manufacture machines and other variables that were not observed in this study.

The result also explored the change in NO_2 in the observed roads. NO_2 was decreased only in one of the experimental roads (Jenderal Sudirman Street) while Nusantara Street showed no decrease. Other contributing factors must have determined the decrease found in Jenderal Sudirman Street but they were not the focus or the variables of the research. For example, Nusantara Street was an industrial area where several factories must have contributed significantly to the number of NO2 so that the decline of air pollutant emissions from vehicles might not affect the NO2 level on the area.

Somba Opu Street that received no intervention showed an increasing trend on NO_2. Somba Opu Street had a similar characteristic as Nusantara Street since both of them were busy streets occupied with shops and home industries. Without the parking intervention, the level of NO_2 could increase at any times. Therefore, after receiving the intervention, even though Nusantara Street showed no decline, the intervention still somehow managed to reduce NO_2 so that it did not increase significantly.

Furthermore, the decline in Ozone was found not only in the experimental roads but also in Masjid Raya Street whereas Somba Opu Street was quite stable. It indicates that the Ozone level was decreased in both experimental locations since the emission was not concentrated in the areas after the traffic became smoother. However, the Ozone level in Masjid Raya Street was declined due to the road character that had a dynamic pollutant change. Thus, other possible variables that reduced the Ozone level in Masjid Raya, although the street received no intervention, were still in questions

CO was declined in both experimental streets, which were Jenderal Sudirman Street and Nusantara Street. On the contrary, no change of CO level was found in non-experimental roads (Somba Opu Street and Masjid Raya Street). This finding confirmed to the prior expectation, claiming that the decline in CO level was only found in the experimental roads whereas the non-experimental roads showed stable levels. The results ascertained that the intervention helped the traffic to run smoothly, so that engine combustions were more efficient, leading to the reduction of CO emission. Therefore, parking management was a determinant factor in reducing the level of CO in the air.

Different results were found for the noise level. The noise reduction only occurred in Jenderal Sudirman Street as the result of the intervention while Nusantara Street did not demonstrate any significant decrease. In contrast, Somba Opu Street showed a significant increase in the noise whereas Masjid Raya Street managed to be stable. Due to the various results, it is unlikely to claim that parking management reduced the noise level. Even though one of the observed roads had a lower noise level, the other three roads did not give the same results. Moreover, Somba Opu Street that received no intervention had a higher noise level.

Noise is not only caused by vehicles. For example, Somba Opu as a trade and creative industry area attracted a mass of people at the same time required various heavy machines to work; the vehicle machine was just one of the factors contributing to the noise. A similar situation was found in Nusantara Street. Even though it received the intervention, traffic vehicle was not the only source of noise pollution. Thus, the decreasing percentage of occupancy did not lead to noise reduction.

It should be noted that the researchers were aware that Masjid Raya Street was always positioned at the highest average of environmental pollution among the other three roads. The pollution movement and the noise on the road were not stable and must have been determined by other diverse variables. Those possible variables could determine the fluctuation of the pollutant level or environmental pollution. Air pollutant emission from traffic vehicles was just one factor among other possible variables that contribute to environmental pollution. The parking intervention succeeded in reducing several air pollutants. However, the change of the pollutant levels was not merely determined by the passing vehicles. Thus, further study is highly required.

Based on the intervention and the measurement, it could be summarized that parking management could be a determinant of the traffic flow. It led to more efficient engine combustion at the same time reduced the pollution level concentrated in a particular road. Further, parking management could reduce several air pollutant levels from vehicles. Unfortunately, even though the parking management had potential in reducing the pollutant levels, the pollution was not only generated from the traffic emissions. The condition on some roads demonstrated that other unobserved factors could increase air pollution and noise level.

Previous research stated that the effect of air pollutant emissions from traffic vehicles could prompt the CO concentration. Even though other pollutant concentrations could grow, the increase of CO was mainly determined by traffic emissions. It was by another study claiming that high-concentrated CO was found at the dense and jammed traffics [16]. It emphasizes the current finding where CO was found lower in the experimental roads only. On the contrary, the non-experimental roads showed a relatively stable level of CO. Different from CO, another pollutant level such as NO_2 was highly influenced by diverse variables. As stated by Han and Naeher [16], NO_2 could be produced from traffic emission or chemical reactions in the atmosphere. Thus, even though the current study found a decrease in NO_2 on the experimental roads, it was not sufficient to claim that the lower traffic emission was the only reason for the decrease in NO_2.

Previous research investigated that a narrow lane and a high-concentrated emission in a particular area could deteriorate the pollution contamination. Based on the prior finding, if the airflow in some roads were blocked, the concentration levels of CO and NO_2 could increase faster [17]. It happened when vehicles attempted to pass by the obstructions due to the side-way parking. The street-occupying vehicles and densely tall buildings blocked the air circulation in busy streets. This condition leads to a high-concentrated emission such as CO and NO_2.

The disorganized condition created by side-way parking can deteriorate the environmental contamination. Previous research found that if the traffic speed was less than the average of 30 km/hour, it could increase CO production,

where 18 km/h speed could reach to 40% (for diesel-based machines) or 60% (for petroleum-based machines) higher than the free running vehicles [12]. The study also discovered that all vehicles attempting to pass the side-way barriers moved less than 18 km/h. After an intervention, both experimental locations showed a decrease in the travel time, signifying that vehicles moved faster. Thus, it can be concluded that the increasing speed influenced the efficient engine combustion so that CO production could be decreased and CO concentration on the roads could be reduced as well.

1) Controlling Environmental Pollution through the 450 Parking Intervention

Pollution that contaminates environment has been long examined not only in Indonesia but also in numerous international forums. One of the contributing factors to air pollution was the traffic emission that could also be influenced by traffic management [11]. Aside from the types of vehicles, traffic management can be a determinant in increasing CO levels as has been currently found and discussed in this study.

The researchers have examined the effectiveness of reducing air pollution through parking management. The 45^0 parking method was applied to lower the narrowing street space and to accelerate the traffic flows. The slow speed creates street density so that the vehicles cannot combust the engine perfectly. It accumulates the traffic emission such as CO and NO_2 that are produced excessively compared to faster moving vehicles, thus consequently forming air pollution.

After conducting the evaluation and analysis, the researchers argue that parking management contributes to the intensity of particulate emissions such as CO. Even though the declines were also found in SO_2, NO_2, O^3, and Noise, the researchers assume that other variables significantly determined the intensity fluctuation of SO_2, NO_2, O^3, and Noise. These conclusions were reached through the observation in the non-experimental roads that sometimes showed declines in spite of receiving no intervention. Thus, the researchers claim that parking management could lower the pollution intensity for SO_2, NO_2, O^3, and Noise although parking management could not have been the sole cause of the pollutant dynamic.

This current study obviously proved that parking management could leave more space for vehicles to pass by the roads. The research also showed that side-way barriers did not only increase the pollutant but also triggered negative emotional driving conditions. Unmanaged parking method did not only emanate air pollution but also influenced drivers' emotional condition and mental health. A measurement on emotional driving condition and proved that street obstructions could trigger negative emotional conditions such as anger has been established [13].

The current result provides important information that systematically simple parking management with 45^0 declivities could reduce the intensity of air pollution and allow for effectively in the street usage for drivers. Thus, the result requires further development to comprehend deeply on the transportation management method so that it can reduce the air pollution generated from the traffic emission due to the inefficient engine combustion.

2) Limitation and Further Research

The researchers have perused numerous studies, collected some data, conducted analysis and managed several interpretations to reach the research results. Even then, at the end of the research, several limitations demand additional examinations. Here are the limitations and the potentials that can be investigated deeper:

The researchers assume that other possible variables influenced environmental pollution; traffic emission was just one of the factors. Based on the result, parking management was not the only treatment that could reduce the intensity of pollution. Therefore, it is suggested for further research to investigate other factors that contribute to air pollution. For example, roads that are occupied with densely high buildings and street locations in industrial areas can generate severe pollution. However, advanced research is required to prove the hypothesis.

Second, roads have their own distinct conditions that distinguish them from one to another, thus, the parking method best applied is not always the 45^0 method. The researchers chose this technique by considering the contour of Nusantara and Jenderal Sudirman streets. The use of the technique allowed more street space so that it eased the drivers to park their vehicles. However, any kind of parking methods will not work when applied in different roads such as Somba Opu Street. Its wide is only three meters meanwhile the road has already been occupied crowdedly with shops and home industries. This case requires further research to investigate which method works best to reduce the contamination in similar road condition.

One of the unobserved studies is the health level of the nearby population who live in an area that is consistently contaminated by high traffic emission. This is crucial to understand and conduct preventive treatments if the people are exposed to the contamination that threats their health. The data analysis result of the current study showed that emission was still below the dangerous level. However, further research is highly needed to examine the effect of parking management, pollution and people's health condition in a long time.

Lastly, even though the researchers measured the emission accumulated in the roads, the emission from individual vehicles was not calculated. It would take more complex procedures such as stopping each vehicle to measure its emission. The current research was aided by the local environmental department to access some data on environmental pollution as needed. It restricts the reliability to accurately identify if the emission was generated from vehicles or other factors.

Based on the above explanation, the researchers need to investigate an experiment to distinguish the emission from each vehicle in various areas. It can emphasize the different levels of contamination produced by different vehicles in some conditions. The researchers have examined the effect of percentage of occupancy on several pollution variables. However, the researchers could not control other possible variables that might contribute to reducing the air quality at the same time. Therefore, further research is required to

examine the effect of particulate emission by controlling or involving other variables.

IV. CONCLUSION

The intervention attempted to manage side-way parking by using the 450 methods showed a significant effect in reducing the level of several particulate emissions. Nevertheless, it was only CO that was accurately decreased as the result of the intervention. Other airborne particulate emissions (SO2, NO2, and O3) might have been influenced by other variables. The parking intervention expanded the vehicles' moving space so that the time of occupancy was decreased and the engine combustion was more efficient. Thus, the perfect combustion quality reduced pollutant production in the air. Therefore, there were some influences of parking management on the traffic emission.

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