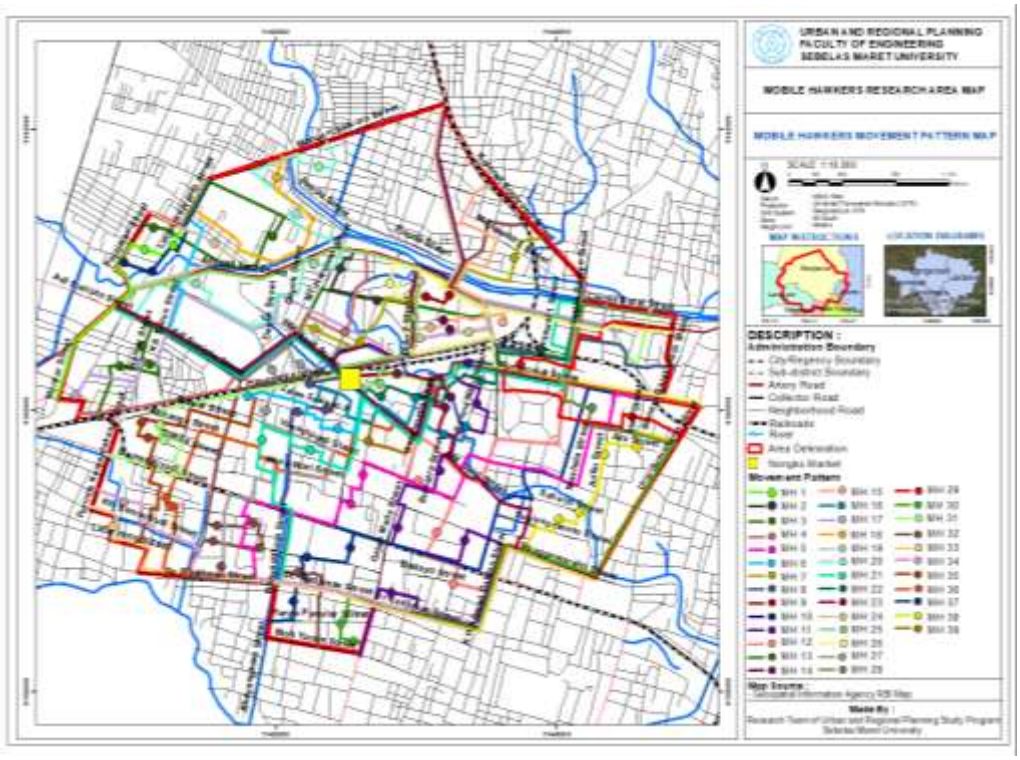

Figure 1. Mobile hawkers route

Figure 1 depicts the selling routes of 39 mobile hawkers within a 2-kilometer radius of Pasar Nongko, the traditional market. Each mobile hawker has a fixed stopping point and route and a fixed selling time every day. This consistency of selling makes mobile hawkers in Surakarta City dependable for the community's daily shopping needs.

The impact of mobile hawkers on urban planning sustainability

Mobile hawkers utilizing motorized vehicles to fulfill their grocery buying demands produce carbon emissions. Food, housekeeping, transportation, and entertainment significantly contribute directly to carbon emissions (Shen et al., 2022). Carbon emissions will also impact urban planning's livability and sustainability.

This study measures the distance traveled by mobile hawkers daily and the distance traveled by customers for shopping at the nearest mobile hawkers' stopping point from their houses. According to the research's findings, the distance traveled and method of transportation used by those who buy every day, both at mobile hawkers and the nearest traditional market, Pasar Nongko,

Mobile hawkers move from the market where they purchase what they sell to various locations throughout the city on a frequent schedule. These movements generate emissions (Table 1), which may be seen based on the type of mode used by mobile hawkers.

Table 1. Emissions generated by mobile hawkers

Category	Number of Mobile Hawkers	Total mileage (km)	Mode Used	CO_2 gas emissions generated (g)
1	5	16.76	Car	746155.2
2	34	138.71	Motorcycle	6175369.2

Table 2 presents the findings of analyzing the emissions produced by those who shop throughout their daily activities. The capital used to reach the mobile hawkers' stopping point and the nearest traditional market from their home is used to categorize emissions.

Table 2. Community-generated emissions by category

Category	Number of customers	shopping movement to the mobile hawkers' point			shopping movement to the market			
		Total mileage (km)	Mode used	Total shopping frequency (in a week)	Total mileage (km)	Mode Used	Total shopping frequency (in a week)	CO_2 gas emissions generated (g/week)
1	49	4.72	On foot	216	81	Motorcycle/Car	117	1207764
2	9	1.4	Motorcycle	29	13.9	Motorcycle	26	296567
3	2	-	-	-	3.8	Motorcycle	9	115116
4	2	0.3	On foot	1	2.2	Motorcycle/Car	10	69960
5	20	2.65	On foot	113	13.4	On foot	27	0
6	4	0.55	On foot	21	1.8	Bicycle	4	0
7	5	1.27	Bicycle	21	5.9	Bicycle	7	0
8	79	6.38	On foot	440	-	-	-	0

We compared the carbon emissions produced by daily shopping activities in the area. This study compared the current conditions to the scenario to estimate the impact of mobile hawkers on urban development. The existing conditions reflect the characteristics of community daily shopping and mobile hawkers near their homes (Table 2). The scenario being attempted is that if there are no mobile hawkers, people go to the nearby market, namely Pasar Nongko, to fulfill their daily buying demand. Each respondent's data was evaluated for emissions if they changed their shopping route to Pasar Nongko using a motorcycle or car. Table 3 reveals the difference in total emissions between the present and scenarios, highlighting that emissions are lower with the presence of mobile hawkers. These results show that the presence of mobile hawkers has an impact on the environment. The presence of mobile hawkers can reduce emissions in urban areas because mobile hawkers reduce people's movement to the market. This also shows that the existence of mobile hawkers has an impact on the sustainability of the city.

Table 3. The difference in emissions caused

	Existing Condition (mobile hawkers around the customer's home)	Scenario (no mobile hawkers)
Total Emission of CO_2 (g)	8,616,337	9,991,624

The difference will be analyzed statistically to determine whether it is significant enough to be applied to formulate conclusions. Because the normality test findings indicated that the data were not normally distributed, the Wilcoxon test was used to assess for differences (Table 4).

Table 4. The result of the Normality Test

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	**df**	**Sig.**	**Statistic**	**df**	**Sig.**
CO2_with_MH	.302	209	.000	.624	209	.000
CO2_without_MH	.109	209	.000	.946	209	.000

a. Lilliefors Significance Correction

The Wilcoxon test findings (Table 5) show a significant distinction between emissions produced by existing shopping activities (with mobile hawkers) and the scenario without mobile hawkers. This noteworthy result illustrates how the results of the emission analysis with the presence of mobile hawkers, which produce less emissions than if there are no mobile hawkers, can be used to make sustainable urban planning. Detailed information on urban consumption habits can assist in advising policies for the government that foster environmentally friendly innovations as part of sustainable urban planning (Fan et al., 2012).

Table 5. The result of the Wilcoxon Test

Test Statistics[b]

	CO2_without_MH - CO2_with_MH
Z	-3.986[a]
Asymp. Sig. (2-tailed)	.000

a. Based on negative ranks.

b. Wilcoxon Signed Ranks Test

Every day, people go shopping, whether they go to mobile hawkers or the nearby traditional market. The presence of mobile hawkers has the potential to contribute to emissions due to their movement from pick-up places (often traditional markets outside the urban areas) to stopping points, which usually occur in residential zones in urban areas. However, the emissions are significantly higher compared to emissions generated if there are no mobile hawkers in residential zones. This higher emission is due to the fact that individuals must shop at markets farther away than the mobile hawkers' stopping locations and rely on motorized vehicles to get there.

According to these findings, mobile hawkers may assist with sustainable planning. Integrating mobile hawkers into sustainable planning involves recognizing their role in the local economy, minimizing their environmental impact, and ensuring that regulations and initiatives support their contribution to the city. Regulation of mobile hawkers remains required because the number of mobile hawkers may increase or decrease due to various circumstances that weren't studied in this research. Furthermore, since mobile hawkers typically travel outside the city where they trade, policies inside the city may not cover them. Similarly, region policies where mobile hawkers originate cannot intervene in mobile hawker-stopping locations since they are outside their administrative jurisdiction. In other words, no policy covers them, either from the city where they trade or the city where the mobile hawkers come from.

Mobile hawkers who operate using motorized vehicles have the potential to disrupt the city's sustainability. The emissions caused by mobile hawkers traveling around the

city according to their daily route are thought to increase emissions in the city. On the other hand, the presence of mobile hawkers can reduce people's trips to shop at the market, most of whom use motorbikes. With mobile hawkers stopping or passing by their houses, people don't need to go to the market daily. The scenario examined in this research shows the difference in emissions if people shop at the market (using motorized vehicles) and mobile hawkers (on foot). The research results show that urban emissions are lower if people shop at mobile hawkers who stop or pass by their houses. Therefore, the existence of mobile hawkers has an important impact on urban emissions and environmental sustainability.

4. Conclusion

The viability of urban planning is impacted by mobile hawkers who meet people's daily buying demands. Emissions from motorized vehicle use, including that of shoppers and mobile hawkers, are the source of this harm. Based on the results of this study, even though mobile hawkers need motorized vehicles to operate, their presence has reduced motor vehicle emissions from customers while individuals go shopping. Mobile hawkers can improve the accessibility of goods and services. They can take care of residents' demands, saving them time and hassle by minimizing their need to drive far for demands. Mobile hawkers who have set their stop locations along their daily route and hours of operation bring value and are, therefore, dependable. However, to preserve the sustainability of urban planning, regulations must be put in place regarding the presence of mobile hawkers and their impact on the environment. Cities and urban planners should consider implementing regulations and incentives to encourage mobile hawkers to drive environmentally friendly vehicles and adopt sustainable business methods to optimize beneficial environmental sustainability. In that way, the advantages of less emissions from individual shopping travel can be multiplied by lowering the mobile hawker businesses' ecological footprint.

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